An Invitation to Health: Build Your Future

DIANNE HALES

15TH EDITION
After studying the material in this chapter, you should be able to

• Define cardiometabolic health, and distinguish between risk factors that can and cannot be controlled.
• Discuss types of diabetes mellitus and describe symptoms, health consequences, detection methods, and treatments.
• Discuss hypertension, including health consequences, prevention, and treatments.
• Identify the types of cholesterol that compose your lipoprotein profile, health consequences, recommended levels, and prevention and treatment for elevated cholesterol.
• Explain heart function and define myocardial infarction.
• Contrast stroke and transient ischemic attacks.
• Discuss the most common types of cancer, and describe the treatments of each.
• Evaluate your personal cardiometabolic and cancer risk factors and strategies to decrease risk.
Chris never forgot the terror he felt when his dad had his first heart attack. Only ten, he couldn’t understand why this towering giant of a man had fallen to the ground, his face twisted in pain, his fist pressed against his chest. His father seemed different when he came home from the hospital, as if something had gone out of him. But his face would still light up with an impish grin, especially when he’d sneak a cigarette and wink at Chris.

Preventing Major Disease

so he wouldn’t tell his mother. The second heart attack came four years later. This time Chris’s dad didn’t come home.

Chris promised his mother that he’d take better care of his heart. He wouldn’t smoke; he’d watch his blood pressure and weight; he’d keep tabs on his diet; he’d exercise regularly. Chris didn’t forget these promises as time passed. But like many college students, he felt invincible. He was shocked when a sports physical revealed that his blood pressure was high and his levels of the most dangerous type of cholesterol were elevated. But he also felt lucky: “I got my wake-up call,” he explains. “And I’m not going to ignore it.”

As Chris realizes, it’s never too soon, or too late, to start protecting your health and your future. Whether or not you will get a serious disease at some time in your life may seem to be a matter of odds. Genetic tendencies, environmental factors, and luck affect your chances of having to face many health threats. However, often you can prevent or delay major illnesses, such as heart disease, for years, even decades.

The time to start protecting your health is now. People mistakenly think of heart disease, cancer, and other disorders as illnesses of middle and old age. But the events leading up to these diseases often begin in childhood, progress in adolescence, and become a health threat to men in their 30s and 40s and to women in their 40s and 50s. This chapter provides the information about the risk factors, silent dangers, and medical advances that can improve your chances of a healthier, longer life.

The Power of Prevention

Young people often feel immune to such serious diseases, but illness can strike anyone. Regardless of your age, being in tune with your body is one of the best ways to safeguard your health.

More Americans are developing chronic illnesses such as diabetes and high blood pressure, often having more than three such conditions
Health on a Budget

Lowering Your Cardiometabolic Risks

Yes, advances in treatment can help if you eventually develop a cardiometabolic condition. But changes in lifestyle can do even more: To make healthy changes, select some of the behavioral modifications that require little or no expense to follow.

Changes You Can Make Today

• Eat a good breakfast: whole-grain cereal, juice, yogurt, and so forth.
• Take a walk after lunch.
• Skip dessert at dinner.
• Eat one more serving of vegetables.
• Eat one more piece of fruit.
• Drink one more glass of water.
• Take the stairs for one or two flights rather than riding the elevator in your dorm or classroom building.
• Get seven to eight hours of sleep tonight.
• Don’t smoke.

Changes You Can Make This Term

• Block out time for exercise on your calendar. Try for at least 30 minutes of physical activity most days.
• If you haven’t had your lipoproteins checked within the last year, schedule a test.
• If you don’t know your blood pressure, find out what it is.
• Make a list of stress-reducing activities, such as meditation or listening to music. Select two or three to try every week.
• Learn your family history. Inheriting a predisposition to high blood pressure, diabetes, or heart disease means that you need extra preventive care.
• Develop and use a support system of friends and family members. Identify individuals you can talk to, work out with, or call.

at a time—a financial as well as a physiological burden. Many chronic problems begin early in life. One in five children and teens in the United States has high cholesterol.1 More than a third of youngsters over age six are overweight. Obese children are twice as likely to die before age 55 as normal-weight youngsters.2 An estimated one in four college students already has at least one risk factor, such as excess weight or physical inactivity, that increases the risk of conditions affecting the heart and metabolism. The habits you develop now—regular exercise, sensible eating, responsible drinking, getting regular checkups—can keep you healthy for decades to come. (See How Do You Compare? p. 489.)

Deaths from the number-one killer of Americans—heart disease—have dropped 30 percent since 1996.3 Despite the gains that have been made, more people are still dying of illnesses than should be, many at young ages. “Everything is coming together in the worst way—obesity, inactivity, smoking,” says Dr. Clyde Yancy, president of the American Heart Association. “In our younger group, instead of seeing improvement, it is getting worse.”4

Simple lifestyle changes could reduce cardiovascular deaths by another 20 percent. However, many Americans are ignoring the basic rules for preventing cardiovascular disease, such as keeping their weights and their waistlines under control. (See Health on a Budget.)

Your Cardiometabolic Health

In recent years medical scientists in the United States and Canada have focused on the complex connections between various risk factors, symptoms, and diseases.5 Physical inactivity, for instance, increases the risk of obesity, which in turn leads to greater risk of many diseases. This new awareness has led to a focus on cardiometabolic health. “Cardio” refers to the heart and blood vessels of the cardiovascular system; “metabolic,” to the biochemical processes involved in the body’s functioning.

Cardiometabolic Risk Factors

Specific risk factors determine your cardiometabolic health. Once you understand your risk, you can start making changes to lower your odds of developing metabolic syndrome, diabetes, and heart disease.

Reducing as many risk factors as possible, rather than just focusing on one such as cholesterol, is more effective in preventing a heart attack.6
Risk Factors You Can Control  The choices you make and the habits you follow can have a significant impact on whether or not you remain healthy. Avoid the following potential risks for the sake of your cardiometabolic health.

Overweight/Obesity   Excess weight, an increasingly common and dangerous cardiometabolic risk factor in both men and women, undermines good health. The higher your BMI (Body Mass Index, discussed in Chapter 8) during adolescence, according to a recent study, the greater your risk of type 2 diabetes and heart disease in the future. Even teens with a BMI in the high “normal” range face an increased likelihood of health problems. Overweight teens who lose weight and keep their BMI within a healthy range as adults can eliminate the danger of diabetes, but being obese at any age endangers cardiovascular health. Obese adult men are at dramatically higher risk of dying from a heart attack regardless of whether they have any other risk factors.

Waist Circumference   Doctors had believed that apple-shaped people who carry most of their excess weight around their waists are at greater risk of cardiometabolic conditions than are pear-shaped individuals who carry most of their excess weight below their waist. The more visceral (abdominal) fat that you have, the more resistant your body’s cells become to the effects of your own insulin. However, recent research suggests that fat alone, regardless of where it is stored, boosts the likelihood of heart attack or stroke. Subcutaneous fat (located under the skin) as well as visceral fat pose dangers to cardiometabolic health.

A measurement of more than 40 inches in men and more than 35 inches in women indicates increased health risks. A “pot belly” raises risk even when a person’s weight is normal. Rather than waist circumference alone, the ratio of waist to height may be a more precise indicator of risk.

Physical Inactivity   As discussed in Chapter 8, about one-quarter of U.S. adults are sedentary and another third are not active enough to reach a healthy level of fitness. The risk for cardiometabolic conditions is higher for people who are inactive compared with those who engage in regular physical activity.

Fitness may be more important than overweight or obesity per se for women’s cardiometabolic risk. A minimum of 30 minutes a day of moderate activity at least five days a week can lift a woman from the “low-fitness category” and lessen her cardiometabolic risk.

The greater the exercise “dose,” the more benefits it yields. In studies that compared individuals of different fitness levels, the least fit were at much greater risk of dying. In men, more rigorous exercise, such as jogging, produces greater protection against heart disease and boosts longevity.

Tobacco Use   Smoking may be the single most significant risk factor for cardiometabolic conditions. Each year smoking causes more than 250,000 deaths from cardiovascular disease—far more than it causes from cancer and lung disease. Smokers who have heart attacks are more likely to die from them than are non-smokers. Smoking is the major risk factor for peripheral arterial disease, in which the vessels that carry blood to the leg and arm muscles become hardened and clogged.

Both active and passive smoking accelerate the process by which arteries become clogged and increase the risk of heart attacks and strokes.

Percentage of students who

<table>
<thead>
<tr>
<th>Activity</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Used sunscreen regularly when outdoors</td>
<td>48</td>
</tr>
<tr>
<td>If male, performed a testicular self-exam in last 30 days</td>
<td>34</td>
</tr>
<tr>
<td>If female, performed a breast self-exam in last 30 days</td>
<td>37</td>
</tr>
<tr>
<td>If female, had a gynecological exam in last 12 months</td>
<td>54</td>
</tr>
</tbody>
</table>

Source: American College Health Association, American College Health Association-National College Health Assessment II: Reference Group Executive Summary Spring 2010 (Linthicum, MD: American College Health Association, 2010).

How Do You Compare?

Simple steps can help you stay as healthy as possible as long as possible. Are you conscientious about these protective practices? Are you better at some than others? If not, why not? Are you too busy? Do you have other priorities? Is money an issue? Think through these issues and develop a personalized health maintenance plan. Write it down in your online journal.
You can do something today to prevent heart disease in your future. Eat some fruit.

You can do something today to prevent heart disease in your future. Eat some fruit.

**systolic blood pressure**  
Highest blood pressure when the heart contracts.

**diastolic blood pressure**  
Lowest blood pressure between contractions of the heart.

**hypertension**  
High blood pressure occurring when the blood exerts excessive pressure against the arterial walls.

**cholesterol**  
An organic substance found in animal fats; linked to cardiovascular disease, particularly atherosclerosis.

**lipoprotein**  
A compound in blood that is made up of proteins and fat; a high-density lipoprotein (HDL) picks up excess cholesterol in the blood; a low-density lipoprotein (LDL) carries more cholesterol and deposits it on the walls of arteries.

**High Blood Pressure (Hypertension)**  
Blood pressure is a result of the contractions of the heart muscle, which pumps blood through your body, and the resistance of the walls of the vessels through which the blood flows. Each time your heart beats, your blood pressure goes up and down within a certain range. It’s highest when the heart contracts; this is called **systolic blood pressure**. It’s lowest between contractions; this is called **diastolic blood pressure**. A blood pressure reading consists of the systolic measurement “over” the diastolic measurement, recorded in millimeters of mercury (mm Hg).

High blood pressure, or **hypertension**, occurs when the artery walls become constricted so that the force exerted as the blood flows through them is greater than it should be. Physicians see blood pressure as a continuum: The higher the reading, the greater the risk of stroke and heart disease.

As a result of the increased work in pumping blood, the heart muscle of a person with hypertension can become stronger and also stiffer. This stiffness increases resistance to filling up with blood between beats, which can cause shortness of breath with exertion. Hypertension can also act on the kidney arteries, which can lead to kidney failure in some cases. In addition, hypertension accelerates the development of plaque buildup within the arteries. Especially when combined with obesity, smoking, high cholesterol levels, or diabetes, hypertension increases the risks of cardiovascular problems several times. However, you can control high blood pressure through diet, exercise, and, if necessary, medication.

**Lipoprotein Levels**  
**Cholesterol** is a fatty substance found in certain foods and also manufactured by the body. Figure 15.1 shows food sources of cholesterol. The measurement of cholesterol in the blood is one of the most reliable indicators of the formation of plaque, the sludgelike substance that builds up on the inner walls of arteries. You can lower blood cholesterol levels by cutting back on high-fat foods and exercising more, thereby reducing the risk of a heart attack.

**Lipoproteins** are compounds in the blood that are made up of proteins and fat. The different types are classified by their size or density. The heaviest are high-density lipoproteins, or HDLs,
which have the highest proportion of protein. These “good guys,” as some cardiologists refer to them, pick up excess cholesterol in the blood and carry it back to the liver for removal from the body. An HDL level of 40 mg/dL or lower substantially increases the risk of heart disease. (Cholesterol levels are measured in milligrams of cholesterol per deciliter of blood—mg/dL.) The average HDL for men is about 45 mg/dL; for women, it is about 55 mg/dL.

Low-density lipoproteins, or LDLs, and very low-density lipoproteins (VLDLs) carry more cholesterol than HDLs and deposit it on the walls of arteries—they’re the “bad guys.” The higher your LDL cholesterol, the greater your risk for heart disease. If you are at high risk of heart disease, any level of LDL higher than 100 mg/dL may increase your danger.

**Triglycerides** are fats that flow through the blood after meals and have been linked to increased risk of coronary artery disease, especially in women. Triglyceride levels tend to be highest in those whose diets are high in calories, sugar, alcohol, and refined starches. High levels of these fats may increase the risk of obesity, and cutting back on these foods can reduce high triglyceride levels.

Figure 15.2 summarizes the factors to ask your doctor about at your next checkup.

**Risk Factors You Can’t Control**

**Family History** Certain cardiometabolic risk factors, such as abnormally high blood levels of lipids, can be passed down from generation to generation. Although you can’t rewrite your family history, individuals with an inherited vulnerability can lower the danger by changing the risk factors within their control. Your cardiometabolic health depends to a great extent on your behavior, including the decisions you make about the foods you eat or the decision not to smoke.

**Race and Ethnicity** Cardiometabolic risk factors occur at higher rates among ethnic minority populations such as African Americans, Hispanic Americans, and Native Americans. For reasons that aren’t entirely clear, people of some races are more likely to develop diabetes. Blacks and Hispanics have double the rate than those for whites. The incidence is even higher among

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**Figure 15.1 Cholesterol in Our Food**

Food sources of cholesterol in the U.S. diet. Percentages indicate the proportion of cholesterol each type of food contributes to the diet.

**Figure 15.2 Checkup Chart**

Adapted from CheckUpAmerica.org.
risk factor for members of this minority group, who are less likely to receive medical treatments or undergo corrective surgery. Family history, lifestyle, diet, and stress may also play a role, starting early in life. However, researchers have found no single explanation for why African American youngsters, like their parents, tend to have higher blood pressure than white children.

Black women are twice as likely as white women to suffer heart attacks and to die from heart disease. Common cardiometabolic risk factors—high blood pressure, diabetes, and high cholesterol—account for this increased jeopardy. In addition, black women are less likely to receive common medications, such as cholesterol-lowering drugs, to lower their risk.

Age  Cardiometabolic risk factors increase as people get older, especially past the age of 45. This may be because many individuals tend to exercise less, lose muscle mass, and gain weight as they age. However, cardiometabolic conditions are also increasing dramatically among younger people.

Metabolic syndrome, once called Syndrome X or insulin-resistant syndrome, is not a disease but a cluster of disorders of the body’s metabolism—including high blood pressure, high insulin levels, abdominal obesity, and abnormal cholesterol levels—that make a person more likely to develop diabetes, heart disease, or stroke. Each of these conditions is by itself a risk factor for other diseases. In combination, they dramatically boost the chances of potentially life-threatening illnesses.

This dangerous syndrome has become so widespread that health officials describe it as an epidemic that affects one in four Americans, especially Hispanic men and women.

College-age men and women who maintain their weight as they get older are much less likely to develop metabolic syndrome. About one in four undergraduates already has one risk factor for
metabolic syndrome. Young adults with metabolic syndrome are more likely than others their age to have thicker neck arteries, an indicator of atherosclerosis, the buildup of fatty plaques in arteries. Because retired professional football players have increased rates of metabolic syndrome and atherosclerosis, health professionals have called for regular screening of athletes, beginning in high school and college. An all-too-common culprit for young people is consumption of sugary soft drinks, which, according to a recent report by the American Heart Association, contribute to 130,000 new cases of diabetes and 14,000 new cases of heart disease every year.\textsuperscript{13} Watching television compounds the risk. Every hour you spend watching TV may increase your risk of an early death from cardiovascular disease by as much as 18 percent.\textsuperscript{13} However, losing 7 to 10 percent of your initial body weight may reverse the symptoms of metabolic syndrome.

Three or more of the following characteristics indicate metabolic syndrome:

- A larger-than-normal waist measurement—40 inches or more in men and 35 inches or more in women (for Asians and individuals with a genetic predisposition to diabetes, 37 to 39 inches in men and 31 to 35 inches in women).
- A higher-than-normal triglyceride level—150 mg/dL or more.
- A lower-than-normal high-density lipoprotein (HDL) level—less than 40 mg/dL in men or 50 mg/dL in women.
- A higher-than-normal blood pressure—130 mm Hg systole over 85 mm Hg diastole (130/85), or higher.
- A higher-than-normal fasting blood sugar—110 mg/dL or higher.

People with three factors of metabolic syndrome are nearly twice as likely to have a heart attack or stroke and more than three times more likely to develop heart disease than those with none.

Men with four or five characteristics of the syndrome have nearly four times the risk of heart attack or stroke and more than 24 times the risk of diabetes.

According to a review of 35 clinical trials, eating a Mediterranean diet, high in fresh produce, olive oil, and fish (discussed in Chapter 6), may prevent or even reverse metabolic syndrome.\textsuperscript{14}

**Insulin Resistance**

In a healthy body, the digestive system breaks food down into glucose, which then travels in the bloodstream to cells throughout the body. As the blood glucose level rises after a meal, the pancreas releases insulin to help cells take in the glucose. Insulin resistance is a condition in which the body produces insulin but does not use it properly.

When muscle, fat, and liver cells do not respond properly to insulin, the pancreas tries to keep up with the increased demand for insulin by producing more, but eventually it cannot. Excess glucose builds up in the bloodstream, setting the stage for diabetes. Many people with insulin resistance have high levels of both glucose and insulin circulating in their blood at the same time.

Insulin resistance increases the chance of developing type 2 diabetes and heart disease. Excess weight and lack of physical activity, along with genetic factors, contribute to insulin resistance.

**Prediabetes**

Prediabetes—sometimes called impaired fasting glucose or impaired glucose tolerance—is a condition in which blood glucose levels are higher than normal but not high enough for a diagnosis of diabetes. According to the most recent estimates from the CDC, more than a third of adults in the United States—an estimated 79 million men and women—have prediabetes, although more than 90 percent are not aware of it. Among Americans age 65 or older, half may have prediabetes.\textsuperscript{15}

**Risk Factors**

Several factors—some of which you can control—increase your risk for prediabetes and diabetes.

- Overweight or obese.
- Age 60 or older.
- Physically inactive.
- Parent or sibling with diabetes.
Diabetes Mellitus

About 12 percent of people in the United States have diabetes mellitus, a disease in which the body doesn’t produce or respond properly to insulin. In those with diabetes, the pancreas, which produces insulin (the hormone that regulates carbohydrate and fat metabolism) doesn’t function as it should. When the pancreas either stops producing insulin or doesn’t produce sufficient insulin to meet the body’s needs, almost every body system can be damaged. (See Figure 15.3.)

Worldwide an estimated 280 million people—6.4 percent of the people living on the planet—have diabetes. Nearly 26 million American have diabetes; an estimated 1.9 million receive new diagnoses every year. The CDC projects that up to a third of Americans could have diabetes by 2050 if they continue to gain weight and avoid exercise. (See “Health in the Headlines.”)

However, nearly 90 percent of adult diabetics...
do not meet the recommended healthy levels for blood sugar, blood pressure, and cholesterol. This puts them at risk of an early death from heart disease or of significant complications of untreated diabetes, such as blindness and chronic kidney disease.

About 8.5 percent of Americans overall have diabetes, but the rate is much higher—11 percent or greater—in 15 states, mostly in the South. People living in this so-called diabetes belt are more likely to become obese, sedentary, and less educated than in the country as a whole. Racial and ethnic minorities around the country also have higher rates: 16 percent for American Indians/Alaska Natives, 13 percent for blacks, 12 percent for Hispanics, and 8 percent for Asian Americans, compared with 7 percent for whites.

Diabetes shortens life expectancy by an average of 8 years—7.8 years for men, 8.4 years for women. The risk of premature death among people with diabetes is about twice that of people without the disease. Obesity, diabetes, and heart disease also can work together to speed dementia and other brain disorders, such as cognitive impairment.

In addition to increasing the risk of dying from heart attack or stroke, untreated or uncontrolled diabetes also ups the danger of dying from many cancers by 25 percent and heightens the likelihood of death from infection and kidney and liver disease.

According to the American Diabetes Association, the total economic cost of diabetes is more than $132 billion a year. Diabetes accounts for $1 of every $10 spent on health care in the United States. An estimated 48 million Americans may develop diabetes by 2050.

Understanding Diabetes

Glucose is the primary form of sugar that the body cells use for energy. When a person without diabetes eats a meal, the level of glucose in the blood rises, triggering the production and release of insulin by special cell clusters in the pancreas. Insulin enhances the movement of glucose into various body cells, bringing down the level of glucose in the blood. In those who have diabetes, however, insulin secretion is either nonexistent or deficient. Without sufficient insulin, the glucose in the blood is unable to enter most body cells, so the cells’ energy needs aren’t met. The levels of glucose in the blood rise higher and higher after each meal. This unused glucose eventually passes through the kidneys, which are unable to process the excessive glucose, and out of the body in urine.

Deprived of the fuel it needs, the body begins to break down stored fat as a source of energy. This process produces weak acids, called ketones. A buildup of ketones leads to ketoacidosis, an upheaval in the body’s chemical balance that brings on nausea, vomiting, abdominal pain, lethargy, and drowsiness. Severe ketoacidosis can lead to coma and eventual death.

Before the development of insulin injections, diabetes was a fatal illness. Today diabetics can have normal lifespans. However, diabetes still can lead to devastating complications. Uncontrolled glucose levels slowly damage blood vessels throughout the body; thus, individuals who become diabetic early in life may face devastating complications even before they reach middle age. Diabetes is the number one cause of blindness, nontraumatic amputations, and kidney failure, and diabetes increases by two or three times the risk of heart attack or stroke.

The risk of heart attack increases the longer a man has diabetes. In a recent study, men who have had type 2 diabetes for a decade or more face the same risk as those who have already had a prior heart attack.

Types of Diabetes

Diabetes includes several conditions in which the body has difficulty controlling levels of glucose in the bloodstream. After an overnight fast, most people have blood glucose levels between 70 and 100 milligrams of glucose per deciliter of blood (mg/dL). This is considered normal. If your fasting blood glucose level is between 101 and 125 mg/dL, you have prediabetes. If your fasting blood glucose is consistently 126 mg/dL or higher, you have diabetes.

- **Type 1 diabetes.** In this form of diabetes (once called juvenile-onset or insulin-dependent diabetes), the body’s immune system attacks the insulin-producing beta cells in the pancreas and destroys them. The pancreas then produces little or no insulin.
and therefore blood glucose cannot enter the cells to be used for energy. Type 1 diabetes develops most often in young people but can appear in adults. Individuals with type 1 diabetes require insulin therapy because their own bodies no longer supply this vital hormone.

- **Type 2 diabetes.** In type 2 diabetes (once called adult-onset or non-insulin-dependent diabetes), either the pancreas does not make enough insulin or the body is unable to use insulin correctly. Type 2 diabetes is becoming more common in children and teenagers because of the increase in obesity in the young.

- **Gestational diabetes.** Women who get diabetes while they are pregnant are more likely to have a family history of diabetes, especially on their mothers’ side; they are at greater risk of developing diabetes later in life.

Although type 1 and type 2 diabetes have different causes, two factors are important in both: an inherited predisposition to the disease and something in the environment that triggers diabetes. Genes alone are not enough. In most cases of type 1 diabetes, people need to inherit risk factors from both parents and to experience some environmental trigger, which might involve prenatal nutrition, a virus, or an unknown agent.

In type 2 diabetes, family history is one of the strongest risk factors for getting the disease, but only in Westernized countries. African Americans, Mexican Americans, and Native Americans have the highest rates, but people who live in less developed nations tend not to get type 2 diabetes, no matter how high their genetic risk.

Excess weight, especially around the waistline, is the major and most controllable risk factor for type 2 diabetes. Losing weight greatly reduces this risk and, in individuals with the disease, can help get blood sugar under control. Researchers also have found a complex relationship between depression and type 2 diabetes. Individuals with depressive symptoms are somewhat more likely to develop the disorder, while people being treated for type 2 diabetes have higher odds of becoming depressed.

Diabetic women who become pregnant face higher risks of miscarriage and babies with serious birth defects; however, precise control of blood sugar levels before conception and in early pregnancy can lower the likelihood of these problems.

The Diabetes Prevention Program (DPP), a landmark study sponsored by the National Institutes of Health, found that people at increased risk for type 2 diabetes can prevent or delay the onset of the disease by taking the following steps:

- Exercise 30 minutes on at least five days of the week.
- If you’re overweight or obese, lose weight. Aim to lose 5 to 7 percent of your initial weight.
- Eat a diet rich in complex carbohydrates (bread and other starches) and high-fiber foods and low in sodium and fat.
- Eat fruits and vegetables that are rich in antioxidants, substances that prevent oxygen damage to cells.
- If your doctor advises, take medications, such as metformin (Glucophage), to help lower your blood sugar.

**Diabetes Signs and Symptoms**

About a third of individuals with type 2 diabetes do not realize they have the illness. If you have risk factors for the disease, watch for the following warning signs:

- **Increased thirst and frequent urination.** Excess glucose circulating in your body draws water from your tissues, making you feel dehydrated. Drinking water and other beverages to quench thirst leads to more frequent urination.
- **Flu-like symptoms.** Type 2 diabetes can sometimes feel like a viral illness, with such symptoms as extreme fatigue and weakness. When glucose, your body’s main fuel, doesn’t reach cells, you may feel tired and weak.
- **Weight loss or weight gain.** Because your body is trying to compensate for lost fluids and glucose, you may eat more than usual and gain weight, or the opposite may occur. Although eating more than normal, you may lose weight because your muscle tissues don’t get enough glucose to generate growth and energy.
• **Blurred vision.** High levels of blood glucose pull fluid from body tissues, including the lenses of the eyes, which affects ability to focus. Vision should improve with treatment of diabetes.

• **Slow-healing sores or frequent infections.** Diabetes affects the body’s ability to heal and fight infection. Bladder and vaginal infections can be a particular problem for women.

• **Nerve damage (neuropathy).** Excess blood glucose can damage the small blood vessels to your nerves, leading to symptoms such as tingling and loss of sensation in hands and feet.

• **Red, swollen, tender gums.** Diabetes increases the risk of infection in your gums and in the bones that hold your teeth in place.

**Detecting Diabetes**

To identify individuals with this disease as early as possible, the American Diabetes Association now recommends screening every three years for all men and women beginning at age 45. The American College of Endocrinology recommends screening at age 30 for individuals at risk, including those who are overweight, sedentary, have a family history of diabetes, or have high blood pressure or heart disease.

Tests that can detect diabetes include:

• **Random blood sugar test.** Because you don’t necessarily fast for this test, your blood glucose may be high because you’ve just eaten. Even so, it shouldn’t be higher than 200 mg/dL.

• **Fasting blood glucose test.** In general, glucose is lowest after an overnight fast. That’s why the preferred way to test your blood sugar is after you’ve fasted overnight or for at least eight hours.

• **Glucose challenge test.** Often used to screen pregnant women for gestational diabetes, this test measures glucose before drinking eight ounces of an extremely sweet liquid after fasting for six hours, then every hour for a three-hour period. If your blood sugar rises more than expected and doesn’t return to normal by the third hour, you likely have diabetes.

**Diabetes Management**

Unlike many other medical conditions, patients must take charge of their diabetes and monitor their blood glucose regularly to prevent or delay the serious complications of the disease. Diabetes educators teach patients a new set of ABCs:

- **Manage your A1c** (blood glucose or sugar), Blood pressure, and Cholesterol:
  - **A** is for the **A1c test.** This test measures the amount of glucose attached to hemoglobin molecules, the iron-rich molecules in red blood cells that deliver oxygen to the body. The higher your blood glucose levels, the more hemoglobin molecules you will have with glucose attached—and the greater the risk of damage to eyes, kidneys, and feet. In general, the life cycle of a red blood cell is 75 to 90 days, which is why the A1c test shows average blood glucose levels for the past two to three months. The American Diabetes Association recommends a goal for A1c of less than 7 percent. The American College of Endocrinology recommends a goal of 6.5 percent. (Normal A1c levels are below 6.) Individuals with diabetes should have their A1c levels checked at least twice a year.
  - **B** is for **blood pressure.** As discussed on page 501, the goal for most people is 115/75. High blood pressure can cause heart attack, stroke, and kidney disease.
  - **C** is for **cholesterol.** The LDL goal for most people is less than 160 mg/dL (see Table 15.2 on page 503). Bad cholesterol, or LDL, can build up and clog your blood vessels.

**Treatment**

The goal for diabetics is to keep blood sugar levels as stable as possible to prevent complications, such as kidney damage.22 Home glucose monitoring, including new continuous glucose monitors, allows diabetics to check their blood sugar levels as many times a day as necessary and to adjust their diet or insulin doses as appropriate.

Types of insulin differ in how long it takes to start working after injection (onset), when it works hardest (peak), and how long it lasts in the body (duration). Individuals with diabetes may use different types in various combinations, depending on time of day and timing of

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**Chapter 15  Preventing Major Disease**

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meals. New insulin inhalers offer an alternative to injections for those with type 2 diabetes. Those with type 1 diabetes require daily doses of insulin via injections, an insulin infusion pump, or oral medication. Those with type 2 diabetes often can control their disease through a well-balanced diet, exercise, and weight management. However, insulin therapy may be needed to keep blood glucose levels near normal or normal, thereby reducing the risk of damage to the eyes, nerves, and kidneys. New medications help control weight and lower blood pressure and cholesterol.

Medical advances hold out bright hopes for diabetics. Laser surgery, for instance, is saving eyesight. Bypass operations are helping restore blood flow to the heart and feet. Dialysis machines and kidney and pancreas transplants save many lives.

The number of Americans receiving treatment for diabetes has doubled to about 19 million (some 8.5 percent of the population) since 2007. During this period, the costs of diabetes treatment increased from $18.5 billion to $40.8 billion.

**Can Diabetes Be Cured?**

In most cases, diabetes requires lifelong management and treatment. However, a cure for some patients no longer seems impossible. About 400 to 500 pancreas transplants are performed in the United States every year; when successful they normalize glucose levels, thereby curing diabetes. However, only about half of these transplants continue to function for ten years.

Gastric bypass surgery (which limits the amount of food a person can ingest) for extremely obese individuals has led to lasting remission of diabetes, sometimes even before a patient loses weight. (See Chapter 6.) Scientists do not yet know how bypass surgery “cures” diabetes, but it may affect chemicals involved in insulin resistance. Some surgeons are advocating this approach for all diabetics with body mass indexes (BMIs) over 50; others, as an option for those with BMIs over 35.

Among other promising approaches are the use of stem cells to “rejuvenate” the pancreas, antibodies to block the autoimmune response of type 1 diabetes, and a more sophisticated artificial pancreas to monitor and manage glucose levels.

**Hypertension**

Blood pressure refers to the force of blood against the walls of arteries. When blood pressure remains elevated over time—a condition called hypertension—it forces the heart to pump harder than is healthy. Because the heart must force blood into arteries that are offering increased resistance to blood flow, the left side of the heart becomes enlarged. If untreated, high blood pressure can cause a variety of cardiovascular complications, including heart attack and stroke—two of the three leading causes of death among U.S. adults—as well as kidney failure and blindness (Figure 15.4).

In a young person even mild hypertension can cause organs such as the heart, brain, and kidneys to start to deteriorate. By age 50 or 60, the damage may be irreversible.

**Who Is at Risk?**

According to a recent report by the World Health Organization, about 1 billion people worldwide have hypertension, which causes one in every eight deaths globally, making it the third leading killer in the world. In the United States, high blood pressure is responsible for about a third of cardiovascular problems like heart attack or stroke and a quarter of all premature deaths.

About a third of adults age 18 and older in the United States—some 65 million men and women—have high blood pressure. Hypertension is responsible for roughly one in six deaths among adults every year.

Blood pressure has increased among children and adolescents as well as adults, with the highest rates among black and Mexican American children. The primary culprit is the increase in obesity in the young. No one knows why African Americans are more vulnerable, although some speculate that overweight or dietary factors may contribute.
Different races also suffer different consequences of high blood pressure. An African American with the same elevated blood pressure reading as a Caucasian faces a greater risk of stroke, heart disease, and kidney problems.

Family history also plays a role. “If you study healthy college students with normal blood pressures, those who have one parent with hypertension will have blood pressure that’s a little higher than average,” notes Rose Marie Robertson, M.D., of the American Heart Association. “If two parents have high blood pressure, their levels will be a little higher, and they’re destined to go higher still. If your parents have high blood pressure, have yours checked regularly.”

Men and women are equally likely to develop hypertension, but in women blood pressure tends to rise around the time of menopause. A larger proportion of middle-aged women than men have high systolic blood pressure, which puts their hearts in greater danger.

For individuals who smoke, are overweight, don’t exercise, or have high cholesterol levels,
hypertension multiplies the risk of heart disease and stroke. Overweight people with high blood pressure have twice the risk of dying of a heart attack or stroke as those with normal blood pressure. At ultrahigh risk are people with diabetes or kidney disease.

What Is a Healthy Blood Pressure?

Current guidelines (Table 15.1) categorize a reading of 120-139/80-89 as prehypertension, a condition that is likely to worsen in time. A healthy reading is 115/75 mm Hg. Once blood pressure rises above this threshold, the risk of cardiovascular disease may increase.

In healthy adults, blood pressure screening should begin at age 21, with repeat evaluations at least every two years, or more often depending on your current health, medical history, and risk factors for cardiovascular disease. According to the National College Health Assessment survey, about nine in ten students have done so.

To get an accurate blood pressure reading, you should visit the doctor’s office at least twice and have your blood pressure taken two or more times while you’re seated. The average of those measurements determines how your blood pressure is classified.

The current guidelines classify hypertension into two categories:

• Stage 1. This consists of a systolic pressure ranging from 140 to 159 or a diastolic pressure ranging from 90 to 99.

• Stage 2. The most severe form of hypertension occurs with a systolic pressure of 160 or higher or a diastolic reading of 100 or higher.

Only one of the numbers—the top or bottom—needs to be high to meet these criteria. In people over age 50, systolic pressure is more important than diastolic. If it rises to 140 mm Hg or higher, doctors advise treatment regardless of the diastolic pressure.

Lowering High Blood Pressure

Lifestyle changes are a first-line weapon in the fight against high blood pressure. Rather than making a single change, a combination of behavioral changes, including losing weight, eating heart-healthy foods, reducing sodium, and exercising more, yields the best results. A low-carbohydrate diet (discussed in Chapter 6) may be most effective for lowering blood pressure.

Too much sodium and too little potassium boost blood pressure in people who are sensitive to salt. The American Medical Association is calling for food makers and restaurants to cut the sodium content of food by 50 percent by 2016. For a healthful diet, aim for less than 1.5 grams of sodium a day, and at least 4.7 grams of potassium. The lower the amount of sodium in the diet, the lower the blood pressure for both those with and those without hypertension and for both genders and all racial and ethnic groups. However, reducing dietary sodium has an even greater effect on blood pressure in blacks than whites, and in women than men.

The National Heart, Lung and Blood Institute has developed what is known as the DASH diet. Following DASH, which stands for Dietary Approaches to Stop Hypertension, has proved as effective as drug therapy in lowering blood pressure.

### Table 15.1 What Your Blood Pressure Reading Means

<table>
<thead>
<tr>
<th>Normal Results</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>In adults, the systolic pressure should be less than 120 mm Hg and the diastolic pressure should be less than 80 mm Hg.</td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>What Abnormal Results Mean</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Prehypertension</td>
<td></td>
</tr>
<tr>
<td>Top number is consistently 120 to 139 or the bottom number reads 80 to 89.</td>
<td></td>
</tr>
<tr>
<td>Stage 1: Mild hypertension</td>
<td></td>
</tr>
<tr>
<td>Top number is consistently 140 to 159 or the bottom number reads 90 to 99.</td>
<td></td>
</tr>
<tr>
<td>Stage 2: Moderate-to-severe hypertension</td>
<td></td>
</tr>
<tr>
<td>Top number is consistently 160 or over or the bottom number reads 100 or over.</td>
<td></td>
</tr>
<tr>
<td>Low blood pressure (hypotension)</td>
<td></td>
</tr>
<tr>
<td>Top number reading lower than 90 or pressure 25 mm Hg lower than usual.</td>
<td></td>
</tr>
</tbody>
</table>

Blood pressure readings may be affected by many different conditions, including cardiovascular disorders; neurological conditions; kidney and urological disorders; psychological factors such as stress, anger, or fear; various medications; and “white coat hypertension,” which may occur if the medical visit itself produces extreme anxiety.
How to Lower Your Blood Pressure

• Get moving. Regular exercise can lower blood pressure by 10 points, prevent the onset of high blood pressure, or let you reduce your dosage of blood pressure medications.

• Eat your way to better blood pressure. Choose more fruits, vegetables, low-fat dairy products, whole grains, poultry, fish, and nuts. Cut down on red meat, sweets, sugar-containing beverages, and saturated fat and cholesterol.

• Lose ten. Shedding 10 percent of your current weight—or even ten pounds—can make a big difference.

• Don’t smoke. A single cigarette can cause a 20-point spike in systolic blood pressure. Don’t light up. See Chapter 6 for tips on quitting.

• Hold the salt. If you’re salt sensitive, you may be spiking your blood pressure as you spice your food.

• Stick with your medications. If your doctor has prescribed medication to lower your blood pressure, take it conscientiously. Your future health may depend on it.

pressure. An additional benefit: The DASH diet also lowers harmful blood fats, including cholesterol and low-density lipoprotein, and the amino acid homocysteine (one of the new suspects in heart disease risk).

Too much sodium and too little potassium boost blood pressure in people who are sensitive to salt. The American Medical Association is calling for food makers and restaurants to cut the sodium content of food by 50 percent by 2016. For a healthful diet, aim for less than 1.5 grams of sodium a day, and at least 4.7 grams of potassium. The lower the amount of sodium in the diet, the lower the blood pressure for both those with and those without hypertension and for both genders and all racial and ethnic groups. However, reducing dietary sodium has an even greater effect on blood pressure in blacks than whites, and in women than men.

Medications Making healthy lifestyle modifications can help reduce Stage 1 hypertension, but most people also require a medication. Drugs for lowering blood pressure come in a range of regimens (once a day to several times a day) with a range of effects on other conditions, interactions with other drugs, and potential side effects.

Medications to lower blood pressure have proven beneficial for individuals who have cardiovascular disease, but the scientific jury is out for those who do not because of the long-term costs and possible adverse effects. The current recommendation for those with blood pressure under 140/90 mm Hg is to lower blood pressure through lifestyle modifications, including dietary changes and regular exercise. Some of the medicines used to treat high blood pressure are:

• Alpha blockers
• Angiotensin-converting enzyme (ACE) inhibitors
• Angiotension receptor blockers (ARBs)
• Beta-blockers
• Calcium channel blockers
• Central alpha agonists
• Diuretics
• Renin inhibitors, including aliskiren (Tekturna)
• Vasodilators

If your blood pressure is very high, you may need additional medications. Those with Stage 2 hypertension typically need at least two types of high blood pressure medications (antihypertensives) to reduce blood pressure to a safer level. The goal for most people with hypertension is to reduce blood pressure to below 140/90 mm Hg.

About 20 to 30 percent of people with high blood pressure have “resistant hypertension,” which means that their blood pressure remains elevated despite taking three medications to lower it. In addition to medical conditions and certain medications, lifestyle factors, including excess weight, salt intake, and alcohol consumption, can contribute to this problem. New guidelines from the American Heart Association recommend weight loss, reduced salt, and decreased alcohol.

Only about one-third of people with hypertension have it effectively controlled—below 140/90 mm Hg. Reducing systolic blood
pressure 12 mm Hg for ten years can prevent one death in every 11 people treated for hypertension. In those with existing cardiovascular disease or organ damage, such as kidney disease, that reduction has an even bigger benefit, preventing one death in every nine people treated.

**Your Lipoprotein Profile**

Medical science has changed the way it views and targets the blood fats that endanger the healthy heart. In the past, the focus was primarily on total cholesterol in the blood. The higher this number was, the greater the risk of heart disease. The NHLBI’s National Cholesterol Education Program has recommended more comprehensive testing, called a lipoprotein profile, for all individuals age 20 or older.

This blood test, which should be performed after a 9- to 12-hour fast and repeated at least once every five years, provides readings of:

- **Total cholesterol.**
- **LDL (bad) cholesterol**, the main culprit in the buildup of plaque within the arteries.
- **HDL (good or healthy) cholesterol**, which helps prevent cholesterol buildup.
- **Triglycerides**, the blood fats released into the bloodstream after a meal.

**What Is a Healthy Cholesterol Reading?**

Total cholesterol is the sum of all the cholesterol in your blood. Less than 200 mg/dL total cholesterol is ideal, and 200–239 mg/dL is borderline-high. Total cholesterol above 240 mg/dL is high and doubles your risk of heart disease. However, total cholesterol is not the only crucial number you should know. Because LDL increases your risk for heart disease, you always should find out your LDL level. Even if your total cholesterol is higher than 200, you may not be at high risk for a heart attack. Some people—such as women before menopause and young, active men who have no other risk factors—may have high HDL cholesterol and desirable LDL levels. Ask your doctor to interpret your results so you both know your numbers and understand what they mean. (See Table 15.2.)

HDL, good cholesterol, also is important, particularly in women. Federal guidelines define an HDL reading of less than 40 mg/dL as a major risk factor for developing heart disease. HDL levels of 60 mg/dL or more are protective and lower the risk of heart disease.

Triglycerides, the free-floating molecules that transport fats in the bloodstream, ideally should be below 150 mg/dL. Individuals with readings of 150 to 199 mg/dL, considered borderline, as well as those with higher readings, may benefit from weight control, physical activity, and, if necessary, medication.

**Lowering Cholesterol**

According to federal guidelines, about one in five Americans may require treatment to lower his or her cholesterol level. However, nearly half of people who need cholesterol treatment, which can reduce the risk of heart disease by 30 percent over five years, don’t get it. The National Cholesterol Education Program (NCEP) estimates that some 36 million Americans should be watching their diet and exercising more. Another 65 million should be taking cholesterol-lowering drugs. Depending on your lipoprotein profile and an assessment of other risk factors, your physician may recommend that you take steps to lower your LDL cholesterol.

**Lifestyle Changes**

Some individuals with elevated cholesterol can improve their lipoprotein profile with lifestyle changes:

- **Dietary changes.** In the past, dietary changes produced relatively modest improvements compared to the effects of medications, which can cut cholesterol by as much as 35 percent. However, a diet consisting of cholesterol-lowering foods, including nuts, soy, oats, and plant sterols (in margarine and green leafy vegetables), reduced LDL cholesterol by about 30 percent. An added benefit: a reduction in C-reactive protein, discussed later in this chapter. Researchers are recommending this diet as an effective first treatment for individuals with high cholesterol levels, particularly when coupled with exercise and weight loss.
How to Get an Accurate Lipoprotein Profile

- Go to your primary health-care provider to get a lipoprotein profile. Although cholesterol tests at shopping malls or health fairs can help identify people at risk, the analyzers are often not certified technicians, and the readings may be inaccurate.

- Ask about accuracy. Find out if the lab is using the National Institutes of Health standards, and ask about the lab’s margin for error (which should be less than 5 percent).

- Fast beforehand. Cholesterol tests are most accurate after a 9- to 14-hour fast. Women may not want to get tested at the end of their menstrual cycles, when minor elevations in cholesterol levels occur because of lower estrogen levels. Cholesterol levels can also rise 5 to 10 percent during periods of stress. Reschedule the test if you come down with an intestinal flu because the viral infection could interfere with the absorption of food and thus with cholesterol levels. Let your doctor know if you’re taking any drugs. Common medications, including birth control pills and hypertension drugs, can affect cholesterol levels.

- Sit down before allowing blood to be drawn or your finger to be pricked. Don’t let a technician squeeze blood from your finger, which forces fluid from cells, diluting the blood sample and possibly leading to a falsely low reading.

Table 15.2 How to Interpret Your Lipoprotein Profile

<table>
<thead>
<tr>
<th>Total Cholesterol Level</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 200 mg/dL</td>
<td>Desirable level that puts you at lower risk for coronary heart disease. A cholesterol level of 200 mg/dL or higher raises your risk.</td>
</tr>
<tr>
<td>200 to 239 mg/dL</td>
<td>Borderline high</td>
</tr>
<tr>
<td>240 mg/dL and above</td>
<td>High blood cholesterol. A person with this level has more than twice the risk of coronary heart disease as someone whose cholesterol is below 200 mg/dL.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>HDL Cholesterol Level (for men)</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 40 mg/dL</td>
<td>Low HDL cholesterol. A major risk factor for heart disease.</td>
</tr>
<tr>
<td>60 mg/dL and above</td>
<td>High HDL cholesterol. An HDL of 60 mg/dL and above is considered protective against heart disease.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>LDL Cholesterol Level</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 100 mg/dL</td>
<td>Optimal</td>
</tr>
<tr>
<td>100 to 129 mg/dL</td>
<td>Near or above optimal</td>
</tr>
<tr>
<td>130 to 159 mg/dL</td>
<td>Borderline high</td>
</tr>
<tr>
<td>160 to 189 mg/dL</td>
<td>High</td>
</tr>
<tr>
<td>190 mg/dL and above</td>
<td>Very high</td>
</tr>
</tbody>
</table>

| Your LDL cholesterol goal depends on how many other risk factors you have. |
|-----------------------------|--------------------------------------------------------------------------------|
| • If you don’t have coronary heart disease or diabetes and have one or no risk factors, your LDL goal is less than 160 mg/dL. |
| • If you don’t have coronary heart disease or diabetes and have two or more risk factors, your LDL goal is less than 130 mg/dL. |
| • If you do have coronary heart disease or diabetes, your LDL goal is less than 100 mg/dL. |

<table>
<thead>
<tr>
<th>Triglyceride Level</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 150 mg/dL</td>
<td>Normal</td>
</tr>
<tr>
<td>150–199 mg/dL</td>
<td>Borderline high</td>
</tr>
<tr>
<td>200–499 mg/dL</td>
<td>High</td>
</tr>
<tr>
<td>500 mg/dL or above</td>
<td>Very high</td>
</tr>
</tbody>
</table>

• **Weight management.** For individuals who are overweight, losing weight can help lower LDL. This is especially true for those with high triglyceride levels and/or low HDL levels and those who have a large waist measurement (more than 40 inches for a man and more than 35 inches for a woman).

• **Physical activity.** Regular activity can help lower LDL, lower blood pressure, reduce triglycerides, and particularly important, raise HDL. Again, these benefits are especially important for those with high triglyceride levels or large waist measurements.

Lifestyle changes can lower harmful LDL levels by 5 to 10 percent. However, a greater reduction of 30 to 40 percent requires either intensive lifestyle changes, including an extremely low-fat diet, or the addition of cholesterol-lowering medication.

**Medications** Drugs called statins—better known by brand names such as Lipitor, Mevacor, Pravachol, and Zocor—can cut the risk of dying of a heart attack by as much as 40 percent. Initially tested in men, statins have proved equally beneficial for women, including those whose cholesterol levels rise after menopause.

Statins also protect patients who have not had a heart attack but are at high risk for developing cardiovascular disease because of high cholesterol or other risk factors. Large-scale studies indicate that statins protect against heart attacks and strokes even in older adults without known cardiovascular disease or diabetes and with low cholesterol—if these patients also have high levels of CRP or C-reactive protein (discussed on p. 508).

Statins work in the liver to block production of cholesterol. When the liver can't make cholesterol, it draws LDL cholesterol from the blood to use as raw material. This means that less LDL is available to trigger or promote the artery-clogging process known as atherosclerosis. Statins also appear to stabilize cholesterol-filled deposits in artery walls and to cool down inflammation. Long-term therapy with statins reduces the risk for death, heart attack, and stroke among people with heart disease, even when LDL levels are not elevated. The lower the LDL, the lower the risk.

**Cardiovascular (Heart) Disease**

In the United States, death rates from cardiovascular disease have dropped by 60 percent since 1950, one of the major U.S. health achievements of the twentieth century. The medical advances described in this chapter have contributed to this decline, but much of the credit goes to lifestyle changes, such as quitting smoking and making dietary changes that lower blood pressure and cholesterol levels.

Yet we still have a long way to go to keep the hearts of all Americans healthy. Only one of nearly 2,000 middle-aged Americans meets the criteria for ideal heart health as defined by the American Heart Association. These criteria are:

• Never smoked or quit more than a year ago.
• Body Mass Index (BMI) less than 25.
• Physical exercise—at least 150 minutes of moderate intensity or 75 minutes of vigorous intensity a week.
• At least four components of a healthful diet, such as fewer calories and more fruits and vegetables (see Chapter 5).
• Total cholesterol lower than 200.
• Blood pressure below 120/80.
• Fasting blood sugar below 100.

Nearly 2,600 Americans die of heart disease every day—that's one every 34 seconds. More than 64 million Americans have heart disease. Each year an estimated 1 million Americans suffer a heart attack; nearly half of them die. The costs of treating heart disease and stroke are expected to triple in the next 20 years to an estimated $818 billion, according to the American Heart Association.

**How the Heart Works**

The heart is a hollow, muscular organ with four chambers that serve as two pumps (see Figure 15.5). It is about the size of a clenched fist. Each pump consists of a pair of chambers formed of muscles. The upper two—each called an atrium—receive blood, which then flows through valves into the lower two chambers, the ventricles, which contract to pump blood out
into the arteries through a second set of valves. A thick wall divides the right side of the heart from the left side; even though the two sides are separated, they contract at almost the same time. Contraction of the ventricles is called **systole**; the period of relaxation between contractions is called **diastole**. The heart valves, located at the entrance and exit of the ventricular chambers, have flaps that open and close to allow blood to flow through the chambers of the heart.

The **myocardium** (heart muscle) consists of branching fibers that enable the heart to contract, or beat, between 60 and 80 times per minute, or about 100,000 times a day. With each beat, the heart pumps about 2 ounces of blood. This may not sound like much, but it adds up to nearly 5 quarts of blood pumped by the heart in one minute, or about 75 gallons per hour.

The heart is surrounded by the **pericardium**, which consists of two layers of a tough membrane. The space between the two contains a lubricating fluid that allows the heart muscle to move freely. The **endocardium** is a smooth membrane lining the inside of the heart and its valves.

Blood circulates through the body by means of the pumping action of the heart, as shown in Figure 15.6. The right ventricle (on your own right side) pumps blood, via the **pulmonary arteries**, to the lungs, where it picks up oxygen (a gas essential to the body’s cells) and gives off carbon dioxide (a waste product of metabolism). The blood returns from the lungs via the **pulmonary veins** to the left side of the heart, which pumps it, via the **aorta**, to the arteries in the rest of the body.

The arteries divide into smaller and smaller branches and finally into **capillaries**, the smallest blood vessels of all (only slightly larger in diameter than a single red blood cell). The blood within the capillaries supplies oxygen and nutrients to the cells of the tissues and takes up various waste products. Blood returns to the heart via the veins: The blood from the upper body (except the lungs) drains into the heart through the **superior vena cava**, while blood from the lower body returns via the **inferior vena cava**.

The workings of this remarkable pump affect your entire body. If the flow of blood to or through the heart or to the rest of the body is reduced, or if a disturbance occurs in the small bundle of highly specialized cells in the heart that generate electrical impulses to control heartbeats, the result may at first be too subtle to notice. However, without diagnosis and treatment, these changes could develop into a life-threatening problem.

Perhaps the biggest breakthrough in the field of cardiology has been not a test or a treatment but a realization: Heart disease is not inevitable. We can keep our hearts healthy for as long as we live, but the process of doing so must start early and continue throughout life.

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**Figure 15.5  The Healthy Heart**

The heart muscle is nourished by blood from the coronary arteries, which arise from the aorta. (b) The cross section shows the four chambers and the myocardium, the muscle that does the heart’s work. The pericardium is the outer covering of the heart.
Figure 15.6  The Path of Blood Flow

Blood is pumped from the right ventricle into the pulmonary arteries, which lead to the lungs, where gas exchange (oxygen for carbon dioxide) occurs. Oxygenated blood returning from the lungs drains into the left atrium and is then pumped into the left ventricle, which sends the blood into the aorta and its branches. The oxygenated blood flows through the arteries, which extend to all parts of the body. Again, gas exchange occurs in the body tissues; this time oxygen is “dropped off” and carbon dioxide “picked up.”

Heart Risks on Campus

Many people, including college students and other young adults, are unaware of habits and conditions that put their hearts at risk. Many undergraduates view heart disease as mainly a problem for white men and underestimate the risks for women and ethnic groups. Students rate their own knowledge of heart disease as lower than that of sexually transmitted infections and psychological disorders. Yet heart disease is the third-leading cause of death among adults age 25 to 44. Diabetes, family history, and other risk factors increase their likelihood of heart disease.

Young athletes face special risks. Each year seemingly healthy teens or young adults die suddenly on playing fields and courts. The culprit in one of every three cases of sudden cardiac death in young athletes is a silent condition called hypertrophic cardiomyopathy (HCM), an excessive thickness of the heart muscle. Because of HCM, the heart is more prone to dangerous heart irregularities.

In research studies, cardiac screening with an electrocardiogram has revealed abnormalities in 21 to 37 percent of student athletes. Most were mild, but approximately 1 percent of the students had significant electrical problems in the heart that would have been missed without electrocardiography. Some medical groups have recommended routine electrocardiograms to reduce risk of sudden cardiac death in competitive collegiate sports; others believe that a simpler physical exam-based screening is sufficient.

Hearts and Minds: Psychosocial Risk Factors

As discussed in Chapter 2, our psychological and social health affects not just our minds but our bodies, including the heart. While problems such as depression and stress may increase cardiovascular risk, happiness may help keep our hearts healthy. In a study that followed men and women for ten years, those who showed more “positive” emotions—such as enthusiasm, joy, and contentment—were less likely to develop heart disease than less happy individuals. The happier people were, the lower their risk of heart disease became.15

Other factors also may protect the heart. In a study of adults in 52 nations, education—but not family income, occupation, or material possessions—lowered the risk of having a heart attack. Even with lifestyle, age, and income taken into consideration, people with low education levels (grade school or less) were significantly more likely to suffer a heart attack than those whose education extended beyond high school.16

How you respond to everyday sources of stress can affect your heart as well as your overall health. While you may not be able to control...
the sources of stress, you can change how you habitually respond to it.

Researchers classify psychological risk factors for heart disease into three categories: chronic, episodic, and acute. Chronic factors, such as job strain or lack of social support, play an important role in the buildup of artery-clogging plaque and may increase blood pressure. Even feeling that life has treated you unfairly boosts a person’s chance of having a heart attack.

Episodic factors, such as depression, can last from several weeks to two years and may lead to the creation of “unstable” plaque, which is more likely to break off and block a blood vessel within the heart. Short-term or acute psychological risk factors, such as an angry outburst, can directly trigger a heart attack in people with underlying heart disease.

These factors may act alone or combine and exert different effects at different ages and stages of life. They may influence behaviors such as smoking, diet, alcohol consumption, and physical activity, as well as directly cause changes in physiology.

**Depression** Depression and heart disease often occur together. People with heart disease are more likely to be depressed, and some seemingly healthy people with depression are at greater risk of heart problems. Depressed women younger than age 60 are more likely to suffer a heart attack than those who do not suffer from depression. After a heart attack, depression is common in both men and women, but physicians are less likely to recognize and treat depression in women.

Patients who suffer heart attacks and develop clinical depression have higher rates of complications and an increased risk of dying from another heart attack or other heart problems. People who are physically healthy with no risk factors for heart disease but who are prone to anger, hostility, and mild depression have higher levels of C-reactive protein, a substance linked to increased risk of heart disease.

**Anger and Hostility** Anger and hostility have both short- and long-term consequences for the heart, particularly for men. In general the angriest men are three times more likely to develop heart disease than the most placid ones. Hostility more than doubles the risk of recurrent heart attacks in men (but not women). Research has linked hostility to increased cardiac risk factors, to decreased survival in men with coronary artery disease below the age of 61, to an increased risk of heart attack in men with metabolic syndrome, and to an increased risk of abnormal heart rhythms. Adults whose spouses rate them high in “antagonism”—a tendency to be argumentative, competitive, or cold—are more likely to have calcium buildup in their heart arteries.

Angry young men may be putting their future heart health in jeopardy. In a study that tracked more than 1,000 physicians for 36 years and took into account other physical and psychological risk factors, the angriest young men were six times more likely to suffer heart attacks by 55 and three times more likely to develop any form of cardiovascular disease. (See Health in Action: “Taming a Toxic Temper.”)

How does hostility harm the heart? Anger triggers a surge in stress hormones that can provoke abnormal and potentially lethal heart rhythms and activates platelets, the tiny blood cells that trigger blood clotting. High levels of anger can also trigger a spasm in a coronary artery, which results in the additional narrowing of a partially blocked blood vessel.

In women, anger and hostility do not always lead to heart troubles. However, women who outwardly express anger may be at increased risk if they also have other risk factors for heart disease, such as diabetes or unhealthy levels of lipoproteins.
**Personality Types**  In addition to stress, anger, and depression, other psychological traits can increase the risk of heart disease. Based on more than a decade of research, Dutch scientists have identified a “Type D” (for distressed) personality type. Type D people tend to be anxious, self-conscious, irritable, insecure, and negative, and go to great lengths not to say or do anything that others might not like. In the Dutch study, almost four times as many Type D individuals as others in cardiac rehabilitation programs died within an eight-year period.

In the past, other personality types have been linked to disease, for example, hard-charging, hostile Type As to heart disease and conflict-avoiding, emotion-suppressing Type Cs to cancer. However, these traits have not proved to be significant risk factors for these illnesses.

**Other Risk Factors**

Researchers have identified other potential threats to heart health.

**Inflammation and C-Reactive Protein**  Inflammation—the process by which the body responds to fever, injury, or infection—plays an essential role in healing and recovering from infection. However, chronic low-grade inflammation may contribute to atherosclerosis and set the stage for heart attacks, strokes, and other forms of cardiovascular disease. The most common triggers of inflammation are smoking, lack of exercise, high-fat and high-calorie meals, and highly processed foods.

C-reactive protein (CRP), produced in the liver, rises whenever the body responds to inflammation. Individuals with the highest CRP levels are more likely to develop heart disease than those with the lowest levels. High concentrations of CRP also may predict greater risk of sudden death.

**Homocysteine**  High levels of homocysteine—an amino acid in the blood—have been linked to a greater risk of heart disease and stroke. Homocysteine may have an effect on atherosclerosis by damaging the inner lining of arteries and promoting blood clots. Several clinical trials are under way to test whether lowering homocysteine will reduce the risk of heart disease.

**Illegal Drugs**  Illegal drugs pose many dangers—one of the most serious is their potentially deadly impact on the cardiovascular system. Ecstasy, amphetamines, and cocaine can cause a sudden rise in blood pressure, heart rate, and contractions of the left ventricle (the pumping chamber) of the heart, which can increase the risk of a heart attack.

The hallucinogens lysergic acid diethylamide (LSD) and psilocybin (psychoactive mushrooms) also have the potential for triggering irregular heartbeats and heart attacks, although less serious cardiac complications, such as a temporary rise in blood pressure, are more common. Morphine and heroin, which account for almost half of drug-related deaths, can lower blood pressure and affect the heart rate. Inhalants can produce fatal heartbeat irregularities.

Marijuana, the most widely used illegal drug among young adults, can affect blood pressure and heart rate, but it is not known whether it can trigger a heart attack.

**Bacterial Infection**  Certain bacteria may indeed put the heart at risk. *Streptococcus sanguis*, the bacterium found in dental plaque, has been implicated in the buildup of atherosclerotic plaque. Individuals with periodontal disease are at increased risk of heart disease and stroke. Regular brushing, flossing, and dental visits can reduce this danger.

Another common bacterium, *Chlamydia pneumoniae*, long linked to respiratory infections, also may threaten the heart. Individuals with high levels of antibodies to this bacteria are more likely to suffer a heart-related problem. Researchers have reported that antibiotics, taken to treat common infections, may protect against first-time heart attacks. A national clinical trial to determine whether antibiotics can reduce the risk of heart attack and stroke is under way.

**The Heart of a Woman**

Many people still think of heart disease as a “guy problem.” Men do have a higher incidence of cardiovascular problems than women before age 45. Although women develop heart problems later in life, by about age 65, their risk is about the same as men’s. Heart disease, which now kills one in four women in the United States, is the largest single cause of death of women worldwide. Death rates from heart disease are rising among American women ages 35
to 54. American women are four to six times more likely to die of heart disease than of breast cancer.

Doctors no longer classify women as “low risk” or “intermediate risk” but consider them either to have ideal cardiovascular health or to be at risk of cardiovascular “events,” such as a heart attack or stroke.

According to revised guidelines to prevent cardiovascular disease, women should strive for the following:

• BMI of less than 25
• Abstinence from smoking
• 150 minutes of moderate or 75 minutes of vigorous exercise every week (for additional benefits, 300 minutes of moderate or 150 minutes of vigorous exercise weekly)
• Diet high in fruits and vegetables, fiber, and whole grains and low in saturated fat, cholesterol, sugar, and sodium
• Non-HDL cholesterol level of less than 230 mg/dL
• Blood pressure of 120/80 mm Hg
• Fasting blood glucose of less than 100 mg/dL

The guidelines also encourage omega-3 fatty acids (discussed in Chapter 6) in fish or capsule form for women who have high cholesterol or triglycerides and advise all women to avoid therapies with risks that outweigh potential benefits, including postmenopausal hormone therapy, antioxidant vitamin supplements, folic acid supplements except during childbearing years to prevent birth defects, and routine use of aspirin if under age 65.

According to the American Heart Association, all women with at least one major cardiovascular risk factor are at risk for heart disease. Nine in ten women may meet this standard. Many women don’t get a proper diagnosis because they have a form of heart disease that doesn’t show up on the usual diagnostic tests. In women with vascular dysfunction, the blood vessels—both the large coronary arteries and the small microvessels—supplying the heart do not expand properly to accommodate increased blood flow. Standard diagnostic procedures, including stress tests and coronary angiograms, do not reveal this condition. However, newer tests, including ultrasound of the blood vessels, do not reveal this condition. However, newer tests, including ultrasound of the blood vessels, do not reveal this condition. However, newer tests, including ultrasound of the blood vessels, do not reveal this condition. However, newer tests, including ultrasound of the blood vessels, do not reveal this condition. However, newer tests, including ultrasound of the blood vessels, do not reveal this condition. However, newer tests, including ultrasound of the blood vessels, do not reveal this condition. However, newer tests, including ultrasound of the blood vessels, do not reveal this condition.

### Taming a Toxic Temper

Are you a hothead? Do you lose it, blow up, explode, go ballistic, have a fit? The terms we use for getting angry reveal its dangers. Anger is a bomb, and if you have a short fuse, you and everyone around you are in harm’s way. In the long run, chronic rage puts your life at risk—especially if you’re an angry young male. In a study that tracked more than 1,000 physicians for 36 years, the angriest young men were six times more likely to suffer heart attacks by 55 and three times more likely to develop any form of cardiovascular disease. Anger and hostility also threaten the hearts of women with other cardiovascular risk factors.

“Taming a Toxic Temper” in Labs for IPC shows you how to recognize the earliest signs of anger and analyze the situations that trigger your anger—so you can handle them, change the ways in which you respond, and keep in mind the consequences of an angry outburst. It is important that you, not your temper, be in control of your life. Here’s a preview.

Begin by asking yourself these questions:

• Do people describe you as hotheaded?
• Do you get so annoyed when someone tries to get ahead of you in a line that you confront the person?
• Do you get so angry you forget what you’re thinking?
• Did you ever become so angry with someone that you felt as if you would explode?

After reviewing your answers, you rate your temper on a scale of 1 (tranquil) to 10 (red-hot). You also review your anger history by describing the five worst rage explosions of your life and listing all of the negative consequences of your anger and outbursts.

The next step involves setting aside time to practice anger-reduction exercises you learn and writing journal entries.

Taming your temper is a six-step process. You learn one step each week, and each week add a new one. Here’s a sampling of the first one:

#### WEEK 1. Tune into your cues.

To control your anger, you must be mindful and sensitive to subtle cues that you are becoming angry as early as possible. What is the earliest sign of anger you experience in your body . . . ?

• Do you clench your fists?
• Do you tighten your jaw?
• Do you feel heat?

Whenever you feel the first sensation, look for something subtle that comes before it—a thought, perhaps, or a perception of something about another person that does not set right with you. The earlier you sense that something is beginning to make you angry, the greater the opportunity . . .

The other five steps are:

• Identify your triggers.
• Talk yourself down.
• Rely on anger-reducers.
• Develop better coping tools.
• Take it to the street.

In the final stage you continue to monitor your anger levels, triggers, and cues daily and continue to rehearse in real life, by deliberately putting yourself in circumstances that used to set off angry outbursts. Let someone take the last bagel even though you were obviously reaching for it. Stand next to the student talking loudly on her cell phone . . .
can reveal heart problems that angiograms fail to pick up.

Women are less likely to survive heart attacks than men, perhaps because they don’t seek or receive treatment as soon as men. That’s why women need to know the early signs and symptoms of female heart disease:

• Tiredness, even after getting adequate sleep.
• Trouble breathing.
• Trouble sleeping.
• Feeling sick to the stomach.
• Feeling scared or nervous.
• New or worse headaches.
• An ache in the chest.
• Feeling “heavy” or “tight” in the chest.
• A burning feeling in the chest.
• Pain in the back, between the shoulders.
• Pain or tightness in the chest that spreads to the jaw, neck, shoulders, ear, or the inside of the arms.
• Pain in the belly, above the belly button.

Researchers long believed that postmenopausal hormone therapy (HT) protected women from heart disease. However, more recent large-scale studies have shown little, if any, benefit. In fact, in older women HT increases the risk of cardiovascular problems and blood clots. However, women in their 50s who take estrogen therapy have lower levels of dangerous calcium deposits in their arteries, suggesting that supplemental estrogen for younger women with menopausal symptoms may benefit their hearts.

In light of these inconclusive and contradictory results, the AHA guidelines recommend against use of hormone therapy simply to prevent heart disease. They also recommend not using antioxidant supplements or folic acid, which have proven ineffective.

**Aspirin and the Heart**

Daily low-dose aspirin has been recommended as a preventive step for men at high risk of cardiovascular disease because it reduces the stickiness of platelets (cells that cause blood clotting). This lowers the risk of blood clots, which can block a blood vessel and trigger a heart attack or stroke. Several research studies have demonstrated an association between aspirin use and reductions in heart attacks in men. However, while aspirin lowers the likelihood of heart attack, it may slightly increase stroke risk.

According to new recommendations from the U.S. Preventive Services Task Force, people should consider various factors including age, gender, diabetes, blood pressure, cholesterol levels, smoking, and risk of gastrointestinal bleeding before deciding to use aspirin. The more risk factors they have, the more likely they are to benefit from aspirin.

The Task Force recommends that men between the ages of 45 and 79 should use aspirin to reduce their risk for heart attacks when the benefits outweigh the harm from potential gastrointestinal bleeding. Women between ages 55 and 70 should use aspirin to reduce their risk for ischemic stroke when the benefits outweigh the risk from gastrointestinal bleeding. The Task Force recommends against aspirin use in men under age 45 or women under age 55 because heart attacks and strokes are less likely in these age groups.

Small doses of aspirin can lower the risk of heart attack in men who have never had heart disease, but the drug does not cut the chances of dying from the disease. A U.S. Preventative Services Task Force has recommended low-dose aspirin for men between ages 45 and 79 to stave off heart attacks and for women over 65 to prevent strokes.

Aspirin can produce side effects, including gastrointestinal bleeding, allergic reactions, and peptic ulcers. However, the very low doses recommended for heart disease prevention generally do not cause serious problems. Aspirin is not advised for people taking anticoagulant medication, who have stomach ulcers, or who have kidney or liver disease. Some individuals are aspirin-resistant and do not benefit from its protective effects.

Researchers are testing a “polypill,” a single pill that contains a statin, three blood pressure medications, and aspirin to see if this combination might best reduce the risk of heart attack, stroke, and other cardiovascular problems.
Crises of the Heart

**Coronary Artery Disease** The general term for any impairment of blood flow through the blood vessels, often referred to as “hardening of the arteries,” is *arteriosclerosis*. The most common form is *atherosclerosis*, a disease of the lining of the arteries in which plaque—deposits of fat, fibrin (a clotting material), cholesterol, other cell parts, and calcium—narrow the artery channels. Twenty-first-century research has revealed that inflammation also plays a crucial role.

**Atherosclerosis** This process begins when LDL cholesterol penetrates the wall of an artery. Ideally, HDL cholesterol carries the cholesterol out of the artery wall to the liver for disposal. However, if LDL accumulates, the artery responds by releasing chemical messengers called cytokines, which trigger active inflammation in the artery wall. T-lymphocytes and macrophages, specialized white blood cells that are part of the body’s defensive immune system, move from the bloodstream into the artery and engulf the LDL. As they ingest the LDL, the macrophages enlarge and become foam cells, which rupture, releasing cholesterol into the artery wall, where the cycle of damage begins again. In response, the smooth muscle cells in the artery wall create a fibrous cap over the inflamed area (Figure 15.7).

These hard-capped plaques are dangerous: They narrow arteries, reduce the flow of blood, and produce angina (chest pain). However, the usual culprits in heart attacks are smaller, softer plaques that can rupture. As the body responds with clotting factors, platelets, and blood cells, a blood clot, or thrombus, forms on the disrupted plaque’s surface. The clot ultimately blocks the artery and kills heart muscle cells. Similar clots can block blood flow to the brain and lead to other complications, including kidney failure and circulation problems in the legs and feet.

**Unclogging the Arteries** Reversing the buildup of plaque inside the arteries is possible with cholesterol-lowering drugs and a low-fat diet. A strict program of dietary and lifestyle change without any medication, developed by Dean Ornish, M.D., of the University of California, San Francisco, also has proved effective in reversing coronary artery disease. The following are the key elements of this approach:

- **A very low-fat, vegetarian diet**, including nonfat dairy products and egg whites, keeping fat intake to below 8 percent of total calories consumed. Ornish’s recommended diet allows no meat, poultry, fish, butter, cheese, ice cream, or any form of oil.
- **Moderate exercise**, consisting of an hour of aerobic activity three times a week. Walking is recommended because more rigorous exercise might be dangerous for heart patients, who may develop increased risk of blood clots, irregular heartbeats, or coronary artery spasms during exertion.

*Figure 15.7 How Atherosclerosis Happens*  
LDL cholesterol penetrates an artery wall, and the accumulation of LDL cholesterol triggers an inflammation. Macrophages engulf the LDL and become foam cells. The artery wall creates a fibrous cap over this plaque, and the artery is narrowed. If the plaque ruptures, blood clots can block blood flow to the heart or to the brain.
• Stress counseling. Ornish’s patients learn how the body’s stress response can cause a rapid heartbeat and narrowing of the arteries, and how stress reduction can reduce cholesterol levels.

• An hour a day of yoga, meditation, breathing, and progressive relaxation. Some patients use visualization, for instance, imagining their arteries being cleared by a tunneling machine.

**Angina Pectoris** A temporary drop in the supply of oxygen to the heart tissue causes feelings of pain or discomfort in the chest known as angina pectoris. Some people suffer angina only when the demands on their hearts increase, such as during exercise or when under stress. Many people have angina for years and yet never suffer a heart attack; in some, the angina even disappears. However, angina should be considered a warning of danger if it becomes more severe or more frequent, occurs with less activity or exertion, begins to waken a person from a sound sleep at night, persists for more than 10 to 15 minutes, or causes unusual perspiration.

**Heart Attack (Myocardial Infarction)** Each year, about 1.5 million Americans suffer a heart attack. About 500,000 die. Half of the deaths occur within an hour of the start of symptoms and before the person reaches the hospital. The medical name for a heart attack, or coronary, is myocardial infarction (MI). The myocardium is the cardiac muscle layer of the wall of the heart. It receives its blood supply, and thus its oxygen and other nutrients, from the coronary arteries. If an artery is blocked by a clot or plaque, or by a spasm, the myocardial cells do not get sufficient oxygen, and the portion of the myocardium deprived of its blood supply begins to die.

Although such an attack may seem sudden, usually it has been building up for years, particularly if the person has ignored risk factors and early warning signs. According to research, 80 to 90 percent of those who develop heart disease and 95 percent of those who suffer a fatal heart attack have at least one major risk factor.

**Is It a Heart Attack?** If they experience the following symptoms, individuals should seek immediate medical care and take an aspirin (325 milligrams) to keep the blood clot in a coronary artery from getting any bigger:

- A tight ache, heavy, squeezing pain, or discomfort in the center of the chest, which may last for 30 minutes or more and is not relieved by rest.
- Chest pain that radiates to the shoulder, arm, neck, back, or jaw.
- Anxiety.
- Sweating or cold, clammy skin.
- Nausea and vomiting.
- Shortness of breath.
- Dizziness, fainting, or loss of consciousness.

As noted on page 508, women often experience heart attacks differently than men. In the month before an attack, many report unusual fatigue and disturbed sleep. Fewer women than men experience chest pain. More common symptoms are shortness of breath, weakness, and fatigue, a clammy sweat, dizziness, and nausea.

Many everyday activities—eating, drinking coffee, having sex, even breathing—can spur a heart attack. In a recent major analysis of heart attack triggers, air pollution from traffic posed the greatest risk, causing about 7 percent of heart attacks. Coffee was linked to 5 percent of heart attacks, and alcohol to another 5 percent. Physical exertion may trigger 6 percent of heart attacks, eating a heavy meal, 3 percent. And having sex, 2 percent.41

If you’re with someone who’s exhibiting the classic signs of heart attack, and if they last for two minutes or more, act at once. Expect the person to deny the possibility of anything as serious as a heart attack, but insist on taking prompt action.

Time is of the essence when a heart attack occurs. If you develop symptoms or if you’re with someone who does, call 911 immediately. The sooner emergency personnel get to a heart attack victim and administer cardiac life support, the greater the odds of survival. Yet according to the American Heart Association, most patients wait three hours after the initial symptoms begin before seeking help. By that time, half of the affected heart muscle may already be lost.

**Cardiac Arrest** Cardiac arrest occurs when the heart stops beating. If circulation isn’t restored within four or five minutes, the brain shuts down completely, and the person dies.
Cardiopulmonary resuscitation (CPR) is an emergency procedure for a person whose heart has stopped or who is no longer breathing. CPR can maintain circulation and breathing until emergency medical help arrives.

The combination of mouth-to-mouth “rescue” breathing and chest compressions performed by individuals trained in CPR is the most effective method. However, according to the most recent research, chest compressions or “hands-only” CPR, which does not require extensive training, also can keep blood circulating until emergency help arrives. (For video instructions on hands-on CPR, go to: http://handsonlycpr.eisenberginc.com/)

Automated external defibrillators (AEDs), portable computerized devices, can actually restart a heart with a lethal rhythm (ventricular fibrillation) or that is not beating at all. The machines, widely available on airplanes and in public places like stadiums and terminals, also can be purchased by individuals. Written and voice instructions allow lay people as well as trained professionals to use them in case of emergency. A combination of CPR and defibrillation boosts the survival rate much higher than from CPR alone.

**Saving Hearts** State-of-the-art treatments for heart attacks include clot-dissolving drugs, early administration of medications to thin the blood, intravenous nitroglycerin, and in some cases, a beta-blocker (which blocks many of the effects of adrenaline in the body, particularly its stimulating impact on the heart).

*Percutaneous transluminal coronary angioplasty (PTCA)*, also called balloon angioplasty, is the most often performed heart operation. Less costly and less risky than bypass surgery, PTCA opens blood vessels in the heart that are narrowed but not completely blocked. PTCA involves a precise, time-consuming technique called *cardiac catheterization*—the threading of a narrow tube or catheter through an artery to the heart. An X-ray taken with a special dye injected into the arteries reveals the location and extent of a blockage. By inflating a tiny balloon at the tip of the catheter, physicians can break up the clot and widen the narrowed artery. When they deflate the balloon, circulation is restored. Stents can help prevent balloon-opened arteries from clogging again.

A *coronary bypass* is a procedure in which an artery from the patient’s leg or chest wall is grafted onto a coronary artery to detour blood around the blocked area. Each year hundreds of thousands of coronary bypasses are performed in the United States; about 1 to 5 percent of these patients die as a result of surgical complications. Surgery or angioplasty to improve blood flow in patients with moderate to severe levels of blood flow restriction to the heart reduces the risk of cardiac death more than drugs alone.

**Stroke**

When the blood supply to a portion of the brain is blocked, a cerebrovascular accident, or *stroke*, occurs. The proportion of strokes among young adults between ages 20 and 45 has been rising, probably as a consequence of the higher incidence of obesity, hypertension, and diabetes. About two-thirds of the almost 800,000 strokes that occur every year in the United States strike women. However, before age 85, men experience more strokes. Nonetheless, women of every age fare worse than men in the prevention, diagnosis, treatment, and outcome of stroke. An estimated 20 percent of stroke victims die within three months; 50 to 60 percent are disabled. About half of those who have a stroke are partially paralyzed on one side of their body; between a quarter and a half are partially or completely dependent on others for daily living; a third become depressed; a fifth cannot walk. Quick treatment with a clot-busting drug at a hospital can reduce the chance of disability after a stroke, but few people recognize the signs of a stroke and seek medical care within three hours of the first symptoms.

Strokes rank third, after heart disease and cancer, as a cause of death in this country. Worldwide, stroke is second only to heart disease as a cause of death. After decades of steady decline, the number of strokes per year has begun to rise. The main reasons seem to be that more people in the United States are living longer, advanced medical care is allowing more people to survive heart disease, and doctors are better able to diagnose and detect strokes. Yet 80 percent of strokes are preventable, primarily through lifestyle modification. The most important steps are treating hypertension, not
smoking, managing diabetes, lowering cholesterol, and taking aspirin, which reduces stroke risk in women, but not men. 

Risk Factors

Risk factors for stroke, like those for heart disease, include some that can’t be changed (such as gender, race, and age) and some that can be controlled:

- **Gender.** Men have a greater risk of stroke than women. However, women are at increased risk at times of marked hormonal changes, particularly pregnancy and childbirth. Past studies have shown an association between oral contraceptive use and stroke, particularly in women over age 35 who smoke. The newer low-dose oral contraceptives have not shown an increased stroke risk among women ages 18 to 44. Early menopause (before age 42) may double a woman’s stroke risk.

  - **Race.** The incidence of strokes is two to three times greater in blacks than whites in the same communities. Hispanics also are more likely to develop hemorrhagic strokes than whites.

- **Age.** A person’s risk of stroke more than doubles every decade after age 55.

- **Obesity.** According to a recent longitudinal study of middle-aged Americans, the more overweight individuals are, the more likely they are to have a stroke. Obesity may increase stroke risk by contributing to high blood pressure and diabetes.

- **Hypertension.** Detection and treatment of high blood pressure are the best means of stroke prevention.

- **High red blood cell count.** A moderate to marked increase in the number of a person’s red blood cells increases the risk of stroke.

- **Heart disease.** Heart problems can interfere with the flow of blood to the brain; clots that form in the heart can travel to the brain, where they may clog an artery.

- **Blood fats.** Although the standard advice from cardiologists is to lower harmful LDL levels, what may be more important to lower stroke risk is an increase in the levels of protective HDL.

Your Strategies for Prevention

How to Recognize a Stroke

Prompt treatment can stop a stroke in its tracks—but only with prompt treatment. Researchers have found that the following steps can identify facial weakness, arm weakness, and speech problems, all signs of a stroke:

- **Ask the individual to smile.**
- **Ask him or her to raise both arms.**
- **Ask the person to speak a simple sentence, such as “It is sunny out today.”**

If he or she has trouble with any of these tasks, call 911 immediately and describe the symptoms to the dispatcher.

- **Diabetes mellitus.** Diabetics have a higher incidence of stroke than nondiabetics.

- **Estrogen therapy.** In the Women’s Health Initiative—a series of clinical trials of hormone therapy for postmenopausal women—estrogen-only therapy significantly increased the risk of stroke.

- **A diet high in fat and sodium.** Individuals consuming the largest amounts of fatty foods and sodium are at much greater risk then those eating low-fat, low-salt diets.

Causes of Stroke

There are two types of stroke: **ischemic stroke**, which is the result of a blockage that disrupts blood flow to the brain, and **hemorrhagic stroke**, which occurs when blood vessels rupture. One of the most common causes of ischemic stroke is the blockage of a brain artery by a thrombus, or blood clot—a cerebral thrombosis. Clots generally form around deposits sticking out from the arterial wall. Sometimes a wandering blood clot (embolus), carried in the bloodstream, becomes wedged in one of the cerebral arteries. This is called a cerebral embolism, and it can completely plug up a cerebral artery.

In hemorrhagic stroke, a diseased artery in the brain floods the surrounding tissue with blood. The cells nourished by the artery are deprived of blood and can’t function, and the blood from the artery forms a clot that may interfere with brain function. This is most likely to occur if the
patient suffers from a combination of hypertension and atherosclerosis. Hemorrhage (bleeding) may also be caused by a head injury or by the bursting of an aneurysm, a blood-filled pouch that balloons out from a weak spot in the wall of an artery.

Brain tissue, like heart muscle, begins to die if deprived of oxygen, which may then cause difficulty speaking and walking, and loss of memory. (See Figure 15.8.) These effects may be slight or severe, temporary or permanent, depending on how widespread the damage and whether other areas of the brain can take over the function of

Figure 15.8  The Effects of Stroke on the Brain

(a) Regions of the cerebral cortex responsible for various functions
(b) Regions of increased blood flow during different tasks
the damaged area. About 30 percent of stroke survivors develop dementia, a disorder that robs a person of memory and other intellectual abilities.

**Silent Strokes**

As many as one in ten middle-aged adults may suffer a “silent” stroke, known as a “silent cerebral infarct,” that does not produce clear symptoms but causes damage within the brain. According to new research, silent strokes may be at least five times more common than full-blown strokes in people under age 65 and are not uncommon in those younger than 50. The parts of the brain affected by the stroke may not involve motion or speech, but silent strokes can affect mood or memory.

Doctors note that mild strokes are not really silent but “whisper,” causing very subtle symptoms that people might ignore. However, on tests of mental and physical functioning, individuals who’ve had very mild strokes suffer clear impairments. Even if they do not cause symptoms, brain imaging techniques such as MRIs can detect their effects. The best medical advice: know the warning signs of a stroke and seek immediate treatment.

**Transient Ischemic Attacks (TIAs)**

Sometimes a person will suffer transient ischemic attacks (TIAs), “little strokes” that cause minimal damage but serve as warning signs of a potentially more severe stroke. A TIA doubles the risk for a heart attack. One of three people who suffer TIAs will have a stroke during the following five years if they don’t get treatment. The two major types of TIAs are:

- **Transient monocular blindness.** Blurring, a blackout or whiteout of vision, a sense of a shade coming down, or another visual disturbance in one eye.
- **Transient hemispheral attack.** Diminished blood flow to one side of the brain, causing numbness or weakness of one arm, leg, or side of the face, or problems speaking or thinking.

Many TIAs are caused by a narrowing of blood vessels in the neck (carotid arteries) because of a buildup of plaque. Specialists can diagnose this problem by feeling and listening to the arteries, by ultrasound, by measuring the pressure or circulation rate from the carotid arteries to the eyes, or by arterial angiography (injection of a dye into the arteries as X-rays are taken), a procedure that can be either dangerous, even deadly, or lifesaving.

Surgery to widen the carotid arteries may be recommended for individuals with significant narrowing (50 to 80 percent or more). For other patients, aspirin and other drugs that make platelets less sticky and interfere with clotting may be effective.

**Treatments for Strokes**

Extremely rapid beating of the heart’s upper chambers causes blood clots to form; they may enter the bloodstream and travel to the brain, where they can get stuck and choke off the blood supply. In the past, the only way to prevent such strokes was regular use of a medication called warfarin, which inhibits blood clotting and therefore increases the risk of severe bleeding. However, aspirin proved as effective as warfarin—without that dangerous side effect. Daily low-dose aspirin can cut in half the risk of strokes caused by abnormal heartbeats, which strike 75,000 Americans each year.

For patients who suffer a thrombotic stroke, thrombolytic drugs such as tissue-type plasminogen activator (tPA) can restore brain blood flow and save blood cells. Other medications called heparinoids can reduce the blood’s tendency to clot. For thrombolytic drugs to be effective, they must be administered within three hours after the stroke; heparinoids must be given within 24 hours. People who get to a hospital within an hour of having the first symptoms of a stroke are twice as likely to receive tPA. However, the average person does not seek help for 22 hours or longer.

**Cancer**

The rate of new cancers in the United States has dropped by almost 1 percent a year, and the rate of death from new cancers has fallen 1.6 percent a year. For the first time, lung cancer deaths have decreased in women as well as men—a drop attributed to a decline in smoking.
According to a recent study by the American Cancer Society, the majority of the world’s new cancer cases (7.1 million) and deaths (4.8 million) now occur in developing countries. These numbers are expected to double by 2030 as the world’s population grows and ages.17

Healthier lifestyles could prevent some 340,000 cancers a year.48 A third of cancers are related to smoking; another third, to obesity, poor diet, and lack of exercise.

The number of survivors living with cancer in the United States has risen to an all-time high of 11.7 million, including 7 million age 65 or older.49 In addition to improvements due to early detection and advances in treatment, psychosocial support has proven effective in extending survival in patients with melanoma, leukemia, and cancer of the breast, lung, and gastrointestinal tract.50 (See “Self-Survey,” p. 529.)

Understanding Cancer

The uncontrolled growth and spread of abnormal cells causes cancer. Normal cells follow the code of instructions embedded in DNA (the body’s genetic material); cancer cells do not. Think of the DNA within the nucleus of a cell as a computer program that controls the cell’s functioning, including its ability to grow and reproduce itself. If this program or its operation is altered, the cell goes out of control. The cell nucleus no longer regulates growth. The abnormal cell divides to create other abnormal cells, which again divide, eventually forming neoplasms (new formations), or tumors.

Tumors can be either benign (slightly abnormal, not considered life-threatening) or malignant (cancerous). The only way to determine whether a tumor is benign is by microscopic examination of its cells. Cancer cells have larger nuclei than the cells in benign tumors; they vary more in shape and size; and they divide more often. In general, one billion cancer cells need to have formed before a cancer can be detected. This is the number of cells in a tumor that measures one centimeter (about a third of an inch.)

At one time cancer was thought to be a single disease that attacked different parts of the body. Now scientists believe that cancer comes in countless forms, each with a genetically determined molecular “fingerprint” that indicates how deadly it is. With this understanding, doctors can identify how aggressively a tumor should be treated.

Without treatment, cancer cells continue to grow, crowding out and replacing healthy cells. This process is called infiltration, or invasion. Cancer cells may also metastasize, or spread to other parts of the body via the bloodstream or lymphatic system (Figure 15.9). For many cancers, as many as 60 percent of patients may

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**Figure 15.9 Metastasis, or Spread of Cancer**

Cancer cells can travel through the blood vessels to spread to other organs or through the lymphatic system to form secondary tumors.

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attachment A primary tumor attaches to a blood vessel (or lymph node).

Once cancer cells are attached, they may pass through the lining of the lymph or blood vessel.

Cancer cells move into the circulation system and spread to other parts of the body, colonizing other organs. This traveling and reproducing is called metastasizing.

The cancer cells may then move through the blood and lymph system to form a secondary tumor, or metastasis, at another site in the body.

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have metastases (which may be too small to be felt or seen without a microscope) at the time of diagnosis. Early detection and treatment result in the highest rate of cure.

**Risk Factors for Cancer**

According to the American Cancer Society, almost 1.5 million individuals are diagnosed with cancer each year; about 563,000 die of it. The five-year survival rate for all cancer is 66 percent, up from 50 percent three decades ago.\(^{51}\)

Cancer strikes individuals at all social, economic, and educational levels. However, not everyone receives a prompt diagnosis and equal high-quality care. Those who lack health insurance or whose policies do not cover all the costs of treatments often face delays in detecting a cancer and in beginning treatment.

Since the occurrence of cancer increases over time, most cases affect adults who are middle-aged or older. In the United States, men have a one in two lifetime risk of developing cancer; for women, the risk is one in three (see Figure 15.10).

The term **relative risk** compares the risk of developing cancer in people with a certain exposure or trait to the risk in those who do not have this exposure or trait. Smokers, for instance, have a ten-times-greater relative risk of developing lung cancer than nonsmokers. Most relative risks are smaller. For example, women who have a first-degree (mother, sister, or daughter) family history of breast cancer have a twofold increased risk of developing breast cancer compared with women who do not have a family history of the disease. This means that they are about twice as likely to develop breast cancer.

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### Figure 15.10  Sex Differences in Cancer Rates and Deaths

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<th>Female</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Estimated New Cases</strong>*</td>
<td><strong>Estimated Deaths</strong></td>
</tr>
<tr>
<td><strong>Prostate</strong></td>
<td>Breast</td>
</tr>
<tr>
<td>218,890 (29%)</td>
<td>178,480 (26%)</td>
</tr>
<tr>
<td><strong>Lung &amp; bronchus</strong></td>
<td>Lung &amp; bronchus</td>
</tr>
<tr>
<td>114,760 (15%)</td>
<td>98,620 (15%)</td>
</tr>
<tr>
<td><strong>Colon &amp; rectum</strong></td>
<td>Colon &amp; rectum</td>
</tr>
<tr>
<td>79,130 (10%)</td>
<td>74,630 (11%)</td>
</tr>
<tr>
<td><strong>Urinary bladder</strong></td>
<td>Uterine corpus</td>
</tr>
<tr>
<td>50,040 (7%)</td>
<td>39,080 (6%)</td>
</tr>
<tr>
<td><strong>Non-Hodgkin’s lymphoma</strong></td>
<td>Non-Hodgkin’s lymphoma</td>
</tr>
<tr>
<td>34,200 (4%)</td>
<td>28,990 (4%)</td>
</tr>
<tr>
<td><strong>Melanoma of the skin</strong></td>
<td>Melanoma of the skin</td>
</tr>
<tr>
<td>33,910 (4%)</td>
<td>26,030 (4%)</td>
</tr>
<tr>
<td><strong>Kidney and renal pelvis</strong></td>
<td>Thyroid</td>
</tr>
<tr>
<td>31,590 (4%)</td>
<td>25,480 (4%)</td>
</tr>
<tr>
<td><strong>Leukemia</strong></td>
<td>Ovary</td>
</tr>
<tr>
<td>24,800 (3%)</td>
<td>22,430 (3%)</td>
</tr>
<tr>
<td><strong>Oral cavity &amp; pharynx</strong></td>
<td>Kidney and renal pelvis</td>
</tr>
<tr>
<td>24,180 (3%)</td>
<td>19,600 (3%)</td>
</tr>
<tr>
<td><strong>Pancreas</strong></td>
<td>Leukemia</td>
</tr>
<tr>
<td>18,830 (2%)</td>
<td>19,440 (3%)</td>
</tr>
<tr>
<td><strong>All sites</strong></td>
<td>All sites</td>
</tr>
<tr>
<td>766,860 (100%)</td>
<td>678,060 (100%)</td>
</tr>
</tbody>
</table>

---

* Excludes basal and squamous cell skin cancers and in situ carcinoma except urinary bladder.
Medical experts recommend that cancer survivors exercise regularly, eat at least five servings of fruits and vegetables daily, and not smoke. However, only a small minority—5 percent in one study—are following all three recommendations.

**Heredity** An estimated 13 to 14 million Americans may be at risk of a hereditary cancer. In hereditary cancers, such as retinoblastoma (an eye cancer that strikes young children) or certain colon cancers, a specific cancer-causing gene is passed down from generation to generation. The odds of any child with one affected parent inheriting this gene and developing the cancer are 50–50.

Other people are born with genes that make them susceptible to having certain cells grow and divide uncontrollably, which may contribute to cancer development. The most well-known are mutations of the BRCA gene, linked with increased risk of breast, colon, and ovarian cancer.

Genetic tests can identify some individuals who are born with an increased susceptibility to cancer. By spotting a mutated gene in an individual, doctors can sometimes detect cancer years earlier through increased cancer screening. The most likely sites for inherited cancers to develop are the breast, brain, blood, muscles, bones, and adrenal glands.

**Racial and Ethnic Groups** Although overall cancer death rates have fallen in the United States, black Americans still bear the biggest brunt of fatal cancers. The death rate from cancer among black men is 32 percent higher than that of white men while the cancer death rate among black women is about 16 percent above that of white women.

African American women have the highest incidence of colorectal and lung cancers of any ethnic group, while black men have the highest rates of prostate, colorectal, and lung cancer. African Americans also have higher rates of incidence and deaths from other cancers, including those of the mouth, throat, esophagus, stomach, pancreas, and larynx.

Cancer rates also vary in other racial and ethnic groups. Hispanics have a six times lower risk of developing melanoma than Caucasians, yet tend to have a worse prognosis than Caucasians when they do develop this skin cancer. The incidence of female breast cancer is highest among white women and lowest among Native American women. Cervical cancer is most common in Hispanic women.

Asian Americans, both those born in the United States and immigrants, generally have lower cancer rates than other ethnic groups. Vietnamese men have much higher rates of liver cancer than whites, while Korean men and women are much more likely to develop stomach cancer. Compared with other Asian Americans, Chinese and Vietnamese women have higher rates of lung cancer. Asian Americans who have lived in the United States the longest are likely to develop the cancers that are most common here, such as breast and colon cancer, although at lower rates than whites.

**Obesity** Long recognized as threats to cardiovascular health, overweight and obesity may play a role in an estimated 90,000 cancer deaths each year. According to American Cancer Society researchers who examined the relationship between body mass index (BMI) and risk of dying from cancer, 14 percent of cancer deaths in men and 20 percent of cancer deaths in women may stem from excess weight.

The higher an individual’s BMI, the greater the likelihood of dying of cancer. An unhealthy body weight increases the risk of many types of cancer, including breast (in postmenopausal women), colon and rectum, kidney, cervix, ovary, uterus, esophagus, gallbladder, stomach (in men), liver, pancreas, prostate, non-Hodgkin’s lymphoma, and multiple myeloma.

The degree to which extra pounds affect cancer risk varies by site. Obesity elevates the risk of esophageal cancer fivefold; increases the risk of breast or uterine cancer by two to four times; and boosts the risk for colon cancer by 35 percent to twofold.

**Infectious Agents** Worldwide, an estimated 17 percent of cancers can be attributed to infection. In economically developing countries, infections cause or contribute to 26 percent of cancers. In developed countries, they play a role in 7 percent of new cases of cancer.

Among the cancers that have been linked with infectious agents are human papillomavirus
(HPV) with cervical cancer and Helicobacter pylori with stomach cancer. Viruses have been implicated in certain leukemias (cancers of the blood system) and lymphomas (cancers of the lymphatic system), cancers of the nose and pharynx, liver cancer, and cervical cancer. (See Chapter 10 for details on the human papillomavirus.) Human immunodeficiency virus (HIV) can lead to certain lymphomas and leukemias and to a type of cancer called Kaposi’s sarcoma.

Generally, the presence of a bacterium or a virus per se is not enough to cause cancer. A predisposing environment and other cofactors—most still unknown—are needed for cancer development and growth.

**Common Types of Cancer**

Cancer refers to a group of more than a hundred diseases characterized by abnormal cell growth. Although all cancers have similar characteristics, each is distinct. Some cancers are relatively simple to cure, whereas others are more threatening and mysterious. The earlier any cancer is found, the easier it is to treat and the better the patient’s chances of survival.

Cancers are classified according to the type of cell and the organ in which they originate, such as the following:

- **Carcinoma**, the most common kind, which starts in the epithelium, the layers of cells that cover the body’s surface or line internal organs and glands.
- **Sarcoma**, which forms in the supporting, or connective, tissues of the body: bones, muscles, blood vessels.
- **Leukemia**, which begins in the blood-forming tissues: bone marrow, lymph nodes, and the spleen.
- **Lymphoma**, which arises in the cells of the lymph system, the network that filters out impurities.

If you note any of the following seven warning signs, immediately schedule an appointment with your doctor:

- Change in bowel or bladder habits.
- A sore that doesn’t heal.
- Unusual bleeding or discharge.
- Thickening or lump in the breast, testis, or elsewhere.
- Indigestion or difficulty swallowing.
- Obvious change in a wart or mole.
- Nagging cough or hoarseness.

**Skin Cancer**

One of every five Americans can expect to develop skin cancer in their lifetimes. Once scientists thought exposure to the B range of ultraviolet light (UVB), the wavelength of light responsible for sunburn, posed the greatest danger. However, longer-wavelength UVA, which penetrates deeper into the skin, also plays a major role in skin cancers. An estimated 80 percent of total lifetime sun exposure occurs during childhood, so sun protection is especially important in youngsters. Tanning salons and sunlamps also increase the risk of skin cancer because they produce ultraviolet radiation. A half-hour dose of radiation from a sunlamp can be equivalent to the amount you’d get from an entire day in the sun. Often skin damage is invisible to the naked eye but shows up under special diagnostic lights.

Young adults spend the most time in the sun and also frequent tanning salons. Even when they perceive the seriousness of skin cancer, college students—particularly women—describe suntanned skin as attractive, healthy, and athletic-looking and view the benefits of getting a suntan as outweighing the risks of skin cancer or premature aging. Some students actually become addicted to tanning. (See Consumer Alert, p. 522.) However, a CDC report concluded that indoor tanning is “simply not safe” and causes sunburn, infection, eye damage, and increased risk of skin cancer.

The most common skin cancers are basal cell (involving the base of the epidermis, the top level of the skin) and squamous cell (involving cells in the epidermis). Their incidence is increasing among men and women under the age of 40. Long-term exposure to the sun is the biggest risk factor for these cancers.

Every year more than 5 million Americans develop skin lesions known as actinic keratoses (AKs), rough red or brown scaly patches that develop in the upper layer of the skin, usually on the face, lower lip, bald scalp, neck, back of the hands, and forearms. Forty percent of squamous cell carcinomas, the second leading cause of skin cancer deaths, begin as AKs. Treatments include surgical removal, cryosurgery (freezing
Malignant melanoma, the deadliest type of skin cancer, causes 1 to 2 percent of all cancer deaths. Melanoma has become the most common cancer among young adults between ages 25 and 29 and the second most common cancer among 15- to 24-year-olds. During the 1930s, the lifetime risk of melanoma was about 1 in 1,500. Today it is 1 in 75. This increase in risk is due mostly to overexposure to UV radiation. The use of a tanning bed ten times or more a year doubles the risk for individuals over age 30.

Both the amount and the intensity of lifetime sun exposure play key roles in determining risk for melanoma. People living in areas where the sun’s ultraviolet rays reach Earth with extra intensity, such as tropical or high-altitude regions, are at increased risk. Although melanoma occurs more often among people over 40, it is increasing in younger people, particularly those who had severe sunburns in childhood. The rate of increase in melanoma also has risen more in men (4.6 percent a year) than in women (3.2 percent). Men are more likely than women to be diagnosed with melanoma after age 40.

Individuals with any of the following characteristics are at increased risk:

- Fair skin, light eyes, or fair hair.
- A tendency to develop freckles and to burn instead of tan.
- A history of childhood sunburn or intermittent, intense sun exposure.
- A personal or family history of melanoma.
- A large number of nevi, or moles (200 or more, or 50 or more if under age 20), or dysplastic (atypical) moles.

**Detection** The most common predictor for melanoma is a change in an existing mole or development of a new and changing pigmented mole. The most important early indicators are change in color, an increase in diameter, and changes in the borders of a mole (Figure 15.11). An increase in height signals a corresponding growth in depth under the skin. Itching in a new or long-standing mole also should not be ignored.

**Your Strategies for Prevention**

**Save Your Skin**

- **Once a month, stand in front of a full-length mirror to examine your front and back, and your left and right sides with your arms raised.** Check the backs of your legs, the tops and soles of your feet, and the surfaces between your toes. Use a hand mirror to check the back of your neck, behind your ears, and your scalp.

- **Watch for changes in the size, color, number, and thickness of moles.** Suspicious moles are likely to be asymmetrical (one half doesn’t match the other), with ragged, notched, or blurred edges. Also look for any signs of darkly pigmented growth, oozing, scaliness, bleeding, or a change in sensation, itchiness, tenderness, or pain.

- **Don’t put too much faith in sunscreens.** Wearing sunscreen (with a sun protection factor, or SPF, of at least 15) is good, but protective clothing is better—and staying in the shade is best. Check your shadow. One simple guideline for reducing the risk of skin cancer is avoiding the sun anytime your shadow is shorter than you are. According to the National Cancer Institute (NCI), this shadow method—based on the principle that the closer the sun comes to being directly overhead, the stronger its ultraviolet rays—works for any location and at any time of year.

- **Check for photosensitivity.** If you are taking any drugs, ask your doctor or pharmacist to see if the medication could make you more sensitive to sun damage. Be especially cautious about sun exposure if you have been using a synthetic preparation derived from vitamin A (Retin A) as an acne or anti-wrinkle treatment; it can increase your susceptibility.

- **Use extra caution near water, snow, and sand since they reflect the damaging rays of the sun and increase the risk of sunburn.** Wear protective clothing, such as a wide-brimmed cap or hat, whenever possible.
Figure 15.11  **ABCD: The Warning Signs of Melanoma**

An estimated 95 percent of cases of melanoma arise from an existing mole. A normal mole is usually round or oval, less than 6 millimeters (about 1/4 inch) in diameter, and evenly colored (black, brown, or tan).

Seek prompt evaluation of any moles that change in ways shown in the photo.

Source: American Academy of Dermatology. All rights reserved.

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**CONSUMER ALERT**

**Are You Addicted to Tanning?**

You know that exposure to ultraviolet rays increases your risk of developing skin cancer, but maybe you still can't stay out of the sun or a tanning booth. Why?

**Facts to Know**

- Researchers theorize that repetitive tanning behavior may be the result of a kind of addiction.
- Texas beachgoers, asked questions about their tanning habits, gave replies similar to those who gamble or drink compulsively.

**Steps to Take**

- Test your risk of “ultraviolet light (UVL) dependency” by taking the CAGE screening testing for addictive behavior.
- Ask yourself the following questions;
  - **Cut:** Ever felt you ought to cut down on your behavior?
  - **Annoyed:** Have people annoyed you by criticizing your behavior?
  - **Guilt:** Ever felt bad or guilty about your behavior?
  - **Eye Opener:** Ever engaged in your behavior to steady your nerves in the morning?

Answering yes to two of the CAGE questions is a strong indication for an addictive behavior; answering yes to three confirms it.

---

**Table 15.3  A Woman’s Risk of Developing Breast Cancer**

Source: Surveillance Program, National Cancer Institute.

<table>
<thead>
<tr>
<th>Age</th>
<th>Risk of Breast Cancer</th>
</tr>
</thead>
<tbody>
<tr>
<td>By age 25</td>
<td>1 in 19,608</td>
</tr>
<tr>
<td>By age 30</td>
<td>1 in 2,525</td>
</tr>
<tr>
<td>By age 35</td>
<td>1 in 622</td>
</tr>
<tr>
<td>By age 40</td>
<td>1 in 217</td>
</tr>
<tr>
<td>By age 45</td>
<td>1 in 93</td>
</tr>
<tr>
<td>By age 50</td>
<td>1 in 50</td>
</tr>
<tr>
<td>By age 55</td>
<td>1 in 33</td>
</tr>
<tr>
<td>By age 60</td>
<td>1 in 24</td>
</tr>
<tr>
<td>By age 65</td>
<td>1 in 17</td>
</tr>
<tr>
<td>By age 70</td>
<td>1 in 14</td>
</tr>
<tr>
<td>By age 75</td>
<td>1 in 11</td>
</tr>
<tr>
<td>By age 80</td>
<td>1 in 10</td>
</tr>
<tr>
<td>By age 85</td>
<td>1 in 9</td>
</tr>
<tr>
<td>Ever</td>
<td>1 in 8</td>
</tr>
</tbody>
</table>

**Breast Cancer**  Every 3 minutes, a woman in the United States learns that she has breast cancer. Every 12 minutes, a woman dies of breast cancer. Many women misjudge their own likelihood of developing breast cancer, either overestimating or underestimating their susceptibility. In a national poll, one in every ten surveyed considered herself at no risk at all. This is never the case. Every woman is at risk for breast cancer simply because she’s female.

The most common risk factors include the following:

- **Age.** As shown in Table 15.3, at 25, a woman’s chance of developing breast cancer is 1 in 19,608; by age 45, it has increased to 1 in 93; by 65, it is 1 in 17. The mean age at which women are diagnosed is 63.

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**Steps to Take**

- **Family history.** The overwhelming majority of breast cancers—90 to 95 percent—are not due to strong genetic factors. However, having a first-degree relative—mother, sister, or daughter—with breast cancer does increase risk, and if the relative developed breast cancer before menopause, the cancer is more likely to be hereditary.

- **Long menstrual history.** Women who had their first period before age 12 are at greater risk than women who began menstruating later. The reason is that the more menstrual cycles a woman has, the longer her exposure to estrogen, a hormone known to increase breast cancer danger. For similar
reasons, childless women, who menstruate continuously for several decades, are also at greater risk. Neither miscarriage nor induced abortion increases the risk of breast cancer.

- **Age at birth of first child.** An early pregnancy—in a woman’s teens or 20s—changes the actual maturation of breast cells and decreases risk. But if a woman has her first child in her 40s, precancerous cells may actually flourish with the high hormone levels of the pregnancy.

- **Breast biopsies.** Even if laboratory analysis finds no precancerous abnormalities, women who require such tests are more likely to develop breast cancer. Fibrocystic breast disease, a term often used for “lumpy” breasts, is not a risk factor.

- **Race and ethnicity.** Breast cancer rates are lower in Hispanic and Asian American populations than in whites and in African American women. Caucasian women over 40 have the highest incidence rate for breast cancer in this country, but African American women at every age have a greater likelihood of dying from breast cancer.

BRCA1 mutations indicate a higher risk of aggressive forms of breast cancer and of ovarian cancer. Hispanic women, particularly those of Mexican descent, are more likely than white or black women to have hereditary forms of cancer.

- **Occupation.** Based on two decades of following more than a million women, Swedish researchers have developed a list of jobs linked with a high risk of breast cancer. These include pharmacists, certain types of teachers, schoolmasters, systems analysts and programmers, telephone operators, telegraph and radio operators, metal platers and coaters, and beauticians.

- **Alcohol.** Women’s risk of breast cancer increases with the amount of alcohol they drink. Those who take two or more drinks per day are 40 percent more likely to develop breast cancer than women who don’t drink at all. For a nondrinking woman, the lifetime risk of breast cancer by age 80 is 1 in 11. For heavy drinkers it’s about 1 in 7, regardless of race, education, family history, use of hormone therapy, or other risk factors.

- **Hormone therapy (HT).** Several studies confirm an increased risk with a combination of estrogen and progestin, particularly in women who use combination HT for five years or longer. With the decreasing use of hormone therapy, breast cancer rates have declined, especially among affluent women over 50.

- **Obesity.** Excess weight, particularly after menopause, increases the risk of getting breast cancer. Overweight women, both pre- and postmenopausal, with breast cancer are more likely to die of their disease.

- **Sedentary lifestyle.** According to the World Health Organization, regular physical activity may cut the risk of developing breast cancer by 20 to 40 percent, regardless of a woman’s menopausal status or the type or intensity of the activity. The reason may be that exercise lowers levels of circulating ovarian hormones.

### Detection

Doctors have long advised women to perform monthly breast self-exams (BSEs) after their periods (Figure 15.12). In its newest guidelines, the American Cancer Society now describes BSE as “an option” for women starting in their twenties and urges all women to report any breast changes promptly. It recommends a breast exam by a trained practitioner every three years for women in their twenties and thirties and every year for women 40 and over and a yearly mammogram for all women, starting at age 40.

The best tool for early detection is the diagnostic X-ray exam called mammography. Women whose breast cancer is detected by screening mammography have a significantly better prognosis than those whose cancer is found another way—even if the cancer has already spread to their lymph nodes. A likely reason is that mammography can detect tumors that are both slower growing and less biologically lethal than others.

Mammography has proven effective in detecting breast cancer at an early stage, when treatment is more effective and a cure more likely. The American College of Obstetricians and Gynecologists now recommends annual mammography for women who are 40 and older. Previous guidelines had suggested mammograms every one or two years after age 40.
Women who were diagnosed in their 40s and died of breast cancer account for at least one-third of all potential years of life lost to this disease. Of the 40,000 women who die of breast cancer every year, 18 percent are diagnosed in their 40s.

Magnetic Resonance Imaging may be more accurate than mammography for detecting early forms of breast cancer before they progress to more aggressive forms. The American Cancer Society now recommends MRI screening for women with a strong family history of breast or ovarian cancer and those who have been treated for Hodgkin’s disease. Women who’ve had cancer in one breast or those with extremely dense breasts may also benefit.

**Treatment** Breast cancer can be treated with surgery, radiation, and drugs (chemotherapy and hormonal therapy). Doctors may use one of these options or a combination, depending on the type and location of the cancer and whether the disease has spread.

Most women undergo some type of surgery. Lumpectomy, or breast-conserving surgery, removes only the cancerous tissue and a surrounding margin of normal tissue. A modified radical mastectomy includes the entire breast and some of the underarm lymph nodes. Removing underarm lymph nodes is important to determine if the cancer has spread, but a technique called sentinel node biopsy allows physicians to pinpoint the first lymph node into which a tumor drains (the sentinel node) and remove only the nodes most likely to contain cancer cells.

Radiation therapy is treatment with high-energy rays or particles to destroy cancer. In almost all cases, lumpectomy is followed by six to seven weeks of radiation. Chemotherapy is used to reach cancer cells that may have spread beyond the breast—in many cases even if no cancer is detected in the lymph nodes after surgery.

The use of drugs such as tamoxifen and aromatase inhibitors, in addition to standard chemotherapy, can significantly lower the risk of recurrence.

**Cervical Cancer** Cervical cancer, the second most common cancer in women worldwide, claims 250,000 lives every year. Approximately 85 percent of these deaths occur in developing countries where women do not have access to effective cervical cancer screening. An estimated 11,000 cases of invasive cervical cancer are diagnosed in the United States every year. The highest incidence rate occurs among Vietnamese women; Alaska Native, Korean, and Hispanic women also have higher rates than the national average.

Women are at higher risk for cervical cancer if they engaged in sexual activity before the age of...
HPV infection is very common in young women. In some studies one in five sexually active women under age 30 has HPV. However, only about 13 of the hundred-plus types of HPV cause dysplasia, or precancerous changes in cervical cells. Women should be tested for HPV if they have an abnormal or unclear Pap smear result (Table 15.4).

For a more detailed discussion of HPV, see Chapter 10.

**Ovarian Cancer** Ovarian cancer is the leading cause of death from gynecological cancers. Risk factors include a family history of ovarian cancer; personal history of breast cancer; obesity; infertility (because the abnormality that interferes with conception may also play a role in cancer development); and low levels of transferase, an enzyme involved in the metabolism of dairy foods. Ovarian cancer may be diagnosed by pelvic examination, ultrasound, MRI, computed tomography, or PET (positron emission tomography) scan. Women with ovarian cancer are more likely to report abdominal pain, feeling full quickly after eating, and urinary urgency, but these symptoms are so common that they are often overlooked or dismissed.\(^{58}\)

**Testicular Cancer** In the last 20 years the incidence of testicular cancer has risen 51 percent in the United States—from 3.61 to 5.44 per 100,000. It is not clear why testicular cancer is on the rise, although researchers speculate that changing environmental or socioeconomic risk factors could have a role. Chronic use of marijuana increases the risk of an especially aggressive form of testicular cancer. Testicular cancer occurs mostly among young men between the ages of 18 and 35, who are not normally at risk of cancer. At highest risk are men with an undescended testicle (a condition that is almost always corrected in childhood to prevent this danger). To detect possibly cancerous growths, men should perform monthly testicular self-exams, as shown in Figure 15.13.

Table 15.4 **What Your Pap Test Results Mean**

<table>
<thead>
<tr>
<th>Result</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td>A normal (or “negative”) result means that no cell changes were found on the cervix.</td>
</tr>
<tr>
<td>Unclear</td>
<td>It is common for test results to come back unclear. Doctors may use other words to describe this result such as inconclusive, or ASC-US. These all mean the same thing: that some cervical cells could be abnormal, perhaps because of an infection. An HPV test will indicate if the changes are related to HPV.</td>
</tr>
<tr>
<td>Abnormal</td>
<td>An abnormal result means that cell changes were found on the cervix. This usually does not indicate cervical cancer. Abnormal changes on your cervix are likely caused by HPV. The changes may be minor (low-grade) or serious (high-grade). Most of the time, minor changes go back to normal on their own. But more serious changes can turn into cancer if the cells are not removed. The more serious changes are often called “pre-cancer” because they are not yet cancer but could turn into cancer over time.</td>
</tr>
</tbody>
</table>

Figure 15.13 **Testicular Self-Exam**

The best time to examine your testicles is after a hot bath or shower, when the scrotum is most relaxed. Place your index and middle fingers under each testicle and the thumb on top, and roll the testicle between the thumb and fingers. If you feel a small, hard, usually painless lump or swelling, or anything unusual, consult a urologist.

Often the first sign of this cancer is a slight enlargement of one testicle. There also may be a change in the way it feels when touched. Sometimes men with testicular cancer report a dull ache in the lower abdomen or groin, along with a sense of heaviness or sluggishness. Lumps on the testicles also may indicate cancer.

A man who notices any abnormality should consult a physician. If a lump is indeed present,
a surgical biopsy is necessary to find out if it is cancerous. If the biopsy is positive, a series of tests generally is needed to determine whether the disease has spread.

Treatment for testicular cancer generally involves surgical removal of the diseased testis, sometimes along with radiation therapy, chemotherapy, and the removal of nearby lymph nodes. The remaining testicle is capable of maintaining a man’s sexual potency and fertility. Only in rare cases is removal of both testicles necessary. Testosterone injections following such surgery can maintain potency. The chance for a cure is very high if testicular cancer is spotted early.

Colon and Rectal Cancer Colon and rectal, or colorectal, cancer is the third most common cancer and accounts for 10 percent of cancer deaths. Most cases occur after age 50. Both age and gender influence the risk of colon cancer. Older individuals and men are more likely to develop polyps (nonmalignant growths that may turn cancerous at some point) and tumors in the colon than young people and women.

Risk factors include age (over 50), personal or family history of colon and rectal cancer, polyps in the colon or rectum, ulcerative colitis, smoking, alcohol consumption, prolonged high consumption of red and processed meat, high-fat or low-fiber diet, and inadequate intake of fruits and vegetables. In the landmark Women’s Health Initiative trials, a low-fat diet did not reduce the risk of colon and rectal cancer in postmenopausal women. Low doses of aspirin or other nonsteroidal anti-inflammatory drugs appear to reduce the risk of precancerous polyps that can lead to colon and rectal cancer.

Current guidelines recommend a screening colonoscopy beginning at age 50, earlier for those at higher risk based on personal, family, or medical history. The initial screening is crucial because it detects the largest, most dangerous polyps, which can then be removed.

Early signs of colorectal cancer are bleeding from the rectum, blood in the stool, or a change in bowel habits. Treatment may involve surgery, radiation therapy, and/or chemotherapy.

Prostate Cancer After skin cancer, prostate cancer is the most common form of cancer in American men. The risk of prostate cancer is 1 in 6; the risk of death due to metastatic prostate cancer is 1 in 30. More than a quarter of men diagnosed with cancer have prostate cancer. The disease strikes African American men more often than white; Asian and American Indian men are affected less often.

The risk of prostate cancer increases with age, family history, exposure to the heavy metal cadmium, high number of sexual partners, and history of frequent sexually transmitted infections. A diet high in saturated fat may be a risk factor. An inherited predisposition may account for 5 to 10 percent of cases. A purported link between vasectomy and prostate cancer has been disproved. Statin drugs, commonly prescribed to lower cholesterol, also may lower the risk of prostate cancer.

The development of a simple annual screening test that measures levels of a protein called prostate-specific antigen (PSA) in the blood has revolutionized the diagnosis of prostate cancer. PSA testing is recommended for men at high risk (African Americans and men with close relatives with prostate cancer) starting at age 45 and for all men at age 50. It remains controversial, however. Some claim that PSA testing saves lives; others, that it leads to unnecessary and potentially harmful treatments. Annual screening has not reduced deaths from the disease in older men, and new guidelines recommend against screening for men age 75 or older. There is insufficient evidence to assess the balance of benefits and risks in younger men.59

Treatment may include hormones, chemotherapy, a low-fat diet, and radiation. About 60,000 men undergo radical prostate surgery in the United States every year. The five-year survival rate has increased from 67 percent to 99 percent over the past 20 years.

Other Major Illnesses

Other noninfectious diseases have a debilitating effect on many people. But most of the diseases discussed in this section can be controlled, if not cured.
Epilepsy and Seizure Disorders

About 10 percent of all Americans will have at least one seizure at some time. Between 0.5 and 1 percent of all Americans have recurrent seizures. Derived from the Greek word for seizure, epilepsy is the term used to refer to a variety of neurological disorders characterized by sudden attacks (seizures) of violent muscle contractions and unconsciousness. Epilepsy is rarely fatal; the primary danger to life is to suffer an attack while driving or swimming.

Seizures can be major, referred to as grand mal; minor, referred to as petit mal; or psychomotor. In a grand-mal seizure, the person loses consciousness, falls to the ground, and experiences convulsive body movements. Petit-mal seizures are brief, characterized by a loss of consciousness for 10 to 30 seconds, by eye or muscle flutterings, and occasionally by a loss of muscle tone. About 90 percent of all epileptics have grand-mal seizures; 40 percent suffer both petit-mal and grand-mal seizures. The frequency of attacks defines the severity of the epilepsy. Diagnosis is based on a history of recurring attacks and a study of the brain’s electrical activity, called an electroencephalogram (EEG).

About half of all cases of epilepsy have no known cause and are therefore classified as idiopathic. Others stem from conditions that affect the brain, such as trauma, tumors, congenital malformations, or inflammation of the membranes covering the brain. Idiopathic epilepsy usually begins between the ages of 2 and 14. Seizures before age 2 are usually related to developmental defects, birth injuries, or a metabolic disease affecting the brain. (Fever-induced convulsions are not related to epilepsy.) Seizures after age 14 are generally symptoms of brain disease or injury.

Seizure disorders don’t reflect or affect intellectual or psychological soundness; people who suffer from them have normal intelligence. Therapy with anticonvulsant drugs can control seizures in most people, and once seizures are under control, epileptics can live full, normal lives by continuing to take their medications.

If you’re with a person who suffers a grand-mal seizure, make sure he or she isn’t injured during the attack. Don’t try to restrain the person or interfere with his or her movements, and don’t try to force anything into the person’s mouth.

Asthma

Asthma is a disease characterized by constriction of the breathing passages. As with allergy, asthma rates have skyrocketed in the last two decades. Approximately 20 million Americans have asthma. Asthma-related problems account for more than half a million hospital stays each year and 14 deaths each day in the United States, according to the Asthma and Allergy Foundation of America.

Asthma is more common among inner-city residents and blacks. The disease disproportionately affects African Americans. A black man in New York City is 11 times more likely to die from asthma than other men in the city.

While asthma is not always linked to allergy, the two are related. Among people with asthma, 90 percent of the children, 70 percent of young adults, and 50 percent of older adults also have allergies. According to epidemiologic research, 23 percent of youngsters diagnosed with allergies by age 1 develop asthma by age 6. Of those diagnosed after age 1, 13 percent eventually become asthmatic. Symptoms include wheezing, coughing, shortness of breath, and chest tightness. If the symptoms are untreated or undertreated, they can worsen and damage the lungs. Oral contraceptives increase the risk in some women.65

epilepsy  A variety of neurological disorders characterized by sudden attacks (seizures) of violent muscle contractions and unconsciousness.

asthma  A disease or allergic response characterized by bronchial spasms and difficult breathing.
The number of people with asthma continues to increase into adulthood. However, as shown by a study that followed college students for 23 years, most report that their symptoms improve or disappear.

Over the last decade advances in asthma medications and tools have significantly improved management of this disease. Inhaled corticosteroids, long-acting bronchodilators (such as Advair), and leukotriene receptor antagonists (such as Singular) have proven particularly helpful in controlling symptoms and preventing serious attacks that would require treatment with oral steroids.61

If you have asthma, here are some steps you should take:

- **Get away from the asthma trigger** (cigarette smoke, cat, pollen, etc.).
- **Assess the severity of the attack**. The most precise way to do so is with a peak flow meter. If your peak flow is less than half your best value, the attack is severe.
- **Use a quick reliever**. The fastest way to relieve an asthma attack is to use a quick-acting bronchodilator such as albuterol.
- **Suppress inflammation**. Quick-relief bronchodilators treat only the constricted muscles surrounding the bronchial tubes. Treating the overproduction of mucus requires an anti-inflammatory medication, typically a corticosteroid, such as prednisone.
- **Know when to call for help**. Severe asthma attacks can be dangerous. If you don’t feel improvement, get help immediately from your doctor or an urgent care or emergency health care center, or call 911.

### Ulcers

Open sores, often more than an inch wide, that develop in the lining of the stomach or the duodenum (the first part of the small intestine) are called **ulcers**. They are caused by excessive acidic digestive juices. The major symptom is a burning pain felt throughout the upper abdomen. The pain may come and go, lasting up to three hours. It may begin either right after eating or several hours later.

One in five men and one in ten women get ulcers of the stomach or duodenum, but the number of ulcers is declining. Risk factors include heavy use of cigarettes, alcohol, or caffeine; the ingestion of large amounts of painkillers that contain aspirin or ibuprofen; and advanced age. Bleeding is not common but may be dangerous, even life-threatening. An untreated stomach ulcer can lead to serious weight loss and anemia.

Researchers have identified a bacterium, *Helicobacter pylori*, that may infect the digestive system and set the stage for ulcers. According to various studies, most ulcer patients carry this organism. One theory is that infection leads to an inflammation of the stomach lining called gastritis, which increases vulnerability to other stressors, such as smoking, alcohol, or anxiety. Treatment with antibiotics leads to improvement in most patients.

Conventional therapy for ulcers includes self-help measures, such as avoiding aspirin; eating small, frequent meals; taking antacids; and not smoking or drinking alcohol or caffeine. Drugs such as cimetidine, ranitidine, and sucralfate can reduce the amount of acid produced by the stomach and relieve ulcer symptoms.
Preventing Serious Illness

You may not be able to control every risk factor in your life or environment, but you can protect yourself from the obvious ones.

___ **Not smoking.** There’s no bigger favor you can do for your heart or your lungs—your entire body.

___ **Cutting down on saturated fats and cholesterol.** This can help prevent high blood cholesterol levels, obesity, and heart disease.

___ **Watching your weight.** Even relatively modest gains can have a big effect on your risk of heart disease. Overweight and obesity are associated with increased risks for cancers at several sites: breast (among postmenopausal women), colon, endometrium, esophagus (adenocarcinoma), and kidney.

___ **Moving more.** Regular exercise can help lower your blood pressure, lower LDL, and reduce triglycerides.

___ **Lowering your stress levels.** If too much stress is a problem in your life, try the relaxation techniques described in Chapter 3.

___ **Getting your blood pressure checked regularly.** Knowing your numbers can alert you to a potential problem long before you develop any symptoms.

___ **Avoiding excessive exposure to ultraviolet light.** If you spend a lot of time outside, protect your skin by using sunscreen and wearing long-sleeve shirts and a hat. Also, wear sunglasses to protect your eyes. Don’t purposely put yourself at risk by binge-sunbathing or by using sunlamps.

___ **Controlling your alcohol intake.** The risk of cancers of the mouth, pharynx, larynx, esophagus, liver, and breast increases substantially with intake of more than two drinks per day for men or one drink for women.

___ **Being alert to changes in your body.** You know your body’s rhythms and appearance better than anyone else, and only you will know if certain things aren’t right. Changes in bowel habits, skin changes, unusual lumps or discharges—anything out of the ordinary—may be clues that require further medical investigation.

**Self Survey**

**Are You at Risk of Cancer?**

Answer the following questions:

1. Do you protect your skin from overexposure to the sun? 
2. Do you abstain from smoking or using tobacco in any form? 
3. If you’re over 40 or if family members have had colon cancer, do you get routine digital rectal exams? 
4. Do you eat a balanced diet that includes the recommended daily value for vitamins A, B, and C? 
5. If you’re a woman, do you have regular Pap tests and pelvic exams? 
6. If you’re a man over 40, do you get regular prostate exams? 
7. If you have burn scars or a history of chronic skin infections, do you get regular checkups? 
8. Do you avoid smoked, salted, pickled, and high-nitrite foods? 
9. If your job exposes you to asbestos, radiation, cadmium, or other environmental hazards, do you get regular checkups? 
10. Do you limit your consumption of alcohol? 
11. Do you avoid using tanning salons or home sunlamps? 
12. If you’re a woman, do you examine your breasts every month for lumps? 
13. Do you eat plenty of vegetables and other sources of fiber? 
14. If you’re a man, do you perform regular testicular self-exams? 
15. Do you wear protective sunglasses in sunlight? 
16. Do you follow a low-fat diet? 
17. Do you know the cancer warning signs?

**Scoring**

If you answered no to any of the questions, your risk for developing various kinds of cancer may be increased.
# Detecting Cancer

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<th>Site</th>
<th>Recommendation</th>
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| **Breast**    | • Yearly mammograms are recommended starting at age 40. The age at which screening should be stopped should be individualized by considering the potential risks and benefits of screening in the context of overall health status and longevity.  
• Clinical breast exam should be part of a periodic health exam, about every 3 years for women in their 20s and 30s, and every year for women 40 and older.  
• Women should know how their breasts normally feel and report any breast change promptly to their health care providers. Breast self-exam is an option for women starting in their 20s.  
• Women at increased risk (e.g., family history, genetic tendency, past breast cancer) should talk with their doctors about the benefits and limitations of starting mammography screening earlier, having additional tests (i.e., breast ultrasound and MRI), or having more frequent exams. |
| **Colon and Rectum** | Beginning at age 50, men and women should begin screening with one of the examination schedules that follow:  
• A fecal occult blood test (FOBT) or fecal immunochemical test (FIT) every year.  
• A flexible sigmoidoscopy (FSIG) every 5 years.  
• Annual FOBT or FIT and flexible sigmoidoscopy every 5 years.*  
• A double-contrast barium enema every 5 years.  
• A colonoscopy every 10 years. |
| **Prostate**  | The PSA test and the digital rectal examination should be offered annually, beginning at age 50, to men who have a life expectancy of at least 10 years. Men at high risk (African American men and men with a strong family history of one or more first-degree relatives diagnosed with prostate cancer at an early age) should begin testing at age 45. For both men at average risk and high risk, information should be provided about what is known and what is uncertain about the benefits and limitations of early detection and treatment of prostate cancer so that they can make an informed decision about testing. |
| **Uterus**    | **Cervix:** Screening should begin approximately 3 years after a woman begins having vaginal intercourse, but no later than 21 years of age. Screening should be done every year with regular Pap tests or every 2 years using liquid-based tests. At or after age 30, women who have had three normal test results in a row may get screened every 2 to 3 years. Alternatively, cervical cancer screening with human papillomavirus (HPV) DNA testing and conventional or liquid-based cytology could be performed every 3 years. However, doctors may suggest that a woman get screened more often if she has certain risk factors, such as HIV infection or a weak immune system. Women 70 years and older who have had three or more consecutive normal Pap tests in the last 10 years may choose to stop cervical cancer screening. Screening after total hysterectomy (with removal of the cervix) is not necessary unless the surgery was done as a treatment for cervical cancer.  
**Endometrium:** The American Cancer Society recommends that at the time of menopause all women should be informed about the risks and symptoms of endometrial cancer, and strongly encouraged to report any unexpected bleeding or spotting to their physicians. Annual screening for endometrial cancer with endometrial biopsy beginning at age 35 should be offered to women with or at risk for hereditary nonpolyposis colon cancer (HNPCC). |
| **Cancer-Related Checkup** | For individuals undergoing periodic health examinations, a cancer-related checkup should include health counseling, and, depending on a person's age and gender, might include examinations for cancers of the thyroid, oral cavity, skin, lymph nodes, testes, and ovaries, as well as for some nonmalignant diseases. |

*Combined testing is preferred over either annual FOBT or FIT, or FSIG every 5 years, alone. People who are at moderate or high risk for colorectal cancer should talk with a doctor about a different testing schedule. If you want to write your own goals for lowering your risk for major diseases, access the Behavior Change Planner in CengageNOW at www.cengagebrain.com.

Review Questions

1. The heart
   a. has four chambers, which are responsible for pumping blood into the veins for circulation through the body.
   b. pumps blood first to the lungs where it picks up oxygen and discards carbon dioxide.
   c. beats about 10,000 times and pumps about 75 gallons of blood per day.
   d. has specialized cells that generate electrical signals to control the amount of blood that circulates through the body.

2. A heart attack
   a. occurs when the myocardium receives an excessive amount of blood from the coronary arteries.
   b. is typically suffered by individuals who have irregular episodes of atherosclerosis.
   c. can be treated successfully up to four hours after the event.
   d. occurs when the myocardial cells are deprived of oxygen-carrying blood, causing them to die.

3. You can protect yourself from certain types of cancer by
   a. not smoking.
   b. avoiding people who have had cancer.
   c. wearing sunscreen with an SPF of less than 15.
   d. using condoms during sexual intercourse.

4. Which of the following statements about skin cancer is true?
   a. Individuals with a large number of moles are at decreased risk for melanoma.
   b. The most serious type of skin cancer is squamous cell carcinoma.
   c. The safest way to get a tan and avoid skin cancer is to use tanning salons and sunlamps instead of sunbathing in direct sunlight.
   d. Individuals with a history of childhood sunburn are at increased risk for melanoma.

5. A woman’s risk of developing breast cancer increases if
   a. she is Caucasian over the age of 40.
   b. she had her first child when in her teens or 20s.
   c. her husband’s mother had breast cancer.
   d. she began menstruating when she was 15 or 16.

6. Prostate cancer
   a. occurs mostly among men between the ages of 18 and 35.
   b. is usually more aggressive in white men.
   c. has a low survival rate.
   d. can be detected through a screening test that measures the levels of prostate-specific antigen in the blood.

7. You can control all of these cardiometabolic risk factors except
   a. lipoprotein levels.
   b. high blood glucose.
   c. family history.
   d. overweight.

8. Which of the following statements about diabetes mellitus is false?
   a. Individuals with type 2 diabetes can often control the disease without taking insulin.
   b. The incidence of diabetes has decreased in the last decade, especially among African Americans, Native Americans, and Latinos.
   c. Individuals with diabetes must measure the levels of glucose in their blood to ensure that it does not rise to unsafe levels.
   d. Untreated or uncontrolled diabetes can lead to coma and eventual death.

9. Hypertension
   a. is diagnosed when blood pressure is consistently lower than 130/85 mm Hg.
   b. may be treated with dietary changes, which include eating low-fat foods and avoiding sodium.
   c. can cause fatty deposits to collect on the artery walls.
   d. usually does not respond to medication, especially in severe cases.

10. In your lipoprotein profile, having a high level of this blood element is a good thing.
    a. HDL cholesterol
    b. LDL cholesterol
    c. C-reactive protein
    d. triglyceride

Answers to these questions can be found on page 672.
Critical Thinking

1. Have you had your blood pressure checked lately? If your reading was high, what steps are you now taking to help reduce your blood pressure?

2. Have you had a lipoprotein profile lately? Do you think it’s necessary for you to obtain one? If your reading was/is borderline or high, what lifestyle changes can you make to help control your cholesterol level?

3. Do you have family members who have had cancer? Were these individuals at risk for cancer because of specific environmental factors, such as long-term exposure to tobacco smoke? If no particular cause was identified, what other factors could have triggered their diseases?

4. Are you concerned that you might have inherited a genetic predisposition to any particular type of cancer because of your family history?

A friend of yours, Karen, discovered a small lump in her breast during a routine self-examination. When she mentions it, you ask if she has seen a doctor. She tells you that she hasn’t had time to schedule an appointment; besides, she says, she’s not sure it’s really the kind of lump one has to worry about. It’s clear to you that Karen is in denial and procrastinating about seeing a doctor. What advice would you give her?

Media Menu

Visit www.cengagebrain.com to access course materials and companion resources for this text that will:

- Help you evaluate your knowledge of the material.
- Allow you to prepare for exams with interactive quizzing.
- Use the CengageNOW product to develop a Personalized Learning Plan targeting resources that address areas you should study.

Internet Connections

www.diabetes.org
Here you will find the latest information on both type 1 and type 2 diabetes mellitus, including suggestions regarding diet and exercise. The online bookstore features meal planning guides, cookbooks, and self-care guides. Type in your zip code to find community resources.

www.americanheart.org
This comprehensive site features a searchable database of all major cardiovascular diseases, plus information on healthy lifestyles, current research, CPR, cardiac warning signs, risk awareness, low-cholesterol diets, and family health. The interactive Heart Profilers® provides personalized information about treatment options for common cardiovascular conditions such as hypertension, heart failure, and cholesterol.

www.fl.edu/biosci/heart.html
This interesting site, developed by the Franklin Institute of Science, provides an interactive multimedia tour of the heart, as well as statistics, resources, links, and information on how to monitor your heart’s health by becoming aware of your vital signs.

www.cdc.gov/cancer
This site, sponsored by the Centers for Disease Control and Prevention (CDC), features current information on cancer of the breast, cervix, prostate, skin, and colon. The site also provides monthly spotlights on specific cancers, as well as links to the National Comprehensive Cancer Control Program and the National Program of Cancer Registries.

• Coach you through identifying target goals for behavioral change and creating and monitoring your personal change plan throughout the semester using the Behavior Change Planner available in the CengageNOW resource.
Key Terms

The terms listed are used on the page indicated. Definitions of the terms are in the Glossary at the end of the book.

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References

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