PART I: Cardiovascular diseases

Introduction
Cardiovascular disease is a broad term that is used interchangeably to describe “heart disease.” Cardiovascular diseases encompass many heart conditions that may overlap, such as coronary artery disease (CAD), hypertension (HTN), acute myocardial infarction (AMI or MI), congestive heart failure (CHF) coronary artery disease and arrhythmias. According to the World Health Organization (WHO), Centers for Disease Control and Prevention (CDC) and the American Heart Association (AHA) (2009), cardiovascular disease is the leading cause of death worldwide and a major cause of disability. It has actually been the leading cause of death since 1900 in the United States.

In 2003, the WHO reported that cardiovascular disease made up 16.7 million, or 29.2 percent of all global deaths. Of these deaths, 7.6 million were due to heart attacks and 5.7 million were due to a subset of the problem, cerebrovascular disease and cerebrovascular accident (CVA), or stroke, which will be addressed in Part II of this course. If current trends are allowed to continue, by 2015, an estimated 20 million people will die from cardiovascular disease (mainly from heart attacks and strokes). Cardiovascular disease kills more people than the next-most common causes of death combined, including cancer, chronic lower respiratory disease, accidents, diabetes, influenza and pneumonia. According to the heart association, in 2006, more than 80,000,000 people in the U.S. had one or more forms of cardiovascular disease. The most common forms of cardiovascular disease include hypertension, 73,600,000; coronary heart disease, 16,800,000; acute myocardial infarction, 7,900,000; angina pectoris (chest pain or discomfort caused by reduced blood supply to the heart muscle), 9,800,000; cerebrovascular accident, 6,500,000; and congestive heart failure, 5,700,000.

In 2009, the CDC estimates that 785,000 Americans will have a new coronary heart attack, and about 470,000 will have a recurrent attack this year alone. To put it into perspective, approximately every 25 seconds an individual will have a coronary event, and one person will die every minute.

Although cardiovascular disease is the leading cause of death, most times it is preventable by avoiding unhealthy habits, such as a high-fat diet, physical inactivity and smoking. Every day, nurses are responsible for patients and their families who are living with some form of cardiovascular disease. However, nurses are not immune either, and the daily stressful grind of their work can itself create a risk for nurses of developing cardiovascular disease or picking up bad habits during the long shifts, such as smoking and a high-fat diet. Nurses can use the information in this course in their personal lives as well as in their work caring for others to reduce the overall risk of cardiovascular disease in our nation.

Pathophysiology of cardiovascular diseases
The heart is a hollow, muscular organ that is responsible for continuously pumping an adequate supply of blood throughout the body to vital organs for survival. To reduce our risk of developing cardiovascular disease, it is important that we nurture our bodies with healthy, nutritious foods; exercise; and avoid harmful substances.

Cardiovascular diseases are mainly caused by a buildup of plaque (atherosclerosis) inside the coronary arteries. Over time, the plaque diminishes blood flow and oxygen to the heart, brain and other vital organs secondary to the inflammatory process. The extensive inflammation further exacerbates the ability of oxygenated blood to flow freely in the bloodstream, leading to a further buildup of plaque and an accumulation of blood clots. Blood clots accumulate when a blood vessel is stenosed secondary to the limited blood flow; therefore, it backs up into the previous chamber behind the valve. The pressure in the previous chamber will increase because of the resistance in the stenosed blood vessel. Consequently, the heart is forced to work harder, which results in hypertrophy (enlargement), especially left ventricular hypertrophy, which further increases the heart’s workload because of the resulting increased oxygen demands.

Once blood vessels are blocked by plaque or clots, they cannot supply blood to the heart and brain, which then become damaged and weakened and can lead to a myocardial infarction, congestive heart failure or arrhythmias. Although there are several types of plaque that may result in serious coronary events, retrospective analyses have demonstrated that 70 percent of all fatal acute myocardial infarctions and sudden coronary deaths are attributable to plaque rupture or erosion.

Although atherosclerosis is the predominant predictor of cardiovascular disease, there are other potential pathological rationales for each of the major specific cardiac diagnosis and significant overlapping in each of the most common heart conditions.

Coronary artery disease (CAD)
The most common type of heart disease, coronary artery disease (also called coronary heart disease, or CHD) is the primary cause of acute myocardial infarction secondary to atherosclerosis, and the leading cause of death in the United States for both men and women. Over time, CAD can weaken the heart muscle and lead to heart failure and arrhythmias.

What causes coronary artery disease?
Research suggests that coronary artery disease (CAD) starts when certain factors damage the inner layers of the coronary arteries. These factors include:

- Smoking.
- High amounts of certain fats and cholesterol in the blood.
- High blood pressure.
- High amounts of sugar in the blood caused by insulin resistance or diabetes.

When damage occurs, excess fatty tissues release compounds to promote the healing process. But this in turn causes plaque to build up where the arteries are damaged. The buildup of plaque in the coronary arteries may start in childhood. Over time, plaque can narrow or completely block the coronary arteries, which reduces the flow of oxygen-rich blood to the heart muscle. Plaque also can crack, which causes blood cells called platelets to clump together and form blood clots at the site of the cracks. This narrows the arteries more and worsens angina or causes a heart attack.

Risk factors for coronary artery disease
The major risk factors for CAD, and many other heart diseases, are:

- Unhealthy blood cholesterol levels. This includes high LDL cholesterol (sometimes called bad cholesterol) and low HDL cholesterol (sometimes called good cholesterol).
- High blood pressure. Blood pressure is considered high if it stays at or above 140/90 mm/Hg over a period of time.
- Smoking. This can damage and tighten blood
Stress and sleep apnea can contribute to CAD. Other factors also may contribute to CAD. These factors include:

- **Insulin resistance.** This condition occurs when the body can’t use its own insulin properly. Insulin is a hormone that helps move blood sugar into cells where it’s used.
- **Diabetes.** This is a disease in which the body’s blood sugar level is high because the body doesn’t make enough insulin or doesn’t use its insulin properly.
- **Being overweight or obese.** Being overweight is having extra body weight from muscle, bone, fat or water. Obesity is having a high amount of extra body fat.
- **Metabolic syndrome.** Metabolic syndrome is the name for a group of risk factors linked to being overweight or obese that raises the chance for heart disease and other health problems, such as diabetes and stroke.
- **Lack of physical activity.** Lack of activity can worsen other risk factors for CAD.
- **Age.** As people get older, the risk for CAD increases. Genetic or lifestyle factors cause plaque to build in the arteries as people age. By the time people are middle-aged or older, enough plaque has built up to cause signs or symptoms.
  - In men, the risk for CAD increases after age 45.
  - In women, the risk for CAD increases after age 55.
- **Family history of early heart disease.** The risk increases if a person’s father or a brother was diagnosed with CAD before 55 years of age, or if a mother or a sister was diagnosed with CAD before 65 years of age.

Scientists continue to study other possible risk factors for CAD.

- High levels of a protein called C-reactive protein (CRP) in the blood may raise the risk for CAD and heart attack. High levels of CRP are proof of inflammation in the body. Inflammation is the body’s response to injury or infection. Damage to the arteries’ inner walls seems to trigger inflammation and help plaque grow. Research is under way to find out whether reducing inflammation and lowering CRP levels also can reduce the risk of developing CAD and having a heart attack.
- High levels of fats called triglycerides in the blood also may raise the risk of CAD, particularly in women.

**Other factors**
Other factors also may contribute to CAD. These include:

- **Sleep apnea.** Sleep apnea is a disorder in which breathing stops or gets very shallow while a person sleeps. Untreated sleep apnea can raise the chances of having high blood pressure, diabetes and even a heart attack or stroke.
- **Stress.** Research shows that the most commonly reported “trigger” for a heart attack is an emotionally upsetting event – particularly one involving anger.

- **Alcohol.** Heavy drinking can damage the heart muscle and worsen other risk factors for heart disease. Men should have no more than two drinks containing alcohol a day. Women should have no more than one drink containing alcohol a day.
- **Other signs include nausea (feeling sick to the stomach), vomiting, lightheadedness or fainting, or breaking out in a cold sweat.**

### What causes heart attacks?
Most heart attacks occur as a result of coronary artery disease. CAD is the buildup over time of a material called plaque on the inner walls of the coronary arteries. Eventually, a section of plaque can break open, causing a blood clot to form at the site. A heart attack occurs if the clot becomes large enough to cut off most or all of the blood flow through the artery. The blocked blood flow prevents oxygen-rich blood from reaching the part of the heart muscle fed by the artery. The lack of oxygen damages the heart muscle. If the blockage isn’t treated quickly, the damaged heart muscle begins to die.

Heart attacks also can occur due to problems with the very small, microscopic blood vessels of the heart. This condition is called microvascular disease. It’s believed to be more common in women than in men.

Another less common cause of heart attack is a severe spasm (tightening) of a coronary artery that cuts off blood flow through the artery. These spasms can occur in coronary arteries that don’t have CAD. It’s not always clear what causes a coronary artery spasm, but sometimes it can be related to:

- Taking certain drugs, such as cocaine.
- Emotional stress or pain.
- Exposure to extreme cold.
- Cigarette smoking.

### Risk factors for acute myocardial infarction

- **Coronary artery disease.**
- **Smoking.**
- **High blood pressure.**
- **High blood cholesterol.**
- **Being overweight and obese.**
- **Physical inactivity.**
- **Diabetes (high blood sugar).**
- **Age.** Risk increases for men older than 45 years and for women older than 55 years (or after menopause).
- **Family history of early CAD.** The risk increases if a person’s father or a brother was diagnosed with CAD before 55 years of age, or mother or a sister was diagnosed before 65 years of age.

Certain CAD risk factors tend to occur together. When they do, it’s called metabolic syndrome. In general, a person with metabolic syndrome is twice as likely to develop heart disease and five times as likely to develop diabetes as someone without metabolic syndrome.

### Angina
Angina chest pain or discomfort occurs when an area of the heart muscle doesn’t get enough oxygen-rich blood. Angina may feel like pressure or squeezing in the chest and also may occur in the shoulders, arms, neck or back. Angina pain may even feel like indigestion.
Angina isn’t a disease; it’s a symptom of an underlying heart problem, usually coronary artery disease. It occurs when plaque buildup interrupts blood flow to the heart muscle, causing the chest pain.

Angina also can be a symptom of coronary microvascular disease (MVD). This is heart disease that affects the heart’s smallest coronary arteries. Unlike traditional CAD, coronary MVD doesn’t always create blockages in the arteries. Studies have shown that coronary MVD is more likely to affect women than men.

Coronary MVD also is called cardiac syndrome X and nonobstructive CHD.

Types of angina
The types of angina are stable, unstable, variant (Prinzmetal’s) and microvascular. Knowing how the types differ is important. This is because they have different symptoms and require different treatments.

- **Stable angina**
  - Stable angina is the most common type of angina. It occurs if the heart is working harder than usual. Stable angina has a regular pattern.
  - A person who knows he has stable angina can learn to recognize the pattern and predict when the pain will occur. The pain usually goes away a few minutes after the person rests or takes angina medicine.
  - Stable angina isn’t a heart attack, but it suggests that a heart attack is more likely in the future.

- **Unstable angina**
  - Unstable angina doesn’t follow a pattern. It can occur with or without physical exertion, and it may not be relieved by rest or medicine.
  - Unstable angina is very dangerous and requires emergency treatment. This type of angina is a sign that a heart attack may happen soon.

- **Variant (Prinzmetal’s) angina**
  - Variant angina is rare. It usually occurs while a person is at rest, and the pain can be severe. Variant angina usually happens between midnight and early morning.
  - Medicine can relieve this type of angina.

- **Microvascular angina**
  - Microvascular angina can be more severe and last longer than other types of angina. Medicine may not relieve it. This type of angina may be a symptom of coronary MVD.

What causes angina?
The underlying cause of angina is usually coronary heart disease. However, a number of things can trigger angina pain, depending on the type of angina the patient has:

- **Stable angina**
  - Physical exertion is the most common trigger of stable angina. Severely narrowed arteries may allow enough blood to reach the heart when the demand for oxygen is low, such as when a person is sitting. However, with physical exertion – like walking up a hill or climbing stairs – the heart works harder and needs more oxygen.
  - Other triggers of stable angina include:
    - Emotional stress.
    - Exposure to very hot or cold temperatures.
    - Heavy meals.
    - Smoking.

- **Unstable angina**
  - Blood clots that partly or totally block an artery cause unstable angina. If plaque in an artery ruptures, blood clots may form. This creates a larger blockage. A clot may grow large enough to completely block the artery and cause a heart attack.
  - Blood clots may form, partly dissolve and later form again. Angina can occur each time a clot blocks an artery.

- **Variant angina**
  - A spasm in a coronary artery causes variant angina. The spasm causes the walls of the artery to tighten and narrow.
  - Blood flow to the heart slows or stops. Variant angina may occur in people who have CAD and in those who don’t.
  - Other factors that can cause the coronary arteries to spasm are:
    - Exposure to cold.
    - Emotional stress.
    - Medicines that tighten or narrow blood vessels.
    - Smoking.
    - Cocaine use.

- **Microvascular angina**
  - This type of angina may be a symptom of coronary microvascular disease (MVD). Coronary MVD is heart disease that affects the heart’s smallest coronary arteries.
  - Reduced blood flow in the small coronary arteries may cause microvascular angina.
  - Reduced blood flow may be the result of plaque in the arteries, spasms in the arteries, or damaged or diseased artery walls.

Congestive heart failure
Also known as “heart” or “pump failure,” congestive heart failure is a syndrome that occurs when the heart is unable to adequately pump to meet the body’s metabolic needs. Heart failure develops over time as the heart’s pumping action grows weaker. The condition can affect the right side of the heart only, or it can affect both sides of the heart. Most cases involve both sides of the heart.

The leading causes of heart failure are diseases that damage the heart. Over time, the heart weakens. It isn’t able to fill with and/or pump blood as well as it should. As the heart weakens, certain proteins and other substances may be released into the blood. These substances have a toxic effect on the heart and blood flow, and they worsen heart failure.

Right-side heart failure occurs if the heart can’t pump enough blood to the lungs to pick up oxygen. Left-side heart failure occurs if the heart can’t pump enough oxygen-rich blood to the rest of the body. Right-side heart failure may cause fluid to build up in the feet, ankles, legs, liver, abdomen and the veins in the neck. Right- side and left-side heart failure also may cause shortness of breath and fatigue (tiredness).

Left-sided heart failure is broken down into two subcategories, systolic and diastolic heart failure.

**Systolic heart failure** results from the heart’s inability to contract forcefully during systole to eject an adequate amount of blood into circulation. In systolic heart failure, the following things occur [30]:
- Preload increases (degree of myocardial stretch at the end of diastole and just before contraction).
- Decreased contractility of the heart muscle that affects the stroke volume (SV) and cardiac output (CO). SV is the amount of blood ejected by the left ventricle during each systole. CO is the volume of blood in liters ejected by the heart each minute. The normal CO in adults varies from four to seven liters/ per minute.
- Afterload increases (pressure/resistance that the ventricles must overcome to eject blood through the semilunar valves).
- All of these inadequate functions lead to an increased peripheral resistance (hypertension). The ejection fraction (EF) is the percentage of blood ejected from the heart during systole; normal is 50 to 70 percent.

**Diastolic heart failure** results when the left ventricle is unable to relax adequately during diastole (rest). Over time, the ventricle will stiffen due to the inability to relax completely, leading to insufficient blood filling, resulting in a decreased cardiac output (CO). The ejection fraction may be within the normal range. Diastolic heart failure occurs in 20 to 40 percent of all heart failure cases, especially in older adults and women after an MI.

- Right-sided heart failure occurs over time due to left ventricular failure, with myocardial infarction in the right ventricle or pulmonary hypertension occurring. In right-sided heart failure, the right ventricle is unable to empty completely, leading to increased volume and pressure in the systemic veins.

**Common causes of heart failure**
The most common causes of heart failure are coronary artery disease, high blood pressure and diabetes. Treating these problems can prevent or improve heart failure.

- **Coronary heart disease**
  - Plaque caused by CAD narrows the arteries and reduces blood flow to the heart muscle. It also makes it more likely that blood clots will form in the arteries. Blood clots can partially or completely block blood flow.
  - CAD can lead to chest pain or discomfort called angina, a heart attack, heart
damage or even death.

**High blood pressure**
- Blood pressure is the force of blood pushing against the walls of the arteries. If this pressure rises and stays high over time, it can weaken the heart and lead to plaque buildup.
- Blood pressure is considered high if it stays at or above 140/90 mm/Hg over time. (The mm/Hg is millimeters of mercury – the units used to measure blood pressure.) If you have diabetes or chronic kidney disease, high blood pressure is defined as 130/80 mm/Hg or higher.

**Diabetes**
- Diabetes is a disease in which the body’s blood glucose, or blood sugar, level is too high. Normally, the body breaks down food into glucose and then carries it to cells throughout the body. The cells use a hormone called insulin to turn the glucose into energy.
- In diabetes, the body doesn’t make enough insulin or doesn’t use its insulin properly. Over time, high blood sugar levels can damage and weaken the heart muscle and the blood vessels around the heart, leading to heart failure.

**Other causes**
- **Cardiomyopathy**, or heart muscle disease. Cardiomyopathy may be present at birth or due to injury or infection.
- **Heart valve disease**. Problems with the heart valves may be present at birth or due to infection, heart attack or damage from heart disease.
- **Arrhythmias**, or irregular heartbeats. These heart problems may be present at birth or due to heart disease or heart defects.
- **Congenital heart defects**. These heart problems are present at birth.

**Other factors**
- Treatments for cancer, such as radiation and chemotherapy.
- Thyroid disorders (having either too much or too little thyroid hormone in the body).
- Alcohol abuse or cocaine and other illegal drug use.
- HIV/AIDS.
- Too much vitamin E.

Heart damage from obstructive sleep apnea may cause heart failure to worsen. Sleep apnea is a common disorder in which a person has one or more pauses in breathing or shallow breaths while sleeping. This can deprive the heart of oxygen and increase its workload. Treating this sleep problem may improve heart failure.

**Hypertension**

Often called high blood pressure (HBP), hypertension is a serious condition that can lead to coronary heart disease, heart failure, stroke, kidney failure and other health problems. About one in three adults in the United States has high blood pressure, although the condition itself usually has no symptoms. A person can have hypertension for years without knowing it. During this time, though, it can damage the heart, blood vessels, kidneys and other parts of the body.

When HBP has no known cause, it may be called essential hypertension, primary hypertension or idiopathic hypertension. When another condition causes HBP, it’s sometimes called secondary hypertension. In some cases of HBP, only the systolic blood pressure number is high. This condition is called isolated systolic hypertension (ISH). Many older adults have this condition. ISH can cause as much harm as HBP in which both numbers are too high.

Over time, uncontrolled or prolonged elevation of the blood pressure (BP) can lead to a variety of changes in the myocardium (middle layer composed of striated muscle fibers), coronary vasculature and conduction system of the heart. The most significant changes can lead to the development of left ventricular hypertrophy (LVH), coronary artery disease, various conduction system diseases and systolic and diastolic dysfunction of the myocardium, which manifest clinically as angina or myocardial infarction, cardiac arrhythmias (especially atrial fibrillation, premature ventricular contractions and ventricular tachycardia), and congestive heart failure.

Hypertension is an established risk factor for the development of coronary artery disease, almost doubling the risk. It also increases the risk of sudden cardiac death.
- Fifteen to 20 percent of people will develop left ventricular hypertrophy, especially if the individual is obese.
- Left ventricular hypertrophy plays a significant role in cardiovascular disease. It occurs secondary to increased pressure demands on the left ventricle to become enlarged and thickened. As the left ventricle enlarges and becomes thick, it is unable to effectively pump out an adequate amount of oxygenated blood into the body. Therefore, blood backs up into the left atrium and then into the lungs, causing pulmonary congestion, dyspnea and activity intolerance.

**What causes high blood pressure?**
- Blood pressure tends to rise with age, unless steps are taken to prevent or control it.
- Certain medical problems, such as chronic kidney disease, thyroid disease and sleep apnea, may cause blood pressure to rise.
- Certain medicines, such as asthma medicines (for example, corticosteroids) and cold-relief products, also may raise blood pressure.
- In some women, blood pressure can go up if they use birth control pills, become pregnant or take hormone replacement therapy.
- Women taking birth control pills usually have a small rise in both systolic and diastolic blood pressures. Women who have high blood pressure and want to use birth control pills should discuss it with their doctor.
- Taking hormones to reduce the symptoms of menopause can cause a small rise in systolic blood pressure. Women who already have HBP and want to start using hormones should discuss the risks and benefits with their doctor.
- Children younger than 10 years who have HBP often have another condition that’s causing it (such as kidney disease). Treating the underlying condition may resolve the HBP.
- The older a child is when HBP is diagnosed, the more likely he or she is to have essential hypertension. This means that doctors don’t know what’s causing the HBP.

**Risk factors for hypertension**

**Older age**
- Blood pressure tends to rise with age. Males older than 45 and females older than 55 have a higher risk for HBP. Over half of all Americans aged 60 and older have HBP.
- Isolated systolic hypertension (ISH) is the most common form of HBP in older adults. ISH occurs when only systolic blood pressure (the top number) is high. About two of three people over age 60 who have HBP have ISH.

**Race/ethnicity**
- HBP occurs more often in African American adults than in Caucasian or Hispanic American adults. In relation to these groups, African Americans:
  - Tend to get HBP earlier in life.
  - Often have more severe HBP.
  - Are more likely to be aware that they have HBP and to get treatment.
  - Are less likely than Caucasians and about as likely as Hispanic Americans to achieve target control levels with HBP treatment.
  - Have higher rates than Caucasians of premature death from HBP-related complications, such as coronary heart disease, stroke and kidney failure.
- HBP risks vary among different groups of Hispanic American adults. For instance, Puerto Rican American adults have higher rates of HBP-related death than all other Hispanic groups and Caucasians. But Cuban Americans have lower rates than Caucasians.

**Being overweight or obese**
- People who are overweight or obese are more likely to develop prehypertension.
or HBP. Overweight is having extra body weight from muscle, bone, fat and/or water. Obesity is having a high amount of extra body fat.

- **Gender**
  - Fewer adult women than men have HBP. But younger women (aged 18–59) are more likely than men to be aware of and get treatment for HBP.
  - Women aged 60 and older are as likely as men to be aware of and treated for HBP. However, among treated women aged 60 and older, blood pressure control is lower than it is in men in the same age group.

- **Unhealthy lifestyle habits**
  - Eating too much sodium (salt).
  - Drinking too much alcohol.
  - Not getting enough potassium in the diet.
  - Not doing enough physical activity.
  - Smoking.

- **Other factors**
  - A family history of HBP raises the risk for the condition. Long-lasting stress also can put a person at risk for HBP.
  - Prehypertension increases the likelihood of developing high blood pressure. Prehypertension is a normal blood pressure in the 120–139/80–89 mm/Hg range.
  - Risk factors for children and teens:
    - Being overweight, which is on the rise in youth younger than 18 years. As a result, prehypertension and HBP also are becoming more common in this age group.
    - African American and Mexican American youth are more likely to have HBP and prehypertension than Caucasian youth. Boys are at higher risk for HBP than girls.

- **Arrhythmias**
  - An arrhythmia is a problem with the rate or rhythm of the heartbeat. During an arrhythmia, the heart can beat too fast, too slow, or with an irregular rhythm.
  - A heartbeat that is too fast is called tachycardia. A heartbeat that is too slow is called bradycardia. Most arrhythmias are harmless, but some can be serious or even life threatening. When the heart rate is too fast, too slow or irregular, the heart may not be able to pump enough blood to the body. Lack of blood flow can damage the brain, heart and other organs.

- **The heart's electrical system**
  - To understand arrhythmias, it helps to understand the heart’s internal electrical system. The heart’s electrical system controls the rate and rhythm of the heartbeat. With each heartbeat, an electrical signal spreads from the top of the heart to the bottom. As the signal travels, it causes the heart to contract and pump blood. The process repeats with each new heartbeat.
  - Each electrical signal begins in a group of cells called the sinus node or sinoatrial (SA) node. The SA node is located in the right atrium. In a healthy adult heart at rest, the SA node fires off an electrical signal to begin a new heartbeat 60 to 100 times a minute. From the SA node, the electrical signal travels through special pathways in the right and left atria. This causes the atria to contract and pump blood into the heart’s two lower chambers, the ventricles.
  - The electrical signal then moves down to a group of cells called the atrioventricular (AV) node, located between the atria and the ventricles. Here, the signal slows down just a little, allowing the ventricles time to finish filling with blood. The electrical signal then leaves the AV node and travels along a pathway called the bundle of His. This pathway divides into a right bundle branch and a left bundle branch. The signal goes down these branches to the ventricles, causing them to contract and pump blood out to the lungs and the rest of the body.
  - The ventricles then relax, and the heartbeat process starts all over again in the SA node.

- **Types of arrhythmia**
  - The four main types of arrhythmia are premature (extra) beats, supraventricular arrhythmias, ventricular arrhythmias and bradycardia.
  - **Premature (extra) beats**
    - Premature beats are the most common type of arrhythmia. They’re harmless most of the time and often don’t cause any symptoms. When symptoms do occur, they usually feel like fluttering in the chest or a feeling of a skipped beat. Most of the time, premature beats need no treatment, especially in healthy people.
    - Premature beats that occur in the atria are called premature atrial contractions, or PACs. Premature beats that occur in the ventricles are called premature ventricular contractions, or PVCs.
    - In most cases, premature beats occur naturally, not due to any heart disease. But certain heart diseases can cause premature beats. They also can happen because of stress, too much exercise, or too much caffeine or nicotine.
  - **Supraventricular arrhythmias**
    - Supraventricular arrhythmias are tachycardias (fast heart rates) that start in the atria or the atrioventricular (AV) node. The AV node is a group of cells located between the atria and the ventricles.
    - Types of supraventricular arrhythmias include atrial fibrillation (AF), atrial flutter, paroxysmal supraventricular tachycardia (PSVT) and Wolff-Parkinson-White (WPW) syndrome.
    - **Atrial fibrillation**
      - AF is the most common type of serious arrhythmia. It’s a very fast and irregular contraction of the atria. There are three types:
        - Paroxysmal atrial fibrillation, in which the abnormal electrical signals and rapid heart rate begin suddenly and then stop on their own. Symptoms can be mild or severe and last for seconds, minutes, hours or days.
        - Persistent atrial fibrillation, a condition in which the abnormal heart rhythm continues until it’s stopped with treatment.
        - Permanent atrial fibrillation, a condition in which a normal heart rhythm can’t be restored with the usual treatments. Both paroxysmal and persistent AF may become more frequent and over time, resulting in permanent AF.
    - In AF, the heart’s electrical signal doesn’t begin in the SA node. Instead, the signal begins in another part of the atria or in the nearby pulmonary veins and is conducted abnormally. When this happens, the electrical signal doesn’t travel through the normal pathways in the atria. Instead, it spreads throughout the atria in a fast and disorganized manner. This causes the walls of the atria to quiver very fast (fibrillate) instead of beating normally. As a result, the atria aren’t able to pump blood into the ventricles the way they should.
    - In AF, electrical signals can travel through the atria at a rate of more than 300 per minute. Some of these abnormal electrical signals can travel to the ventricles, causing them to beat too fast and with an irregular rhythm. AF usually isn’t life-threatening, but it can be dangerous when it causes the ventricles to beat very fast.
    - The two most serious complications of chronic (long-term) AF are stroke and heart failure. Stroke can happen if a blood clot travels to an artery in the brain, blocking off blood flow.
    - In AF, blood clots can form because some of the blood “pools” in the fibrillating atria instead of flowing into the ventricles. If a piece of a blood clot in the left atrium breaks off, it can travel to the brain, causing a stroke. People who have AF often are treated with blood-
Ventricular arrhythmias
- These arrhythmias start in the ventricles. They can be very dangerous and usually need medical attention right away. Ventricular arrhythmias include ventricular tachycardia and ventricular fibrillation (v-fib). Coronary heart disease, heart attack, weakened heart muscle and other problems can cause ventricular arrhythmias.
  - Ventricular tachycardia
    - Ventricular tachycardia is a fast, regular beating of the ventricles that may last for only a few seconds or for much longer. A few beats of ventricular tachycardia often don’t cause problems. However, episodes that last for more than a few seconds can be dangerous. Ventricular tachycardia can turn into other, more dangerous arrhythmias, such as v-fib.
  - Ventricular fibrillation
    - V-fib occurs when disorganized electrical signals make the ventricles quiver instead of pump normally. Without the ventricles pumping blood out to the body, a person will lose consciousness within seconds and die within minutes if not treated. To prevent death, the condition must be treated right away with an electric shock to the heart called defibrillation. V-fib may happen during or after a heart attack or in someone whose heart is already weak because of another condition. Health experts think that most of the sudden cardiac deaths that occur every year (about 335,000) are due to v-fib.
    - Torsades de pointes (torsades) is a type of v-fib that causes a unique pattern on an EKG. Certain medicines or imbalanced amounts of potassium, calcium or magnesium in the bloodstream can cause this condition.
    - People who have long QT syndrome are at higher risk for torsades. People who have this condition need to be careful about taking certain antibiotics, heart medicines and over-the-counter medicines.

Bradyarrhythmias
- Bradyarrhythmias are arrhythmias in which the heart rate is slower than normal. If the heart rate is too slow, not enough blood reaches the brain, which can cause loss of consciousness. In adults, a heart rate slower than 60 beats per minute is considered a bradyarrhythmia. Some people normally have slow heart rates, especially people who are very physically fit. For them, a heartbeat slower than 60 beats per minute isn’t dangerous and doesn’t cause symptoms. But in other people, bradyarrhythmia can be due to a serious disease or other condition.
  - Bradyarrhythmias can be caused by:
    - Conditions that harm or change the heart’s electrical activity, such as an underactive thyroid gland or aging.
    - An imbalance of chemicals or other substances, such as potassium, in the blood.
    - Some medicines, such as beta blockers.
  - Bradyarrhythmias also can happen as a result of severe bundle branch block. Bundle branch block is a condition in which an electrical signal traveling down either or both of the bundle branches is delayed or blocked. When this happens, the ventricles don’t contract at exactly the same time, as they should. As a result, the heart has to work harder to pump blood to the body. The cause of bundle branch block often is an existing heart condition.

Arrhythmias in children
- A child’s heart rate normally decreases as he or she gets older. A newborn’s heart beats between 95 to 160 times a minute. A 1-year-old’s heart beats between 90 to 150 times a minute, and a 6- to 8-year-old’s heart beats between 60 to 110 times a minute.
- A baby or child’s heart can beat faster or slower than normal for many reasons. Like adults, when children are active, their hearts will beat faster. When they’re sleeping, their hearts will beat slower. Their heart rates can speed up and slow down as they breathe in and out. All of these changes are normal.
- Some children are born with heart defects that cause arrhythmias. In other children, arrhythmias can develop later in childhood. Doctors use the same tests to diagnose arrhythmias in children and adults.
- Treatments for children who have arrhythmias include medicines, defibrillation (electric shock), surgically implanted devices that control the heartbeat and other procedures that fix abnormal electrical signals in the heart.

What causes an arrhythmia?
An arrhythmia can occur if the electrical signals that control the heartbeat are delayed or blocked. This can happen if the special nerve cells that produce electrical signals don’t work properly, or if electrical signals don’t travel normally through the heart. An arrhythmia also can occur if another part of the heart starts to produce electrical signals. This adds to the signals from the special nerve cells and disrupts the normal heartbeat.

Smoking, heavy alcohol consumption, use of certain drugs (such as cocaine or amphetamines), use of certain prescription or over-the-counter medicines, and other conditions can lead to arrhythmias.
medicines, or too much caffeine or nicotine can lead to arrhythmias in some people. Strong emotional stress or anger can make the heart work harder, raise blood pressure and release stress hormones. In some people, these reactions can lead to arrhythmias.

A heart attack or an underlying condition that damages the heart’s electrical system also can cause arrhythmias. Examples of such conditions include high blood pressure, coronary heart disease, heart failure, overactive or underactive thyroid gland, pericarditis and rheumatic heart disease.

In some arrhythmias, such as Wolf-Parkinson-White syndrome, the underlying heart defect that causes the arrhythmia is congenital. Sometimes the cause of an arrhythmia can’t be found.

Who is at risk for an arrhythmia?

Millions of Americans have arrhythmias. They’re very common in older adults. About 2.2 million Americans have atrial fibrillation. Most serious arrhythmias affect people older than 60. This is because older adults are more likely to have heart disease and other health problems that can lead to arrhythmias. Older adults also tend to be more sensitive to the side effects of medicines, some of which can cause arrhythmias. Some medicines used to treat arrhythmias can even cause arrhythmias as a side effect.

Some types of arrhythmia happen more often in children and young adults. Paroxysmal supraventricular tachycardias (PSVTs), including Wolf-Parkinson-White syndrome, are more common in young people. PSVT is a fast heart rate that begins and ends suddenly.

- **Major risk factors**: Arrhythmias are more common in people who have diseases or conditions that weaken the heart, such as:
  - Heart attack.
  - Heart failure or cardiomyopathy, which weakens the heart and changes the way electrical signals move around the heart.
  - Heart tissue that’s too thick or stiff or that hasn’t formed normally.
  - Leaking or narrowed heart valves, which make the heart work too hard and can lead to heart failure.
  - Congenital heart defects (problems that are present at birth) that affect the heart’s structure or function.

- **Other conditions** also can increase the risk for arrhythmias, such as:
  - High blood pressure.
  - Infections that damage the heart muscle or the sac around the heart.
  - Diabetes, which increases the risk of high blood pressure and coronary heart disease.
  - Sleep apnea (when breathing becomes shallow or stops during sleep), which can stress the heart because the heart doesn’t get enough oxygen.
  - An overactive or underactive thyroid gland (too much or too little thyroid hormone in the body).

- Heart surgery, certain drugs (such as cocaine or amphetamines), or an imbalance of chemicals or other substances (such as potassium) in the bloodstream.

**Peripheral arterial disease**

Peripheral arterial disease (PAD) occurs when plaque builds up in the arteries that carry blood to the head, organs and limbs, a condition known as atherosclerosis. Over time, plaque can harden and narrow the arteries, which limits the flow of oxygen-rich blood to the organs and other parts of the body. PAD usually affects the legs, but also can affect the arteries that carry blood from the heart to the head, arms, kidneys and stomach.

**Overview**

Blocked blood flow to the legs can cause pain and numbness. It also can raise the risk of getting an infection in the affected limbs. It may be hard for the body to fight the infection.

If severe enough, blocked blood flow can cause tissue death (gangrene). In very serious cases, this can lead to leg amputation.

A person who has leg pain when walking or climbing stairs should talk to a doctor. Sometimes older people think that leg pain is just a symptom of aging. However, the cause for the pain could be PAD, and the doctor may wish to test for it.

Smoking is the main risk factor for PAD. The risk for PAD increases four times for a person who smokes or has a history of smoking. Other factors, such as age and having certain diseases or conditions, also increase the risk.

The risk for coronary artery disease, heart attack, stroke and transient ischemic attack ("mini-stroke") is six to seven times greater than the risk for people who don’t have PAD. A person with heart disease has a one-in-three chance of having blocked leg arteries.

Although PAD is serious, the underlying atherosclerosis can be treated. PAD treatment may slow or stop disease progress and reduce the risk of complications. Treatments include lifestyle changes, medicines, and surgery or procedures. Researchers continue to explore new therapies for PAD.

**What causes peripheral arterial disease?**

The most common cause of peripheral arterial disease is atherosclerosis. The exact cause of atherosclerosis isn’t known. The disease may start when certain factors damage the inner layers of the arteries. These factors include:

- Smoking.
- High amounts of certain fats and cholesterol in the blood.
- High blood pressure.
- High amounts of sugar in the blood caused by insulin resistance or diabetes.

When damage occurs, the body starts a healing process. The healing may cause plaque to build up where the arteries are damaged. Over time, the plaque may crack. Blood cell fragments called platelets stick to the injured lining of the artery and may clump together to form blood clots. The buildup of plaque or blood clots can severely narrow or block the arteries and limit the flow of oxygen-rich blood to the body.

**Who is at risk for peripheral arterial disease?**

Peripheral arterial disease (PAD) affects 8 to 12 million people in the United States. African Americans are more than twice as likely as Caucasians to have PAD. The major risk factors for PAD are smoking, age and having certain diseases or conditions:

- **Smoking**
  - Smoking is more closely related to getting PAD than any other risk factor. On average, smokers who develop PAD have symptoms 10 years earlier than nonsmokers who develop PAD.
  - Quitting smoking slows the progress of PAD. Smoking even one or two cigarettes a day can interfere with PAD treatments. Smokers and people who have diabetes are at highest risk for PAD complications, including gangrene (tissue death) in the leg from decreased blood flow.

- **Age**
  - The risk for PAD increases with age because genetic or lifestyle factors can cause plaque to build in the arteries as a person ages. About 5 percent of U.S. adults who are older than 50 have PAD. Among adults aged 65 and older, 12 to 20 percent may have PAD. Older age combined with other risk factors, such as smoking or diabetes, also puts a person at higher risk.

- **Diseases and conditions**. A number of diseases and conditions can raise the risk for PAD. These include:
  - Diabetes. One in three people who has diabetes and is older than 50 is likely to have PAD.
  - High blood pressure or a family history of it.
  - High blood cholesterol or a family history of it.
  - Heart disease or a family history of it.
  - Stroke or a family history of it.

Assessing overall risk factors for the cardiac patient

It is imperative that nurses obtain a thorough history of their patients to assess risk factors and symptoms suggesting cardiovascular disease. Because most cardiovascular disease is caused by atherosclerosis, by the time it is discovered, it may be too late. Therefore, nurses need to understand the potential risk factors when assessing a patient for cardiovascular disease:

- **Non-modifiable risks** are risks that an individual does not control or have the ability to change:
  - Age. As people age, the risk of developing cardiovascular disease, especially coronary artery disease and vascular disease, increases. More than 83 percent of people who die of coronary heart disease are 65 or older. In 2005, nearly 151,000 Americans under the age of 65 died because of cardiovascular
disease. However, all individuals over the age of 40 are at a higher risk of developing coronary artery disease.

Gender. Although heart disease is sometimes thought of as a “man’s disease,” it is the leading cause of death for both women and men in the U.S., and women account for 51 percent of the total heart disease deaths. Heart disease is often perceived as an “older woman’s disease,” linked to the loss of estrogen after menopause and because it is the leading cause of death among women aged 65 and older. However, heart disease is the third leading cause of death among women aged 25-44 years and the second leading cause of death among women aged 45-64. Unfortunately, women who suffer an acute myocardial infarction (MI) typically tend to die more frequently than men.

Ethnicity. According to the CDC in 2009, cardiovascular disease death rates per 100,000 population for the five largest U.S. racial/ethnic groups are as follows: blacks, 300; whites, 228; Hispanics, 173; American Indian/Alaskan natives, 160; and Asian and Pacific Islanders, 128.

- Blacks suffer from hypertension more than Caucasians and have a higher risk of developing cardiovascular disease, especially coronary artery disease.
- In 2002, age-adjusted death rates for heart disease were higher among black women (169.7 per 100,000) than among white women (131.2 per 100,000).
- White women with abdominal obesity (greater waist circumference than hip circumference) are more likely to develop cardiovascular disease than white women with distributed fat in the buttocks, hips and thighs (greater hip circumference than waist circumference).
- Heart disease risk is also higher among Mexican Americans, American Indians, native Hawaiians and some Asian Americans, all linked to higher rates of coinciding obesity and diabetes.
- According to the CDC (2008), heart disease is the leading cause of death and stroke is the sixth among American Indians and Alaska natives. The heart disease death rate was 20 percent greater and the stroke death rate 14 percent greater among American Indians and Alaska natives (1996–1998) than among all U.S. races (1997) after adjusting for misreporting of American Indian and Alaska native races on state death certificates. American Indians and Alaska natives die from heart diseases at younger ages than other racial and ethnic groups in the U.S. Thirty-six percent of those who die of heart disease die before age 65. Diabetes is an extremely important risk factor for cardiovascular disease among American Indians.

Genetics. Any family history for coronary artery disease in a first-degree relative (parent, sibling or child) is the major risk factor for developing cardiovascular disease. It is a higher risk than hypertension, obesity, diabetes or sudden cardiac death. In addition, the younger the age of onset in a first-degree relative, the greater the risk for developing coronary artery disease.
<table>
<thead>
<tr>
<th>Risk factor</th>
<th>How much it affects stroke risk</th>
<th>Why it affects stroke risk</th>
<th>What you can do</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hypertension</td>
<td>Hypertension causes a two-to-fourfold increase in the risk of stroke before age 80. After age 80, the impact of hypertension declines and other risk factors become more important.</td>
<td>Hypertension promotes atherosclerosis and causes mechanical damage to the walls of blood vessels.</td>
<td>Blood pressure medications, such as thiazide diuretics and angiotensin-converting enzyme (ACE) inhibitors, can reduce the risk of stroke by 30 to 40 percent. Early treatment is essential. Among older people with normal blood pressure, prior mid-life hypertension increases stroke risk up to 92 percent. Guidelines from the Centers for Disease Control and Prevention recommend a target blood pressure of less than 140/90 mm/Hg.</td>
</tr>
<tr>
<td>Cigarette smoking</td>
<td>Smoking causes about a two-fold increase in the risk of ischemic stroke and up to a four-fold increase in the risk of hemorrhagic stroke.</td>
<td>Smoking promotes atherosclerosis and aneurysm formation, and stimulates blood clotting factors.</td>
<td>Stroke risk decreases significantly two years after quitting smoking and is at the level of nonsmokers by five years.</td>
</tr>
<tr>
<td>Diabetes</td>
<td>In terms of stroke and cardiovascular disease risk, having diabetes is the equivalent of aging 15 years.</td>
<td>In diabetes, glucose is not efficiently taken up by the body’s cells and accumulates in the blood instead, where it can damage the vascular system. Hypertension is common among diabetics and accounts for much of their increased stroke risk.</td>
<td>Blood pressure medications, dietary changes and weight loss can lower stroke risk. Controlling blood sugar appears to reduce the risk of recurrent stroke.</td>
</tr>
<tr>
<td>Physical inactivity and obesity</td>
<td>Waist-to-hip ratio equal to or above the median (mid-value for the population) increases the risk of ischemic stroke three-fold.</td>
<td>Obesity is associated with hypertension, diabetes and heart disease.</td>
<td>While no clinical studies have tested the effects of exercise or weight loss on stroke risk, both tend to reduce hypertension and boost cardiovascular health.</td>
</tr>
<tr>
<td>Atrial fibrillation (AF)</td>
<td>AF affects fewer than one percent of people under age 60, but is more prevalent in older people. It is responsible for one in four strokes after age 80, and is associated with high mortality and disability.</td>
<td>AF refers to irregular contraction of the atrium – the chamber where blood enters the heart. AF can lead to blood stagnation and increased clotting.</td>
<td>Warfarin, a blood-thinning medication, can reduce the risk of stroke in people with AF. People under age 60 with AF and no other stroke risk factors may benefit from aspirin. Importantly, pacemakers have no effect on the risk of stroke associated with AF.</td>
</tr>
<tr>
<td>Cholesterol imbalance</td>
<td>High-density lipoprotein (HDL) cholesterol is generally considered protective against ischemic stroke. Low-density lipoprotein (LDL) cholesterol, when present in excess, is considered harmful.</td>
<td>LDL and HDL are needed to carry cholesterol (a fatty substance) through the blood (made up mostly of water), and deliver it to cells. Because LDL delivers cholesterol to cells throughout the body, excess LDL can cause cholesterol to build up in blood vessels, leading to atherosclerosis. HDL sends cholesterol to the liver to be eliminated.</td>
<td>Clinical trials have shown that cholesterol-lowering drugs known as statins reduce the risk of stroke. However, some studies point to only a weak association between stroke and cholesterol, and there is speculation that statins reduce stroke risk by acting through some unknown mechanism.</td>
</tr>
</tbody>
</table>
Modifiable risks are personal habits and choices that an individual has the ability to modify or change.

- **Cigarette smoking** is a major risk factor for cardiovascular disease, especially coronary artery disease and peripheral arterial disease (PAD). Individuals who choose to smoke increase their risk of developing cardiovascular disease two to four times higher than that of a nonsmoker. Cigarette smoking is also a powerful independent risk factor for sudden cardiac death in patients with coronary heart disease; smokers have about twice the risk of nonsmokers. Cigarette smoking also acts with other risk factors to greatly increase the risk for coronary heart disease.
  - Other forms of smoking, such as cigars, pipes and secondhand smoke, also add to the risk of developing coronary artery disease and CVA (cerebrovascular accident), although the risk is not as high as with cigarette smoking.
  - Nurses should inquire about patients’ smoking history in terms of the pack per years, which is the number of packs per day multiplied by the number of years smoked.

- **Physical inactivity.** A sedentary, inactive lifestyle is a significant risk factor for the development of cardiovascular disease. Regular, moderate-to-vigorous physical activity helps prevent heart and blood vessel disease by controlling the blood pressure, blood lipids and clotting factors.

- **Being obese or overweight.** Obesity leads to diabetes, hypertension and high cholesterol (hypercholesterolemia/hyperlipidemia). According to the WHO in 2009, there are more than 1 billion overweight adults; at least 300 million of them are considered obese. In addition, the WHO has estimated there are 155 million overweight or obese children worldwide, and 22 million are overweight under the age of 5. In 2000, 22 percent of American preschool-age children were overweight, and 10 percent were considered obese. In essence, one in four preschool age children is overweight or obese. Obesity and overweight conditions are assessed by using body mass index (BMI), defined as the weight in kilograms divided by the square of the height in meters (kg/m²).
  - A BMI over 25 kg/m² is defined as overweight, and a BMI of over 30 kg/m² as obese. These markers provide common benchmarks for assessment, but the risks of disease in all populations can increase progressively from lower BMI levels.
  - Being overweight or obese leads to adverse metabolic effects in numerous ways, but especially on a person’s cardiovascular system, resulting in hypertension, hyperlipidemia and insulin resistance.

- **Psychological factors** such as stress may contribute to the risk of developing cardiovascular disease. Research has demonstrated that people who are highly competitive, concerned about meeting deadlines and often angry are at a higher risk of developing cardiovascular disease. In addition, researchers have noted a significant correlation between coronary heart disease and stress in a person’s life, their health behaviors and socioeconomic status. These factors may affect established risk factors. For example, people under stress may overeat, start smoking or smoke more than they otherwise would.
  - Nurses can assess this risk by asking the patient, “Have you ever experienced road rage?” or “How do you respond when you have to wait for an appointment?”
  - Alcohol use can raise the blood pressure, leading to heart failure and stroke. It may also affect the cardiovascular system by contributing to high triglycerides, obesity and irregular heartbeats.
  - The risk of heart disease in people who drink moderate amounts of alcohol (an average of one drink for women or two drinks for men per day) is lower than in nondrinkers. One drink is defined as 1 1/2 ounces of 80-proof spirits (such as bourbon, Scotch, vodka and gin), 1 ounce of 100-proof spirits, 4 ounces of wine or 12 ounces of beer.

**Other potential risk factors:** It is important to assess the patient for other chronic health problems that may exacerbate the cardiac symptoms and increase the risk of cardiovascular disease. The nurse should inquire about other co-morbidities by obtaining information regarding the onset, duration, frequency, location and associating symptoms.

- **Cerebrovascular accident (CVA or stroke)** is a rapid onset of neurological deficits due to a decreased flow of oxygenated blood to the brain. CVA coincides with cardiovascular disease because most of the modifiable risk factors for CVA include hypertension, cardiac disease, hyperlipidemia and smoking. Strokes will be discussed in detail in Part II of this course.

- **Diabetes mellitus** seriously increases an individual’s risk of developing cardiovascular disease. Even if the overall glucose (blood sugar) levels are under control, diabetes increases the risk of heart disease and stroke, but the risks are even greater if blood sugar is not well controlled. According to the American Diabetes Association (ADA), most of the cardiovascular complications related to diabetes have to do with the way the heart pumps blood through the body. Diabetes can change the chemical makeup of some of the substances found in the blood, and this can cause blood vessels to narrow or to clog up completely, which is known as atherosclerosis. Because of the compounding effects of diabetes and cardiovascular disease, it is estimated that about 65 percent of people living with diabetes will die from some form of heart or blood vessel disease.

- **Hyperlipidemia/dyslipidemia** is an elevation of lipids (fats) in the bloodstream measured by assessing the cholesterol, triglycerides, LDL, HDL cholesterol esters (compounds), phospholipids and triglycerides. A high lipid profile is typically known as a modifiable risk factor because it can be the result of choosing a lifestyle that consists of a high fatty diet and possibly drinking alcohol. However, hyperlipidemia may be due to genetic factors beyond an individual’s choice.
  - Over the past few decades, numerous research studies have demonstrated that elevated plasma cholesterol levels, especially low-density lipoprotein cholesterol (LDL-C), has an enormous impact on developing cardiovascular disease.

- **Hypertension (HTN)** increases the heart’s workload, causing the heart to thicken and become stiff. It increases the risk of coronary artery disease, cerebrovascular accident, heart attack/myocardial infarction, kidney failure and congestive heart failure. The risk of cardiovascular disease is exacerbated if hypertension coincides with obesity, smoking, high blood cholesterol levels or diabetes.

- **Metabolic syndrome (also known as insulin resistance)** is a syndrome that occurs prior to the development of diabetes. The majority of individuals living with metabolic syndrome are unaware of it because they are usually asymptomatic. However, people with a severe form of insulin resistance (metabolic X) may have a condition called acanthosis nigricans, in which they will notice dark patches of skin, usually on the back of the neck, elbows, knees, knuckles and the armpits, an early sign of pre-diabetes. According to the American Heart Association and the National Heart, Lung and Blood Institute, metabolic syndrome is diagnosed when a minimum of three of the following criteria are met:
  - **Elevated waist circumference** (abdominal obesity). Increased abdominal adiposity (waist greater than 40 inches in men and greater than 35 inches for women). The excess fat in the intra-abdominal area is a huge component of the metabolic syndrome. The majority of experts concur that the combination of obesity, obesity-related cytokines called adipokines, excess nutrients and inflammatory cytokines are the main contributors to beta cell death and insulin resistance in type 2 diabetes. Regardless of which event occurred, the mechanisms that are responsible for insulin receptor binding or post receptor can be reversed by weight loss.
  - **Elevated triglycerides** (TG) greater than 150 mg/dl.
  - **Reduced HDL cholesterol** (less than 40 mg/dl in men and less than 50 mg/dl for
women).
- **Fasting blood glucose** (hyperglycemia) greater than 100 mg/dL.
- **Increased blood pressures** (130/85 mm Hg or greater).

### Signs and symptoms of cardiovascular disease

Over time, many experienced health care professionals can speculate a potential diagnosis based upon their gut feeling and the symptoms of the patient. However, the best way to truly assess and diagnose the nature of the symptoms is by collecting a thorough history and performing an explicit assessment, because the severity of these symptoms varies. The symptoms may get more severe as the buildup of plaque continues to narrow the coronary arteries. In other instances, some people do not demonstrate any signs and symptoms of an inevitable myocardial infarction, congestive heart failure or an arrhythmia, which is called silent coronary artery disease.

- **Chest pain** is one of the most common complaints in adults and may indicate a cardiovascular disease [43]. Although cardiovascular disease is not always the primary cause of the chest pain, nurses and doctors need to be able to assess the symptomology and nature of the chest pain. Chest pain may be associated with cardiovascular problems, pulmonary, gastrointestinal (GI), musculoskeletal, neurologic, psychogenic or idiopathic causes [24]. Therefore, each of the most common cardiovascular diseases of chest pain will be explored and elaborated upon in detail to help differentiate the nature of the pain [43]:
  - **Angina pectoris** chest pain or discomfort occurs when the heart muscle is not getting enough blood [4]. The most common symptom of coronary artery disease is angina, although in some individuals the first sign of CAD is a myocardial infarction. The angina pain is paroxysmal pain in the substernal area that may radiate to the precordium, upper extremities, neck or jaw. Angina pain typically lasts 30 seconds to a few minutes, and patients describe it as dull, pressing, squeezing or aching pain. Angina pain is precipitated by exertion, emotional stress, sexual activity, exposure to cold and occasionally by eating. However, unstable angina may occur while at rest. Angina pain is alleviated by rest within 10 minutes and/or administration of a nitroglycerin (NTG) sublingual (S/L) tablet within two to four minutes. Typically, angina symptoms last less than 20 minutes (versus greater than 20 minutes with an MI) [13].
  - **Myocardial infarction** chest pain may be sudden and intense, similar to the “movie heart attack,” where no one doubts what is happening. However, the majority of myocardial infarctions start slowly, with mild pain or discomfort. Often people affected are not significantly sure what is going on. Although they may be aware of the symptoms of an MI, they typically will assume other irrational things are causing their symptoms. Other common symptoms associated with MI chest pain include any of the following:
    - Chest discomfort. Most heart attacks involve discomfort in the center of the chest that lasts more than a few minutes, or that goes away and comes back. It can feel like uncomfortable pressure, squeezing, fullness or pain.
    - Discomfort in other areas of the upper body. Symptoms can include pain or discomfort in one or both arms, the back, neck, jaw or stomach.
    - Shortness of breath with or without chest discomfort.
    - Other signs may include breaking out in a cold sweat, nausea or light-headedness.
  - **Dyspnea** (shortness of breath) is another common symptom of coronary artery disease and congestive heart failure. Shortness of breath occurs if coronary heart failure is caused by the heart’s inability to pump enough blood throughout the body. Since the heart has two ventricles, right and left, it is possible for one side (typically the left) to fail by itself for a short period. Initially, the left ventricle will fail because of its inability to pump an adequate amount of blood to the rest of the body, causing fluid to back up into the lungs. The most common symptoms of left-sided congestive heart failure include, but are not limited to:
    - **Shortness of breath and fatigue.** As the left ventricle enlarges because of its inability to pump efficiently and blood backs up into the left atrium, other symptoms will be noted caused by right-sided heart failure, including exacerbated fatigue, swelling in the ankles, feet, legs, abdomen and neck.
  - **Palpitations** are typically reported by patients who are at risk of developing cardiovascular disease. Palpitations are defined by the patient reporting the heart beating or skipping beats at times. It is important to distinguish the timing of the palpitations. For instance, if it occurs after exercise, it is probably a normal physiological response due to the increased release of catecholamines. However, more serious pathological causes may be contemplated if the patient verbalizes one of the following comments:
    - Heart “stopped momentarily” may imply an atrial or ventricular ectopic beat.
    - Significant skipping may imply a potential arrhythmia, such as atrial fibrillation.
    - The nurse should also inquire about other potential symptoms that coincide with the palpitations, such as anxiety, weakness, dizziness and light-headedness; fainting or nearly fainting; sweating; dyspnea; and chest pain.
  - **Peripheral arterial disease** causes signs or symptoms of it in half of those who have it, although others may have a number of them.
    - People who have PAD may have symptoms when walking or climbing stairs. These may include pain, numbness, aching or heaviness in the leg muscles. Symptoms also may include cramping in affected legs and in the buttocks, thighs, calves and feet. Symptoms may ease after resting. These symptoms are called intermittent claudication. During physical activity, muscles need increased blood flow. If blood vessels are narrowed or blocked, they won’t get enough blood. When resting, the muscles need less blood flow, so the pain goes away.
    - About 10 percent of people who have PAD have claudication. This symptom is more likely in people who also have atherosclerosis in other arteries.
    - Weak or absent pulses in the legs or feet.
    - Sores or wounds on the toes, feet or legs that heal slowly, poorly or not at all.
    - A pale or bluish color to the skin.
    - A lower temperature in one leg compared to the other leg.
    - Poor nail growth on the toes and fingers.
    - Erectile dysfunction, especially among men who have diabetes.

Health authorities recommend patients discuss the need for screening with their doctor if they are:
- Aged 70 or older.
- Aged 50 or older and have a history of smoking or diabetes.
- Younger than 50 and have diabetes and one or more risk factors for atherosclerosis.

### No symptoms?

The nurse should never assume the heart of a patient without symptoms is functioning at the optimal level because some may be asymptomatic initially. The majority of patients with coronary artery disease may be unaware of the existence for years due to the lack of symptoms, especially the elderly because the body compensates for the atherosclerosis by developing collateral circulation. Research has demonstrated that some patients with coronary artery disease may not
develop any symptoms until 75 percent of the coronary artery is narrowed (stenosed).

Once the coronary artery has developed enough stenosis, the primary initial symptom is angina, which should lead the health care professional to immediately speculate coronary artery disease and/or myocardial infarction. Always inquire about other symptoms, such as radiation of chest pain, especially the left arm and jaw; nausea; dyspnea; and light-headedness. Early screening and prevention measures are imperative for early detection.

**Screening for and diagnosing cardiovascular disease**

Ideally, nurses and physicians should screen patients at risk for cardiovascular disease to try to prevent the development and damage to the patient’s heart muscle and left ventricle. Because of the prevalence of cardiovascular disease globally in all cultures, ages, races and socioeconomic statuses, there are stringent guidelines set aside by professional organizations to screen for cardiovascular disease as follows:

- **Blood pressure** recommendations are guided by the Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation and Treatment of High Blood Pressure. The JNC VII recommends accurately assessing the baseline blood pressure (BP) by making sure that the patient is sitting for a minimum of five minutes in a chair (rather than on an exam table), with feet on the floor and arms supported at heart level, and to be sure to use an appropriate sized cuff. At least two measurements should be made on two different occasions before confirming a hypertensive diagnosis.

- Normal blood pressure is less than 120/80.
- Prehypertension is 120-139 (systolic) or 80-89 (diastolic).
- Stage 1 hypertension is 140-159 (systolic) or 90-99 (diastolic).
- Stage 2 hypertension is greater than 160 (systolic) or 100 (diastolic).
- For persons older than 50, systolic blood pressure greater than 140 mm/Hg is a much more important cardiovascular disease risk factor than diastolic blood pressure.
- The risk of cardiovascular disease beginning at 115/75 mm/Hg doubles with each increment of 20/10 mm/Hg; individuals who are normotensive at age 55 have a 90 percent lifetime risk for developing hypertension. Individuals with a systolic blood pressure of 120–139 mm/Hg or a diastolic blood pressure of 80–89 mm/Hg should be considered as prehypertensive and require health-promoting lifestyle modifications to prevent cardiovascular disease.

- **Cholesterol and lipid profile**: The United States Preventive Services Task Force (USPSTF) (2001) and the American Academy of Family Physicians (AAFP) (2006) recommends routine screening of a fasting lipoprotein panel for men aged 20 to 35 and females age 20 to 45 if the patient is at risk for coronary artery disease (hypertension, smoking, DM, family history of coronary artery disease before age 50 in male relatives and age 60 in female relatives and/or family history suggestive of familial hyperlipidemia). The USPSTF and AAFP strongly recommend routine screening for all men at age 35 and women at 45. The National Cholesterol Education Program (NCEP III) (2004) recommends that all men and women aged 20 and over should have a fasting lipoprotein panel completed, then repeat every five years if the results are normal. Desirable or optimal levels for persons with or without existing heart disease are as follows:
  - **Total cholesterol**: Less than 200 milligrams (mg) per deciliter (dL).
  - **Low density lipoprotein (LDL) cholesterol** (“bad” cholesterol): Less than 100 mg/dL.
  - **High density lipoprotein (HDL) cholesterol** (“good” cholesterol): 40 mg/dL or higher. However, the AHA has recommended that men maintain a level above 50 mg/dL and women 60 mg/dL to reduce their individual risk of cardiovascular disease. Higher levels of HDL (“good” cholesterol) provide extra protection against heart disease.
  - Triglycerides: Less than 150 mg/dL. Triglycerides are a form of fat. Many people have high triglyceride levels because of being overweight or obese, physical inactivity, cigarette smoking, excess alcohol consumption or a diet very high in carbohydrates (60 percent or more of calories). High triglycerides are a lifestyle-related risk factor; however, underlying diseases or genetic disorders can be the cause.
  - **Coronary artery disease**: The AAFP, AHA and USPSTF all recommend against routine screening for heart disease with routine electrocardiograms (ECG), exercise tolerance test (ETT) or electrobeam computed tomography (CT) for coronary calcium because they aren’t cost-effective. According to an editorial submitted by the AAFP, cardiac CT is expensive ($400 to $500 per scan) and thus far has not been proven to affect patient-oriented outcomes. At this time, research has not demonstrated that the cost is beneficial for asymptomatic patients.
  - However, the AHA does recommend screening for patients with an intermediate risk based upon the Framingham score. The Framingham risk score assesses an individual’s risk of developing cardiovascular disease over a 10-year time frame based upon their age, diabetes, smoking, JNC-7 blood pressure category, NCEP cholesterol levels and total LDL. Each category correlates to a percentage range that is added up at the end of the seven categories to determine an individual’s risk level.

- **Diabetes screening**: Since 2003, the USPSTF has recommended that adults with high blood pressure or high cholesterol be screened for type 2 diabetes (insulin-resistant diabetes) as part of an integrated approach to reduce their risk of cardiovascular disease, but concluded that further research is needed to determine whether widespread screening of the general population would improve health outcomes. The ADA guidelines are partially congruent with the previous recommendations that screening should begin with a FBG or OGTT every three years, beginning at the age of 45, especially if BMI is greater than 25. According to the ADA, diabetes is diagnosed if:
  - A fasting blood glucose greater than 126 mg/dl (no caloric intake for over eight hours) on two or more occasions (a normal fasting blood glucose is less than 100 mg/dl).
  - A random plasma glucose concentration greater than 200mg/dl taken at any time, regardless of the last meal.
  - A two-hour plasma oral glucose tolerance test (OGTT) greater than 200 mg/dl (two hours after ingesting 75 g of a glucose load). A normal fasting blood glucose level for non-diabetics is 70-110 mg/dl.

When cardiovascular disease is speculated, the physician or nurse practitioner will order specific tests to confirm a potential cardiac diagnosis. If the patient presents with potential life-threatening emergency cardiac symptoms, the patient will be immediately transferred via ambulance to the closest emergency room (ER). Other specific tests that may be ordered are:

- **B-type natriuretic peptide (BNP)**, which is a hormone produced and released by the ventricles secondary to volume and pressure overload, thus decreasing preload [16, 46]. BNP increases sodium and water excretion and signifies congestive heart failure. Therefore, it is a useful test to distinguish between congestive heart failure and other causes of shortness of breath. A normal level of BNP is less than 100 picograms per milliliter (pg/ml).

- **C-reactive protein (CRP)**, which is a marker of inflammatory process and may aid in the prediction of coronary events and signifies atherosclerosis. CRP is a protein produced by the liver and the smooth muscle cells within the atherosclerotic coronary arteries [24]. Although the CRP is a good predictor, it should not be relied on solely because it...
**Cardiac catheterization** is the most definitive, invasive diagnostic test to aide in the diagnosis of cardiovascular disease. During the procedure, a thin, flexible tube is passed through an artery in the groin or arm to reach the coronary arteries to assess for any blockage, coronary artery disease and myocardial and valvular function.

**Chest radiograph (CXR)** provides a picture of the organs and structures inside the chest to determine the size, silhouette and position of the heart.

**Creatine kinase (CK)** is an enzyme specific to cells of the brain, myocardium and skeletal muscle. If a patient tests positive for CK, it indicates tissue necrosis or injury somewhere in the body. However, in order to definitely assess for cardiac necrosis or injury, the nurse needs to be familiar with the three types of isoenzymes:
- CK-MM is the predominant isoenzyme of skeletal muscle.
- CK-MB is found in the myocardial muscle and is most specific for demonstrating an MI.
- CK-BB is found in the brain.

**Echocardiogram (ECHO)** is a noninvasive test that allows cardiologists to assess the function of the valves and structure of the heart by visually observing and taking measurements via an ultrasound device.

**Electrocardiogram (ECG or EKG)** measures the electrical function, rate and regularity of the patient’s heart rhythm. The ECG is a useful tool to distinguish between different types of arrhythmias and myocardial infarction, and demonstrates left ventricular hypertrophy and coronary artery disease.

- Any patient who presents with chest pain, is over 40 or has a history of the major heart ailments should have an ECG to assess and differentiate cardiac ischemia, injury, infarct, myocardial infarction or left ventricular hypertrophy:
  - Myocardial ischemia will result in the inversion of the T-wave.
  - Injury to the myocardial cells is more severe than ischemia and is manifested by ST segment depression or ST elevation.
  - MI (infarction) implies necrosis or death of the myocardial cells secondary to atherosclerosis. In the majority of cases, the left ventricle (LV) is the major site for infarction; however, it may occur in the right ventricle (RV).
  - Q-wave MI is defined as an initial downward deflection of a duration of 40 msec or more in any lead except III and a VR.
  - Non-Q-wave MI may be diagnosed in the presence of ST depression and T-wave abnormalities.

Regardless, the doctor will order cardiac enzymes to assess for MI. In the absence of enzyme elevation, ST and T-wave abnormalities are interpreted as due to injury or ischemia rather than infarction.

- Left ventricular hypertrophy is complex to assess and more applicable for the cardiologists to definitively speculate a diagnosis based upon the height of the R and S waves. It is definitely diagnosed based upon the thickness of the wall measured during an echocardiogram (ECHO).

**Homocysteine** is an amino acid that is produced when proteins are broken down. An elevated level may be a risk factor for cardiovascular disease. However, the correlation is still controversial.

**Myoglobin** is another early marker of an MI; however, it is not specific to the heart. Myoglobin is a low-molecular protein found in the cardiac and skeletal muscle.

**Stress test** is useful in assessing for ischemia caused by fixed coronary lesions, but it may provide inaccurate readings in patients at high risk or with coronary artery disease. Research studies have demonstrated that patients with coronary artery disease may have a false-positive, and patients in a high-risk category for developing it may have false-negatives. At that time, the patient’s cardiologists would need to evaluate the risk and history of the individual to decide whether further testing is warranted.

**Peripheral arterial disease** diagnosis is based on medical and family histories, a physical exam and results from tests. Medical and family histories may include questions about:
- Whether the patient has any risk factors for PAD.
- Symptoms, including any that occur when walking, exercising, sitting, standing or climbing.
- Diet.
- Medications the person takes, including prescription and over-the-counter medicines.
- Whether there is a family history of cardiovascular disease.

During the physical exam, the doctor will look for signs and symptoms of PAD. He or she may check the blood flow in the patient’s legs or feet to see whether there are weak or absent pulses. The doctor also may check the pulses in leg arteries for an abnormal whooshing sound called a bruit, which can be heard with a stethoscope. A bruit may be a warning sign of a narrowed or blocked section of artery. The physician also may compare blood pressure between the limbs to see whether the pressure is lower in the affected limb or check for poor wound healing or any changes in hair, skin or nails that may be signs of PAD.

Diagnostic tests may include:
- **Ankle-brachial index**
  - The ankle-brachial index (ABI) compares blood pressure in the ankle to blood pressure in the arm, which shows how well blood is flowing in the limbs. While the ABI can show whether PAD is affecting a person’s limbs, it won’t show which blood vessels are narrowed or blocked.
- A normal ABI result is 1.0 or greater (with a range of 0.90 to 1.30). The test takes about 10 to 15 minutes to measure both arms and both ankles. This test may be done yearly to see whether PAD is getting worse.

**Doppler ultrasound**
- A Doppler ultrasound is a test that uses sound waves to show whether a blood vessel is blocked. This test uses a blood pressure cuff and special device to measure blood flow in the veins and arteries of the limbs. A Doppler ultrasound can help find out how severe PAD is.

**Treadmill test**
- A treadmill test can show how severe the symptoms are and what level of exercise brings them on. For this test, the patient walks on a treadmill to show whether there are any problems during normal walking.
- An ABI test may be done before and after the treadmill test to compare blood flow in the arms and legs before and after exercise.

**Magnetic resonance angiogram**
- A magnetic resonance angiogram (MRA) uses magnetic and radio wave energy to take pictures of blood vessels inside the body. It can find the location of a blocked blood vessel and show how severe the blockage is.
- Patients who have a pacemaker, man-made joint, stent, surgical clips, mechanical heart valve or other metallic devices in the body might not be able to have an MRA.

**Arteriogram**
- An arteriogram provides a “road map” of the arteries to find the exact location of a blocked artery.
- For this test, dye is injected through a needle or catheter into an artery. The patient may feel mildly flushed. After the dye is injected, an x-ray is taken, which can show the location, type and extent of the blockage in the artery.
- Some hospitals use a newer method of arteriogram that uses tiny ultrasound cameras that take pictures of the insides of the blood vessels. This method is called intravascular ultrasound.

**Blood tests**
- These may be done to check for PAD risk factors, for example, blood glucose levels to check for diabetes or lipid tests to check cholesterol levels.
Overall strategies for prevention of cardiovascular disease
Because of the significant prevalence of cardiovascular disease globally, it is imperative to consider primary prevention before cardiovascular diseases begin. In order to reduce the risk of developing cardiovascular disease, it is imperative to initiate healthy lifestyle choices. The Centers for Disease Control (CDC) and World Health Organization (WHO) recommend the best way to fight heart disease is a healthy diet and lifestyle. Healthy lifestyle choices for all people include exercising, not smoking and eating nutritious foods. Although it may appear difficult, it is all about making healthy choices to protect the heart and to be able to live life to the fullest.

There are a few dietary recommendations that overlap, yet all have one goal in mind: protecting the heart. Since 1998, then revised in 2006, the U.S. Department of Health and Human Services has encouraged Americans to adhere to a dietary approach to stop hypertension, called DASH. Another common diet that nurses may be familiar with is the hospital setting is the cardiac diet initiated by the American Heart Association and updated in 2006. The AHA, CDC and WHO have elaborated upon their diet recommendations by encouraging individuals to adhere to the following:

- Consume a diet high in fruits, vegetables, fiber, nuts and whole grains, and low in refined grains. Fruits and vegetables have folate, vitamin B6 and B12 to reduce the total homocysteine level, especially if the patient is at risk for developing cardiovascular disease.
- Choose lean meats and poultry without skin and prepare them without added saturated and trans fat. Limit energy intake from total fats and shift fat consumption away from saturated fats to unsaturated fats and towards the elimination of trans-fatty acids.
- Select fat-free, 1 percent fat and low-fat dairy products.
- Increase consumption of omega-3 fatty acids from fish oil or plant sources to at least twice a week. Recent research has demonstrated that eating oily fish containing omega-3 fatty acids (for example, salmon, trout and herring) may help limit an individual’s risk of death from coronary artery disease.
- Limit foods containing partially hydrogenated vegetable oils to reduce trans fat in the diet.
- Limit the total dietary cholesterol in a diet, with the goal to eat less than 300 mg of cholesterol every day.
- Limit the consumption of beverages and foods with added sugars.
- Limit the amount of alcohol consumed to no more than one drink per day for women and two drinks per day for men.
- Choose and prepare foods with little or no salt. Americans should aim to eat less than 2,300 mg of sodium per day (or less than 1,500 mg if there is a higher risk of being affected by hypertension for those already diagnosed).
- The DASH diet reiterates the CDC and WHO recommendations by further elaborating that 2,300 mg is the highest level considered acceptable by the National High Blood Pressure Education Program. It is also the highest amount recommended for healthy Americans by the 2005 U.S. Dietary Guidelines for Americans. A 1,500 mg level can lower blood pressure further, and more recently is the amount recommended by the Institute of Medicine (IOM) as an adequate intake level and one that most people should try to achieve. In 2009, the CDC reiterated that patients at higher risk of developing cardiovascular disease and/or hypertension (including people 40 or older, African Americans or those currently hypertensive) should limit their total sodium intake to less than 1,500 mg/day. In 2009, a CDC report said two out of three (69 percent) adults in the U.S. fall into these three groups who are at especially high risk for health problems from consuming too much sodium.
- Eating less sodium can help prevent, lower or even control blood pressure. Most of the sodium consumed comes from packaged, processed, store-bought and restaurant foods. Only about 5 percent comes from salt added during cooking, and about 6 percent comes from being added at the table. All nutritional information facts are available on food products and available at any restaurant.
- Additional research has demonstrated that most Americans eat a lot more than the recommended sodium intake; men currently eat about 4,200 mg a day, and women consume 3,300 mg [45]. The recommended daily nutrient goals in the Third Report of the National Cholesterol Education Program (NCEP) and DASH to reduce the overall weight, blood pressure, lipid profile and to promote a healthy heart are very similar in the specific recommendations:
- Total fat, 27 percent of calories (DASH); 25-35 percent (NCEP).
- Saturated fat, 6 percent of calories (DASH); less than 7 percent of calories (NCEP).
- Polyunsaturated fat, up to 10 percent of calories (NCEP).
- Monounsaturated fat, up to 20 percent of calories (NCEP).
- Sodium, 2,300 mg; however 1,500 mg is ideal, especially to maintain a healthy blood pressure.
- Potassium, 4,700 mg.
- Protein, 18 percent of calories (DASH); 15 percent of calories (NCEP).
- Calcium, 1,250 mg.
- Carbohydrates, 55 percent of calories (DASH); 50-60 percent of calories (NCEP).
- Magnesium, 500 mg.
- Cholesterol, 150 mg (DASH); less than 200 mg/day (NCEP).
- Fiber, 30 grams (g)/day (DASH); 20-30 g/day (NCEP).

NCEP is supported by the Detection, Evaluation and Treatment of High Blood Cholesterol in Adults; Adult Treatment Plan (ATP III) designated by the therapeutic lifestyle changes. Although the majority of patients with cardiovascular disease may be considered overweight or obese based upon their BMI, it may occur in the thin patient as well. Therefore, nurses should never assume by the body size alone that an individual is “healthy.” The JNC VII recommends patients should maintain a normal body weight with a BMI of 18.5 to 24.9 kg/m2 to help maintain a normal blood pressure. In addition to eating healthy, all individuals should be encouraged to exercise for at least 30 minutes every day. The NCEP and the AHA have elaborated upon their recommendations based upon the following research:

Regular physical activity reduces very low density lipoprotein (VLDL) levels, raises HDL cholesterol and in some people, lowers the LDL levels. It also can lower blood pressure, reduce insulin resistance and improve the function of the heart. It should be important for the health care provider to find a level of activity that a patient can accomplish over the long term. The American Academy of Family Physicians (AAFP) recommends a combination of resistance and aerobic exercise, but any activity is better than none, and patients who have been sedentary need to start with walking and gradually increase duration and intensity.

Ideally, the AHA recommends regular aerobic physical activity to increase an individual’s overall fitness level and capacity for exercise. It also plays a role in both primary and secondary prevention of cardiovascular disease. Physical inactivity is a major risk factor for heart disease and stroke and is linked to cardiovascular mortality. Regular physical activity can help control blood lipid abnormalities, diabetes and obesity. Aerobic physical activity can also help reduce blood pressure. Therefore, in order to achieve health benefits to the heart, lungs and circulation, an individual must perform any moderate-to-vigorous-intensity aerobic activity for at least 30 minutes on most days of the week at 50-85 percent of his or her maximum heart rate. One can accumulate 30 minutes in 10- or 15-minute sessions. It is important to include physical activity as part of a regular routine.
- Ideal examples of aerobic activities that increase endurance include brisk walking, jumping rope, jogging, bicycling, rowing, swimming, cross-country skiing and dancing.

Ideally, nurses and physicians should elaborate upon recommended food choices, smoking cessation and choosing an active lifestyle to all their patients, regardless of their current risk of developing cardiovascular disease, because ultimately everyone is at risk at some point.
Although we cannot change our risks due to our age, gender and genetics, we can choose a healthier life.

**Treatment of cardiovascular diseases**

Since 2001, the Joint Commission (JCAHO) has initiated core measures to be implemented by all hospitals in the U.S. to measure and improve patient care with certain diagnoses. JCAHO has specified guidelines for nurses and doctors to implement for patients with acute myocardial infarction and congestive heart failure upon admission to the hospital and discharge. In 2009, JCAHO aligned with the Centers for Medicare and Medicaid Services (CMS) to write a specific manual to treat both of these serious cardiovascular diseases. The mandatory 2009 guidelines and treatment modalities for patients presenting with an acute myocardial infarction are:

- If an **acute myocardial infarction** is speculated upon arrival at the hospital:
  - Administer the patient aspirin (ASA) to prevent and dissolve any potential clots circulating in the bloodstream.
  - Administer some form of reperfusion therapy to the patient, either with fibrinolytic therapy or percutaneous coronary intervention (PCI), especially if the patient has ST-segment elevation myocardial infarction (STEMI). Fibrinolysis should be provided within 30 minutes of first medical system contact, and primary PCI should be provided within 90 minutes for patients presenting with STEMI.
  - Contraindications include previous hemorrhagic cerebrovascular accident or other strokes, cerebrovascular events within the past year, known intracranial neoplasm, active internal bleeding (excluding menstruation) or suspected aortic disease.
  - Since 1993, thrombolytic agents have been available and work by converting plasminogen to the natural fibrinolytic agent plasmin. Plasmin lyses clots by breaking down the fibrinogen and fibrin contained in the clot. Fibrinolitics, sometimes referred to as plasminogen activators, are divided into two categories.
  - Fibrin-specific agents, including alteplase, reteplase and tenecteplase, produce limited plasminogen conversion in the absence of fibrin, whereas nonfibrin-specific agents such as streptokinase catalyze systemic fibrinolysis. Streptokinase is indicated for the treatment of an acute myocardial infarction. Streptokinase is not widely used in the U.S. because it not as effective in opening occluded arteries and less effective in reducing mortality. However, it is used in other countries because of its cheaper cost. Alteplase is the only current lytic agent the U.S. Food and Drug Administration (FDA) has approved for acute myocardial infarction.
  - Tissue plasminogen activator (tPA) is a naturally occurring fibrinolytic agent found in vascular endothelial cells and is involved in the balance between thrombosis and thrombogenesis. At the site of the thrombus, the binding of tPA and plasminogen to the fibrin surface induces a conformational change, facilitating the conversion of plasminogen to plasmin and dissolving the clot.
  - During the hospitalization, the nurse needs to make sure of the following:
    - The function of the left ventricle has been documented in the medical record.
    - Initiate and administer an angiotensin converting enzyme (ACE) or angiotensin receptor blocker (ARB) for left-ventricle dysfunction that is less than 40 percent.
    - ACE/ARBs have demonstrated short and long-term improvements in surviving an MI, especially if a patient has a low EF. ACE inhibitors block the conversion of angiotensin I to the vasoconstrictor angiotensin II. Therefore, it lowers the blood pressure and prevents vasoconstriction, thus increasing blood flow, especially to the kidneys.
    - Educate and provide counseling on adult smoking cessation to prevent further damage to the heart muscle and to possibly prevent another MI.
  - Upon discharge, the nurse needs to check that the patient is provided education and a prescription for ASA, ACE or ARB and a beta-blocker (BB). A lipid-lowering agent may be prescribed, depending on the physician’s recommendations and the lipid profile results.
    - ASA is beneficial because of its anti-platelet, blood thinner effect.
    - ACE/ARBs, as noted above, offer short- and long-term improvements.
    - Beta-blockers block the stimulation of beta 1(myocardial) and beta 2 (pulmonary, vascular and uterine) receptor sites, thus lowering the overall blood pressure, suppressing arrhythmias and reducing the risk of a future MI because the overall contractility is reduced.
  - The mandatory 2009 guidelines and treatment modalities for the patient presenting in heart failure are:
    - During the hospitalization, assess the function of the left ventricle and inform the patient, then initiate an ACE inhibitor or ARB for left ventricular dysfunction because the vasodilation effect reduces the risk of mortality by 20 percent (especially if the EF is less than 40 percent).
    - Provide smoking cessation education.
    - Upon discharge, the nurse needs to ensure patients are provided explicit details on managing their heart failure, such as activity, diet, medications, follow-up appointments, weight checks and options if their symptoms worsen. It is imperative that nurses stress the importance of the treatment and prevention of further attacks because the prognosis of congestive heart failure is poor. The five-year survival rate is less than 50 percent overall. Other treatment modalities not listed by JCAHO, include:
      - Diuretic therapy. Research has demonstrated that diuretics are the most effective means of providing symptomatic relief in patients with congestive heart failure. Ideally, diuretics and ACE inhibitors block sodium reabsorption in the loop of Henle and in the proximal portion of the tubule. Initially, most patients are started on a thiazide diuretic and an ACE inhibitor. As the condition worsens, the diuretic will be changed to a loop diuretic due to the rapid onset and shorter duration. One of the biggest side effects of the combination of an ACE and diuretic is hypotension, so patients normally are always started with a lower dose and slowly worked up to assess for this risk.
    - Beta blockers may also be initiated because of a significant rise in the EF (averaging 10 percent) and reduction in the left ventricle size and mass.
  - Other potential treatments include:
    - **Coronary artery disease**. It is imperative to reduce further progression of atherosclerosis, and in some patients, if properly treated, it may even regress. Therefore, if the patient clinically demonstrates an abnormal lipid profile implying atherosclerosis and risk of coronary artery disease, the following medications should be initiated [34]:
      - Hydroxymethylglutaryl coenzyme A (HMG-CoA), reductase inhibitors (statins) to prevent death, coronary events and CVA in patients with high cholesterol and/or high LDL and coinciding diabetes. Other cholesterol-lowering medications include bile acid sequestrants (but contraindicated if a patient has high triglycerides), fibrates to lower triglycerides and ezetimibe.
      - Niacin is beneficial for patients with abnormally low HDL or elevated lipoproteins.
      - Folic acid 1 milligram (mg)/day is beneficial in the treatment of elevated homocysteine levels to reduce the risk of vascular events. However, adding Vitamins B6 and
B12 supplements demonstrate limited or no value in preventing vascular events.

Aspirin (ASA) 325 mg every other day, anti-platelet therapy in patients over the age of 50 is beneficial in reducing the risk of an MI. It is imperative to recommend a dose of 325 mg if the patient has no other risk and or contraindicated co-morbidities because research has demonstrated that 100 mg every other day did not prevent MI in women 45 years and older.

Clopidogrel (Plavix) has been effective in preventing vascular episodes for nine to 12 months after acute coronary syndrome, yet it has not prevented vascular events.

**Hypertension.** According to the JNC VII, it is imperative to treat systolic (SBP) and diastolic blood pressure (DBP) to targets that are less than 140/90 mm Hg, which is associated with a decrease in cardiovascular disease complications. However, in patients with hypertension and diabetes or renal disease, the BP goal is lower than 130/80 mm Hg [39]. It is important to recognize and treat patients appropriately for hypertension to reduce further complications. Numerous research projects have demonstrated that medications should be initiated in patients based upon their blood pressure and overall cardiovascular risk:

- Thiazide-type diuretics are the initial drug of choice in lowering the overall blood pressure by decreasing the plasma volume (by suppressing the tubular reabsorption of sodium, thus increasing the excretion of sodium and water) and CO. Diuretics lower the blood pressure in 50 percent of patients with mild to moderate hypertension. If dual therapy is required, diuretics should be used in combination with a potassium-sparing agent or an ACE/ARB. ACE inhibitors are ideal in mild to moderate elevations of blood pressure in white individuals. Research has demonstrated limited benefits in blacks and older patients with SBP. However, ACE inhibitors are beneficial in patients with type 1 diabetes with any renal dysfunction because they prevent further progression from the vasodilation effect.
- The nurse should assess for the following:
  - Diuretics also increase the risk of uric acid, thus predisposing the patient to gout. Other potential side effects include but are not limited to hyperglycemia and elevated triglycerides, LDL and cholesterol.
  - ACE inhibitors may cause a new-onset diabetes, cough, hypotension, renal dysfunction, hyperkalemia, taste alteration and rash. ARBs are initiated if the patient develops a cough caused by the ACE inhibitor; no coughs or rashes are associated with ARBs.
  - Beta blockers also reduce the blood pressure in 50 percent of patients.
  - The nurse should assess for hypoglycemia because the symptoms are masked in type 1 diabetics.

**Arrhythmias:** Common arrhythmia treatments include medicines, medical procedures and surgery. Treatment is needed when an arrhythmia causes serious symptoms, such as dizziness, chest pain or fainting. Treatment also is needed if an arrhythmia increases the risk for complications, such as heart failure, stroke or sudden cardiac arrest.

**Medications:** Anti-arrhythmics can be used to speed up a heart that’s beating too slow or slow down a heart that’s beating too fast. They also can be used to convert an abnormal heart rhythm to a normal, steady rhythm. These include:

- Beta blockers (such as metoprolol and atenolol), calcium channel blockers (such as diltiazem and verapamil), and digoxin (digitalis). These medicines often are used to slow the heart rate in people who have atrial fibrillation.
- Medicines used to restore an abnormal heartbeat to a normal rhythm are amiodarone, sotalol, flecainide, propafenone, dofetilide, ibutilide, quinidine, procainamide and disopyramide. These medicines often have side effects, some of which can make an arrhythmia worse or even cause a different kind of arrhythmia.
- People who have atrial fibrillation and some other arrhythmias often are treated with anticoagulants, or blood thinners, to reduce the risk of blood clots forming. Aspirin, warfarin (Coumadin®) and heparin are commonly used blood thinners.
- Medicines also can control an underlying medical condition, such as heart disease or a thyroid condition, that might be causing an arrhythmia.

**Medical procedures:**

- Some arrhythmias are treated with a pacemaker, a small device that’s placed under the skin of the chest or abdomen to help control abnormal heart rhythms. This device uses electrical pulses to prompt the heart to beat at a normal rate. Most pacemakers contain a sensor that activates the device only when the heartbeat is abnormal.
- Some arrhythmias are treated with a jolt of electricity delivered to the heart. This type of treatment is called cardioversion or defibrillation, depending on which type of arrhythmia is being treated.
- Some people who are at risk for ventricular fibrillation are treated with a device called an implantable cardioverter defibrillator (ICD). Like a pacemaker, an ICD is a small device that’s placed under the skin in the chest. This device uses electrical pulses or shocks to help control life-threatening arrhythmias. An ICD continuously monitors the heartbeat. If it senses a dangerous ventricular arrhythmia, it sends an electric shock to the heart to restore a normal heartbeat.
- A procedure called catheter ablation is sometimes used to treat certain types of arrhythmia when medicines don’t work. During this procedure, a long, thin, flexible tube is put into a blood vessel in the arm, groin (upper thigh), or neck and guided to the heart through the blood vessel. A special machine sends energy through the tube to the heart. This energy finds and destroys small areas of heart tissue where abnormal heartbeats may cause an arrhythmia to start. Catheter ablation usually is done in a hospital as part of an electrophysiology study.

**Surgery:**

- Sometimes, an arrhythmia is treated with surgery. This often occurs when surgery is already being done for another reason, such as repair of a heart valve.
- One type of surgery for atrial fibrillation is called “maze” surgery. In this operation, the surgeon makes small cuts or burns in the atria that prevent the spread of disorganized electrical signals.
- If coronary heart disease is causing arrhythmias, coronary artery bypass grafting may be recommended. This surgery improves blood supply to the heart muscle.

**Other treatments:** Vagal maneuvers are another arrhythmia treatment. These simple exercises sometimes can stop or slow down certain types of supraventricular arrhythmias. They do this by affecting the vagus nerve, which
PART II: STROKES AND CEREBROVASCULAR DISEASES

Introduction

More than 2,400 years ago, the father of medicine, Hippocrates, recognized and described stroke—the sudden onset of paralysis. Until recently, modern medicine has had very little power over this disease, but the world of stroke medicine is changing, and new and better therapies are being developed every day. Today, some people who have a stroke can walk away from the attack with no or few disabilities if they are treated promptly. Doctors can finally offer stroke patients and their families the one thing that until now has been so hard to give: hope.

In ancient times stroke was called “apoplexy,” a general term that physicians applied to anyone suddenly struck down with paralysis. Because many conditions can lead to sudden paralysis, the term apoplexy did not indicate a specific diagnosis or cause. Physicians knew very little about the cause of stroke, and the only established therapy was to feed and care for the patient until the attack ran its course.

The first person to investigate the pathological signs of apoplexy was Johann Jacob Wepfer. Born in Schaffhausen, Switzerland, in 1620, Wepfer studied medicine and was the first to identify postmortem signs of bleeding in the brains of patients who died of apoplexy. From autopsy studies, he gained knowledge of the carotid and vertebral arteries that supply the brain with blood. He also was the first person to suggest that apoplexy, in addition to being caused by bleeding in the brain, could be caused by a blockage of one of the main arteries supplying blood to the brain; thus stroke became known as a cerebrovascular disease (“cerebro” refers to a part of the brain; “vascular” refers to the blood vessels and arteries).

Medical science would eventually confirm Wepfer’s hypotheses, but until very recently, doctors could offer little in the area of therapy. Over the last two decades, basic and clinical investigators, including many sponsored and funded in part by the National Institute of Neurological Disorders and Stroke (NINDS), have learned a great deal about stroke. They have identified major risk factors for the disease and have developed surgical techniques and drug treatments for the prevention of stroke. But perhaps the most exciting new development in the field of stroke research is the approval of a drug treatment that can reverse the course of stroke if given during the first few hours after the onset of symptoms.

Studies with animals have shown that brain injury occurs within minutes of a stroke and can become irreversible within as little as an hour. In humans, brain damage begins from the moment the stroke starts and often continues for days afterward. Scientists now know that there is a very short window of opportunity for treatment of the most common form of stroke. Because of these and other advances in the field of cerebrovascular disease, stroke patients now have a chance for survival and recovery.

What is stroke?

A stroke occurs when the blood supply to part of the brain is suddenly interrupted or when a blood vessel in the brain bursts, spilling blood into the spaces surrounding brain cells. In the same way that a person suffering a loss of blood flow to the heart is said to be having a heart attack, a person with a loss of blood flow to the brain or sudden bleeding in the brain can be said to be having a “brain attack.”

Brain cells die when they no longer receive oxygen and nutrients from the blood or when they are damaged by sudden bleeding into or around the brain. Ischemia is the term used to describe the loss of oxygen and nutrients for brain cells when there is inadequate blood flow. Ischemia ultimately leads to infarction, the death of brain cells that are eventually replaced by a fluid-filled cavity (or infarct) in the injured brain.

When blood flow to the brain is interrupted, some brain cells die immediately, while others remain at risk for death. These damaged cells make up the ischemic penumbra and can linger in a compromised state for several hours. With timely treatment, these cells can be saved.

Even though a stroke occurs in the unseen reaches of the brain, the symptoms of a stroke are easy to spot. They include sudden numbness or weakness, especially on one side of the body; sudden confusion or trouble speaking or understanding speech; sudden trouble seeing in one or both eyes; sudden trouble walking, dizziness, or loss of balance or coordination; or sudden severe headache with no known cause.

All of the symptoms of stroke appear suddenly, and often there is more than one symptom at the same time. Therefore, stroke can usually be distinguished from other causes of dizziness or headache. These symptoms may indicate that a stroke has occurred and that medical attention is needed immediately.

There are two forms of stroke:

- **Ischemic** – blockage of a blood vessel supplying the brain.
- **Hemorrhagic** – bleeding into or around the brain.

Ischemic stroke

An ischemic stroke occurs when an artery supplying the brain with blood becomes blocked, suddenly decreasing or stopping blood flow and ultimately causing a brain infarction. This type of stroke accounts for approximately 80 percent of all strokes. Blood clots are the most common cause of artery blockage and brain infarction. The process of clotting is necessary and beneficial throughout the body because it stops bleeding and allows repair of damaged areas of arteries or veins. However, when blood clots develop in the wrong place within an artery they can cause devastating injury by interfering with the normal flow of blood. Problems with clotting become more frequent as people age.

Conclusion

Because of the lifestyle of Americans and access to fast foods on every corner, heart disease will continue to rise unless people make better choices. Although we may have the ability to consume a high fat diet, smoke and remain inactive, heart disease will continue to compound and cause many deaths unless we take control of our lives. In addition to educating the public and the patients we care for as nurses, we need to also practice what we preach. Nurses are also potentially at risk while working long, stressful shifts and grabbing food quickly on the job. However, it is important to realize the potential consequences and complications of choosing to make unhealthy decisions in our personal lives and while working. Every one of us holds the key to make the appropriate changes to reduce our overall risk of being affected by cardiovascular disease.
Blood clots can cause ischemia and infarction in two ways. A clot that forms in a part of the body other than the brain can travel through blood vessels and become wedged in a brain artery. This free-roaming clot is called an embolus and often forms in the heart. A stroke caused by an embolus is called an embolic stroke. The second kind of ischemic stroke, called a thrombotic stroke, is caused by thrombosis, the formation of a blood clot in one of the cerebral arteries that stays attached to the artery wall until it grows large enough to block blood flow.

Ischemic strokes can also be caused by stenosis, a narrowing of the artery due to the buildup of plaque and blood clots along the artery wall. Stenosis can occur in large arteries and small arteries and is therefore called large vessel disease or small vessel disease, respectively. When a stroke occurs because of small vessel disease, a very small infarction results, sometimes called a lacunar infarction, from the French word “lacune” meaning “gap” or “cavity.”

The most common blood vessel disease that causes stenosis is atherosclerosis. In atherosclerosis, deposits of plaque buildup along the inner walls of large and medium-sized arteries, causing thickening, hardening and loss of elasticity of artery walls and decreased blood flow.

Hemorrhagic stroke

In a healthy, functioning brain, neurons do not come into direct contact with blood. The vital oxygen and nutrients the neurons need from the blood come to the neurons across the thin walls of the cerebral capillaries. The glia (nervous system cells that support and protect neurons) form a blood-brain barrier, an elaborate meshwork that surrounds blood vessels and capillaries and regulates which elements of the blood can pass through to the neurons.

When an artery in the brain bursts, blood spews out into the surrounding tissue and upsets not only the blood supply but also the delicate chemical balance neurons require to function. This is called a hemorrhagic stroke. Such strokes account for approximately 20 percent of all strokes.

Hemorrhage can occur in several ways. One common cause is a bleeding aneurysm, a weak or thin spot on an artery wall. Over time, these weak spots stretch or balloon out under high arterial pressure. The thin walls of these ballooning aneurysms can rupture and spill blood into the space surrounding brain cells.

Hemorrhage also occurs when arterial walls break open. Plaque-encrusted artery walls eventually lose their elasticity and become brittle and thin, prone to cracking. Hypertension increases the risk that a brittle artery wall will give way and release blood into the surrounding brain tissue.

A person with an arteriovenous malformation (AVM) also has an increased risk of hemorrhagic stroke. AVMS are a tangle of defective blood vessels and capillaries within the brain that have thin walls and can therefore rupture. Bleeding from ruptured brain arteries can either go into the substance of the brain or into the various spaces surrounding the brain. Intracerebral hemorrhage occurs when a vessel within the brain leaks blood into the brain itself. Subarachnoid hemorrhage is bleeding under the meninges, or outer membranes, of the brain into the thin fluid-filled space that surrounds the brain.

The subarachnoid space separates the arachnoid membrane from the underlying pia mater membrane. It contains a clear fluid (cerebrospinal fluid or CSF) as well as the small blood vessels that supply the outer surface of the brain. In a subarachnoid hemorrhage, one of the small arteries within the subarachnoid space bursts, flooding the area with blood and contaminating the cerebrospinal fluid. Since the CSF flows throughout the cranium, within the spaces of the brain, subarachnoid hemorrhage can lead to extensive damage throughout the brain. In fact, subarachnoid hemorrhage is the most deadly of all strokes.

Transient ischemic attacks

A transient ischemic attack (TIA), sometimes called a mini-stroke, starts just like a stroke but then resolves, leaving no noticeable symptoms or deficits. The occurrence of a TIA is a warning that the person is at risk for a more serious and debilitating stroke. Of the approximately 50,000 Americans who have a TIA each year, about one-third will have an acute stroke sometime in the future. The addition of other risk factors compounds a person’s risk for a recurrent stroke. The average duration of a TIA is a few minutes. For almost all TIAs, the symptoms go away within an hour. There is no way to tell whether symptoms will be just a TIA or persist and lead to death or disability. The patient should assume that all stroke symptoms signal an emergency and should not wait to see if they go away.

Recurrent stroke

Recurrent stroke is frequent; about 25 percent of people who recover from their first stroke will have another stroke within five years. Recurrent stroke is a major contributor to stroke disability and death, with the risk of severe disability or death from stroke increasing with each stroke recurrence. The risk of a recurrent stroke is greatest right after a stroke, with the risk decreasing with time. About 3 percent of stroke patients will have another stroke within 30 days of their first stroke, and one-third of recurrent strokes take place within two years of the first stroke.

Classic stroke symptoms

Symptoms of stroke appear suddenly. Watch for these symptoms and be prepared to act quickly:

- Sudden numbness or weakness of the face, arm or leg, especially on one side of the body.
- Sudden confusion, trouble talking or understanding speech.
- Sudden trouble seeing in one or both eyes.
- Sudden trouble walking, dizziness or loss of balance or coordination.

- Sudden severe headache with no known cause.

How is the cause of stroke determined?

Physicians have several diagnostic techniques and imaging tools to help diagnose the cause of stroke quickly and accurately. The first step in diagnosis is a short neurological examination. When a possible stroke patient arrives at a hospital, a health care professional, usually a doctor or nurse, will ask the patient or a companion what happened and when the symptoms began. Blood tests, an electrocardiogram and a brain scan, such as CT or MRI, will often be done. One test that helps doctors judge the severity of a stroke is the standardized NIH Stroke Scale, developed by the NINDS. Health care professionals use the NIH Stroke Scale to measure a patient’s neurological deficits by asking the patient to answer questions and to perform several physical and mental tests. Other scales include the Glasgow Coma Scale, the Hunt and Hess Scale, the Modified Rankin Scale, and the Barthel Index. A copy of the NIH Stroke Scale can be found at the end of this chapter.

Health care professionals also use a variety of imaging devices to evaluate stroke patients. The most widely used imaging procedure is the computed tomography (CT) scan. Also known as a CAT scan or computed axial tomography, CT creates a series of cross-sectional images of the head and brain. Because it is readily available at all hours at most major hospitals and produces images quickly, CT is the most commonly used diagnostic technique for acute stroke. CT also has unique diagnostic benefits. It will quickly rule out a hemorrhage, can occasionally show a tumor that might mimic a stroke, and may even show evidence of early infarction. Infarctions generally show up on a CT scan about six to eight hours after the start of stroke symptoms.

If a stroke is caused by hemorrhage, a CT can show evidence of bleeding into the brain almost immediately after stroke symptoms appear. Hemorrhage is the primary reason for avoiding certain drug treatments for stroke, such as thrombolytic therapy, the only proven acute stroke therapy for ischemic stroke. Thrombolytic therapy cannot be used until the doctor can confidently diagnose the patient as suffering from an ischemic stroke because this treatment might increase bleeding and could make a hemorrhagic stroke worse.

Another imaging device used for stroke patients is the magnetic resonance imaging (MRI) scan. MRI uses magnetic fields to detect subtle changes in brain tissue content. One effect of stroke is the slowing of water movement, called diffusion, through the damaged brain tissue. MRI can show this type of damage within the first hour after the stroke symptoms start. The benefit of MRI over a CT scan is more accurate and earlier diagnosis of infarction, especially for smaller strokes, while showing equivalent accuracy in determining when hemorrhage is present. MRI is more sensitive than CT for other types of brain
diseases, such as a brain tumor, that might mimic a stroke. MRI cannot be performed in patients with certain types of metallic or electronic implants, such as pacemakers for the heart.

Although increasingly used in the emergency diagnosis of stroke, MRI is not immediately available at all hours in most hospitals, where CT is used for acute stroke diagnosis. Also, MRI takes longer to perform than CT, and may not be performed if it would significantly delay treatment.

Other types of MRI scans, often used for the diagnosis of cerebrovascular disease and to predict the risk of stroke, are magnetic resonance angiography (MRA) and functional magnetic resonance imaging (fMRI). Neurosurgeons use MRA to detect stenosis (blockage) of the brain arteries inside the skull by mapping flowing blood. Functional MRI uses a magnet to pick up signals from oxygenated blood and can show brain activity through increases in local blood flow.

Duplex Doppler ultrasound and arteriography are two diagnostic imaging techniques used to decide whether an individual would benefit from a surgical procedure called carotid endarterectomy. This surgery is used to remove fatty deposits from the carotid arteries and can help prevent stroke.

Doppler ultrasound is a painless, noninvasive test in which sound waves above the range of human hearing are sent into the neck. Echoes bounce off the moving blood and the tissue in the artery and can be formed into an image. Ultrasound is fast, painless, risk-free and relatively inexpensive compared to MRA and arteriography, but it is not considered to be as accurate as arteriography. Arteriography is an X-ray of the carotid artery taken when a special dye is injected into the artery. The procedure carries its own small risk of causing a stroke and is costly to perform. The benefits of arteriography over MR techniques and ultrasound are that it is extremely reliable and still the best way to measure stenosis of the carotid arteries. Even so, significant advances are being made every day involving noninvasive imaging techniques such as fMRI.

Who is at risk for stroke?
Some people are at a higher risk for stroke than others. Unmodifiable risk factors include age, gender, race/ethnicity and stroke family history. In contrast, other risk factors for stroke, like high blood pressure or cigarette smoking, can be changed or controlled by the person at risk.

Unmodifiable risk factors
It is a myth that stroke occurs only in elderly adults. In actuality, stroke strikes all age groups, from fetuses still in the womb to centenarians. It is true, however, that older people have a higher risk for stroke than the general population and that the risk for stroke increases with age. For every decade after the age of 55, the risk of stroke doubles, and two-thirds of all strokes occur in people over 65 years old. People over 65 also have a seven-fold greater risk of dying from stroke than the general population. And the incidence of stroke is increasing proportionately with the increase in the elderly population. As baby boomers move into the over-65 age group, stroke and other diseases will take on even greater significance in the health care field.

Gender also plays a role in risk for stroke. Men have a higher risk for stroke, but more women die from stroke. The stroke risk for men is 1.25 times that for women. But men do not live as long as women, so men are usually younger when they have their strokes and therefore have a higher rate of survival than women. In other words, even though women have fewer strokes than men, women are generally older when they have their strokes and are more likely to die from them.

Stroke seems to run in some families. Several factors might contribute to familial stroke risk. Members of a family might have a genetic tendency for stroke risk factors, such as an inherited predisposition for hypertension or diabetes. The influence of a common lifestyle among family members could also contribute to familial stroke.

The risk for stroke varies among different ethnic and racial groups. The incidence of stroke among African Americans is almost double that of white Americans, and twice as many African Americans who have a stroke die from the event compared to white Americans. African Americans between the ages of 45 and 55 have four to five times the stroke death rate of whites. After age 55, the stroke mortality rate for whites increases and is equal to that of African Americans.

Compared to white Americans, African Americans have a higher incidence of stroke risk factors, including high blood pressure and cigarette smoking. African Americans also have a higher incidence and prevalence of some genetic diseases, such as diabetes and sickle cell anemia, that predispose them to stroke.

Hispanics and Native Americans have stroke incidence and mortality rates more similar to those of white Americans. In Asian Americans, stroke incidence and mortality rates are also similar to those in white Americans, even though Asians in Japan, China and other countries of the Far East have significantly higher stroke incidence and mortality rates than white Americans. This suggests that environment and lifestyle factors play a large role in stroke risk.

The “Stroke Belt”
Several decades ago, scientists and statisticians noticed that people in the southeastern United States had the highest stroke mortality rate in the country. They named this region the stroke belt. For many years, researchers believed that the increased risk was due to the higher percentage of African Americans and an overall lower socioeconomic status (SES) in the Southern states. A low SES is associated with an overall lower standard of living, leading to a lower standard of health care and therefore an increased risk of stroke. But researchers now know that the higher percentage of African Americans and the overall lower SES in the Southern states does not adequately account for the higher incidence of, and mortality from, stroke in those states. This means that other factors must be contributing to the higher incidence of and mortality from stroke in this region.

Recent studies have also shown that there is a stroke buckle in the stroke belt. Three southeastern states, North Carolina, South Carolina and Georgia, have an extremely high stroke mortality rate, higher than the rate in other stroke belt states and up to two times the stroke mortality rate of the United States overall. The increased risk could be due to geographic or environmental factors or to regional differences in lifestyle, including higher rates of cigarette smoking and a regional preference for salty, high-fat foods.

Other risk factors
The most important risk factors for stroke are hypertension, heart disease, diabetes and cigarette smoking. Others include heavy alcohol consumption, high blood cholesterol levels, illicit drug use, and genetic or congenital conditions, particularly vascular abnormalities. People with more than one risk factor have what is called “amplication of risk.” This means that the multiple risk factors compound their destructive effects and create an overall risk greater than the simple cumulative effect of the individual risk factors.

Hypertension
Of all the risk factors that contribute to stroke, the most powerful is hypertension, or high blood pressure. People with hypertension have a risk for stroke that is four to six times higher than the risk for those without hypertension. One-third of the adult U.S. population, about 50 million people (including 40-70 percent of those over age 65) have high blood pressure. Forty to 90 percent of stroke patients have high blood pressure before their stroke event.

A systolic pressure of 120 mm/Hg over a diastolic pressure of 80 mm/Hg is generally considered normal. Persistently high blood pressure greater than 140 over 90 leads to the diagnosis of the disease called hypertension. The impact of hypertension on the total risk for stroke decreases with increasing age, suggesting that factors other than hypertension play a greater role in the overall stroke risk in elderly adults. For people without hypertension, the absolute risk of stroke increases over time until around the age of 90, when the absolute risk becomes the same as that for people with hypertension.

Like stroke, there is a gender difference in the prevalence of hypertension. In younger people, hypertension is more common among men than among women. With increasing age, however, more women than men have hypertension. This hypertension gender-age difference probably has an impact on the incidence and prevalence of stroke in these populations.
Anti-hypertensive medication can decrease a person’s risk for stroke. Recent studies suggest that treatment can decrease the stroke incidence rate by 38 percent and decrease the stroke mortality rate by 40 percent. Common hypertensive agents include adrenergic agents, beta-blockers, angiotensin converting enzyme inhibitors, calcium channel blockers, diuretics and vasodilators.

Heart disease

After hypertension, the second most powerful risk factor for stroke is heart disease, especially a condition known as atrial fibrillation. Atrial fibrillation is irregular beating of the left atrium, or left upper chamber, of the heart. In people with atrial fibrillation, the left atrium beats up to four times faster than the rest of the heart. This leads to an irregular flow of blood and the occasional formation of blood clots that can leave the heart and travel to the brain, causing a stroke.

Atrial fibrillation, which affects as many as 2.2 million Americans, increases an individual’s risk of stroke by 4 to 6 percent, and about 15 percent of stroke patients have atrial fibrillation before they experience a stroke. The condition is more prevalent in the upper age groups, which means that the prevalence of atrial fibrillation in the United States will increase proportionately with the growth of the elderly population. Unlike hypertension and other risk factors that have a lesser impact on the ever-rising absolute risk of stroke that comes with advancing age, the influence of atrial fibrillation on total risk for stroke increases powerfully with age. In people over 80 years old, atrial fibrillation is the direct cause of one in four strokes.

Other forms of heart disease that increase stroke risk include malformations of the heart valves or the heart muscle. Some valve diseases, like mitral valve stenosis or mitral annular calcification, can double the risk for stroke, independent of other risk factors.

Heart muscle malformations can also increase the risk for stroke. Patent foramen ovale (PFO) is a passage or a hole (sometimes called a “shunt”) in the heart wall separating the two atria, or upper chambers, of the heart. Clots in the blood are usually filtered out by the lungs, but PFO could allow emboli or blood clots to bypass the lungs and go directly through the arteries to the brain, potentially causing a stroke. Research is currently under way to determine how important PFO is as a cause for stroke. Atrial septal aneurysm (ASA), a congenital (present from birth) malformation of the heart tissue, is a bulging of the septum or heart wall into one of the atria of the heart. Researchers do not know why this malformation increases the risk for stroke. PFO and ASA frequently occur together and therefore amplify the risk for stroke. Two other heart malformations that seem to increase the risk for stroke for unknown reasons are left atrial enlargement and left ventricular hypertrophy. People with left atrial enlargement have a larger than normal left atrium of the heart; those with left ventricular hypertrophy have a thickening of the wall of the left ventricle.

Another risk factor for stroke is cardiac surgery to correct heart malformations or reverse the effects of heart disease. Strokes occurring in this situation are usually the result of surgically dislodged plaques from the aorta that travel through the bloodstream to the arteries in the neck and head, causing stroke. Cardiac surgery increases a person’s risk of stroke by about 1 percent. Other types of surgery can also increase the risk of stroke.

Blood cholesterol levels

Most people know that high cholesterol levels contribute to heart disease. But many don’t realize that a high cholesterol level also contributes to stroke risk. Cholesterol, a waxy substance produced by the liver, is a vital body product. It contributes to the production of hormones and vitamin D and is an integral component of cell membranes. The liver makes enough cholesterol to fuel the body’s needs, and this natural production of cholesterol alone is not a large contributing factor to atherosclerosis, heart disease and stroke. Research has shown that the danger from cholesterol comes from a dietary intake of foods that contain high levels of cholesterol. Foods high in saturated fat and cholesterol, like meats, eggs and dairy products, can increase the amount of total cholesterol in the body to alarming levels, contributing to the risk of atherosclerosis and the arteries.

Cholesterol is classified as a lipid, meaning that it is fat-soluble rather than water-soluble. Other lipids include fatty acids, glycerides, alcohol, waxes, steroids, and fat-soluble vitamins A, D, and E. Lipids and water, like oil and water, do not mix. Blood is a water-based liquid, so cholesterol does not mix with blood. In order to travel through the blood without clumping together, cholesterol needs to be covered by a layer of protein. The cholesterol and protein together are called a lipoprotein.

There are two kinds of cholesterol, commonly called the “good” and the “bad.” Good cholesterol is high-density lipoprotein, or HDL; bad cholesterol is low-density lipoprotein, or LDL. Together, these two forms of cholesterol make up a person’s total serum cholesterol level. Most cholesterol tests measure the level of total cholesterol in the blood and don’t distinguish between good and bad cholesterol. For these total serum cholesterol tests, a level of less than 200 mg/dL is considered safe, while a level of more than 240 is considered dangerous and places a person at risk for heart disease and stroke.

Most cholesterol in the body is in the form of LDL. LDLs circulate through the bloodstream, picking up excess cholesterol and depositing cholesterol where it is needed (for example, for the production and maintenance of cell membranes). But when too much cholesterol starts circulating in the blood, the body cannot handle the excessive LDLs, which build up along the inside of the arterial walls. The buildup of LDL coating on the inside of the artery walls hardens and turns into arterial plaque, leading to stenosis and atherosclerosis. This plaque blocks blood vessels and contributes to the formation of blood clots. A person’s LDL level should be less than 130 mg/dL to be safe. LDL levels between 130 and 159 put a person at a slightly higher risk for atherosclerosis, heart disease and stroke. A score over 160 puts a person at great risk for a heart attack or stroke.

The other form of cholesterol, HDL, is beneficial and contributes to stroke prevention. HDL carries a small percentage of the cholesterol in the blood, but instead of depositing its cholesterol on the inside of artery walls, HDL returns to the liver to unload its cholesterol. The liver then eliminates the excess cholesterol by passing it along to the kidneys. Currently, any HDL score higher than 35 is considered desirable. Recent studies have shown that high levels of HDL are associated with a reduced risk for heart disease and stroke and that low levels (less than 35 mg/dL), even in people with normal levels of LDL, lead to an increased risk for heart disease and stroke.

A person may lower his risk for atherosclerosis and stroke by improving his cholesterol levels. A healthy diet and regular exercise are the best ways to lower total cholesterol levels. In some cases, physicians may prescribe cholesterol-lowering medication, and recent studies have shown that the newest types of these drugs, called reductase inhibitors or statin drugs, significantly reduce the risk for stroke in most patients with high cholesterol. Scientists believe that statins may work by reducing the amount of bad cholesterol the body produces and by reducing the body’s inflammatory immune reaction to cholesterol plaque associated with atherosclerosis and stroke.

Millimeters of mercury – or mm/Hg – is the standard means of expressing blood pressure, which is measured using a sphygmomanometer. Using a stethoscope and a cuff that is wrapped around the patient’s upper arm, a health professional listens to the sounds of blood rushing through an artery. The first sound registered on the instrument gauge (which measures the pressure of the blood in millimeters on a column of mercury) is called the systolic pressure. This is the maximum pressure produced as the left ventricle of the heart contracts and the blood begins to flow through the artery. The second sound is the diastolic pressure and is the lowest pressure in the artery when the left ventricle is relaxing.

Diabetes

Diabetes is another disease that increases a person’s risk for stroke. People with diabetes have three times the risk of stroke compared to people without diabetes. The relative risk of stroke from diabetes is highest in the fifth and sixth decades of life and decreases after that. Like hypertension, the relative risk of stroke from diabetes is highest for men at an earlier age and highest for women at an older age. People with diabetes may also have other contributing risk factors that can amplify the overall risk.
for stroke. For example, the prevalence of hypertension is 40 percent higher in the diabetic population compared to the general population.

**Modifiable lifestyle risk factors**

**Cigarette smoking** is the most powerful modifiable stroke risk factor. Smoking almost doubles a person’s risk for ischemic stroke, independent of other risk factors, and it increases a person’s risk for subarachnoid hemorrhage by up to 3.5 percent. Smoking is directly responsible for a greater percentage of the total number of strokes in young adults than in older adults. Risk factors other than smoking—like hypertension, heart disease and diabetes—account for more of the total number of strokes in older adults.

Heavy smokers are at greater risk for stroke than light smokers. The relative risk of stroke decreases immediately after quitting smoking, with a major reduction of risk seen after two to four years. Unfortunately, it may take several decades for a former smoker’s risk to drop to the level of someone who never smoked.

Smoking increases the risk of stroke by promoting atherosclerosis and increasing the levels of blood-clotting factors, such as fibrinogen. In addition to promoting conditions linked to stroke, smoking also increases the damage that results from stroke by weakening the endothelial wall of the cerebrovascular system. This leads to greater damage to the brain from events that occur in the secondary stage of stroke.

**High alcohol consumption** is another modifiable risk factor for stroke. Generally, an increase in alcohol consumption leads to an increase in blood pressure. While scientists agree that heavy drinking is a risk for both hemorrhagic and ischemic stroke, in several research studies daily consumption of smaller amounts of alcohol has been found to provide a protective influence against ischemic stroke, perhaps because alcohol decreases the clotting ability of platelets in the blood. Moderate alcohol consumption may act in the same way as aspirin to decrease blood clotting and prevent ischemic stroke. Heavy alcohol consumption, though, may seriously deplete platelet numbers and compromise blood clotting and blood viscosity, leading to hemorrhage.

In addition, heavy drinking or binge drinking can lead to a rebound effect after the alcohol is purged from the body. The consequences of this rebound effect are that blood viscosity (thickness) and platelet levels skyrocket after heavy drinking, increasing the risk for ischemic stroke.

**The use of illicit drugs**, such as cocaine and crack cocaine, can cause stroke. Cocaine may act on other risk factors, such as hypertension, heart disease and vascular disease, to trigger a stroke. It increases relative cerebrovascular blood flow by up to 30 percent, causes vascular constriction and inhibits vascular relaxation, leading to narrowing of the arteries. Cocaine also affects the heart, causing arrhythmias and rapid heart rate that can lead to the formation of blood clots.

Marijuana smoking may also be a risk factor for stroke. Marijuana decreases blood pressure and may interact with other risk factors, such as hypertension and cigarette smoking, to cause rapidly fluctuating blood pressure levels, damaging blood vessels.

**Other drugs of abuse**, such as amphetamines, heroin, and anabolic steroids (and even some common, legal drugs, such as caffeine and L-asparaginase and pseudoephedrine found in over-the-counter decongestants), have been suspected of increasing stroke risk. Many of these drugs are vasoconstrictors, meaning that they cause blood vessels to constrict and blood pressure to rise.

**Head and neck injuries**

Injuries to the head or neck may damage the cerebrovascular system and cause a small number of strokes. Head injury or traumatic brain injury may cause bleeding within the brain leading to damage akin to that caused by a hemorrhagic stroke. Neck injury, when associated with spontaneous tearing of the vertebral or carotid arteries caused by sudden and severe extension of the neck, neck rotation or pressure on the artery, is a contributing cause of stroke, especially in young adults. This type of stroke is often called “beauty-parlor syndrome,” which refers to the practice of extending the neck backwards over a sink for hair-washing in beauty parlors. Neck calisthenics, “bottoms-up” drinking, and improperly performed chiropractic manipulation of the neck can also put strain on the vertebral and carotid arteries, possibly leading to ischemic stroke.

**Infections**

Recent viral and bacterial infections may act with other risk factors to add a small risk for stroke. The immune system responds to infection by increasing inflammation and increasing the infection-fighting properties of the blood. Unfortunately, this immune response increases the number of clotting factors in the blood, leading to an increased risk of embolic-ischemic stroke.

**Genetic risk factors**

Although there may not be a single genetic factor associated with stroke, genes do play a large role in the expression of stroke risk factors such as hypertension, heart disease, diabetes and vascular malformations. It is also possible that an increased risk for stroke within a family is due to environmental factors, such as a common sedentary lifestyle or poor eating habits, rather than hereditary factors.

Vascular malformations that cause stroke may have the strongest genetic link of all stroke risk factors. A vascular malformation is an abnormally formed blood vessel or group of blood vessels. One genetic vascular disease is called CADASIL, which stands for cerebral autosomal dominant arteriopathy with subcortical infarcts and leukencephalopathy. CADASIL is a rare, genetically inherited, congenital vascular disease of the brain that causes strokes, subcortical dementia, migraine-like headaches and psychiatric disturbances. CADASIL is very debilitating, and symptoms usually surface about the age of 45. Although CADASIL can be treated with surgery to repair the defective blood vessels, patients often die by the age of 65. The exact incidence of CADASIL in the United States is unknown.

**What is CADASIL?**

CADASIL is an inherited form of cerebrovascular disease that occurs when the thickening of blood vessel walls blocks the flow of blood to the brain. The disease primarily affects small blood vessels in the white matter of the brain. A mutation in the Notch3 gene alters the muscular walls in these small arteries. CADASIL is characterized by migraine headaches and multiple strokes progressing to dementia. Other symptoms include white matter lesions throughout the brain, cognitive deterioration, seizures, vision problems and psychiatric problems such as severe depression and changes in behavior and personality. Individuals may also be at higher risk of heart attack. Symptoms and disease onset vary widely, for some people in the mid-30s while others may not show signs of the disease until later in life. CADASIL – formerly known by several names, including hereditary multi-infarct dementia – is one cause of multi-infarct dementia (dementia caused by lack of blood to several areas of the brain). It is an autosomal dominant inheritance disorder, meaning that one parent carries and passes on the defective gene. Most individuals with CADASIL have a family history of the disorder.

There is no treatment to halt this genetic disorder. Individuals are given supportive care. Migraine headaches may be treated by different drugs and a daily aspirin may reduce stroke and heart attack risk. Drug therapy for depression may be given. Affected individuals who smoke should quit because that can increase the risk of stroke in CADASIL.

Symptoms usually progress slowly. By age 65, the majority of persons with CADASIL have severe cognitive problems and dementia. Some people lose the ability to walk, and most become completely dependent because of multiple strokes.

The National Institute of Neurological Disorders and Stroke (NINDS) conducts stroke research and clinical trials at its laboratories and clinics at the National Institutes of Health (NIH) and through grants to major medical institutions across the country. Scientists are currently studying different drugs to reduce cognitive problems seen in patients with CADASIL. Researchers are also looking at ways to overcome an over-reaction to hormones that lead to high blood pressure and poor blood supply in patients with CADASIL.

**Treating stroke**

Timing is everything in treatment of stroke, particularly acute ischemic stroke, which comprises about 80 percent of cerebrovascular accidents. Health organizations have tried to get the word out to the public: When symptoms appear, don’t delay; call 911. These organizations
have encouraged emergency responders to also take action, and to “load and go” once a patient is stable enough for transport. Nurses and physicians staffing emergency departments must be informed about stroke symptoms and interventions and also “ready to roll” when a patient arrives.

Medications
Medicines that lower blood pressure and cholesterol can protect against atherosclerosis and reduce a person’s risk of stroke. Aspirin and other blood-thinning medications have been used for years to reduce the risk of ischemic stroke in individuals with AF or prior stroke. Recent studies have helped refine the use of these drugs to maximize safety and efficacy. This section, however, begins with a discussion of what happens when prevention fails and a person requires emergency treatment for an acute ischemic stroke.

Thrombolytic drugs
In treating acute ischemic stroke (acute meaning that the stroke has occurred within the past few hours), the immediate goal is to break apart the offending clot, a process known as thrombolysis. The body produces its own thrombolytic proteins, and some of these have been engineered into drugs. One, called tissue plasminogen activator (tPA), has a proven track record for treating heart attacks. In the late 1980s, NINDS-funded investigators laid the plans for the first placebo-controlled trial of tPA to treat acute ischemic stroke. They knew from animal studies that irreversible brain injury is likely to occur if blood flow is not restored within the first few hours after ischemic stroke. Therefore, the NINDS tPA Study Group tested the drug within a three-hour time window. Compared to individuals given a placebo, those given intravenous tPA were more likely to have minimal or no disability three months after treatment—a finding that persuaded the U.S. Food and Drug Administration to approve tPA for use against acute stroke. Trials in Europe and the U.S. subsequently confirmed those results. Recent studies attempt to identify individuals who may benefit even after three hours of stroke onset. In any case, more brain tissue will be saved the earlier the treatment is delivered.

A 1998 follow-up analysis of the NINDS trial found that, after their initial hospitalization, individuals who may benefit even after three hours of stroke onset, which has limited its use to the first three hours after stroke (where benefit was most clearly established in the U.S. trials).

Platelets (magnified here thousands of times) go to damaged areas of blood vessels and contribute to the formation of clots. Anti-platelet drugs can help reduce the risk of ischemic stroke.

### Anti-platelet drugs and anticoagulants
Blood-thinning medications fall into two classes: anti-platelet drugs and anticoagulants. Anti-platelet drugs inhibit the activity of cells called platelets, which stick to damaged areas inside blood vessels and lay the foundation for blood clots. The most common anti-platelet drug is aspirin. Anticoagulants, such as heparin (produced by inflammatory cells in the body) and warfarin (found in plants and also known by the trade name Coumadin©), inhibit proteins in the blood that stimulate clotting.

Anti-platelet drugs and anticoagulants can help prevent a variety of potentially life-threatening conditions for which individuals with stroke are at risk, such as myocardial infarction, pulmonary embolism and deep vein thrombosis, which are caused by clots in the heart, lungs and deep veins of the legs, respectively. In recent years, the value of these drugs in treating and preventing stroke itself has been more closely scrutinized.

One focus of this research has been to determine whether there is any benefit in giving anti-platelet drugs or anticoagulants during an acute ischemic stroke as an adjunct to tPA or as an alternative for people ineligible to receive tPA. In an international trial coordinated by researchers in the United Kingdom in the late 1990s, individuals received aspirin, subcutaneous heparin injections, or neither treatment within 48 hours of an ischemic stroke. Aspirin significantly reduced the risk of a recurrent ischemic stroke at two weeks. A similar benefit from heparin was offset by an increased risk of hemorrhagic stroke. Around the same time, NINDS-funded researchers tested whether acute stroke could be treated with intravenous Org 10172, a form of heparin considered less likely to cause bleeding. This study, Trial of Org 10172 in Acute Stroke Treatment (TOAST), found that Org 10172 produced no significant benefit. The study authors also developed the TOAST criteria, a set of guidelines for classifying different subtypes of ischemic stroke that are now widely used in other studies.

Two other NINDS-sponsored trials compared the effectiveness of daily warfarin and aspirin for individuals who did not have AF but who had experienced a prior stroke, and thus were at risk for another. The Warfarin vs. Aspirin Recurrent Stroke Study (WARSS) showed that aspirin was as effective as warfarin in preventing recurrent stroke in people with no history of AF or other cardioembolic causes of stroke. The Warfarin-Aspirin Symptomatic Intracranial Disease (WASID) trial focused more narrowly on individuals with stenosis of arteries in the brain and was terminated early because of a high rate of adverse events in participants treated with warfarin. Both trials concluded that aspirin is equivalent to warfarin for reducing the risk of stroke in people without AF.

### Medication for subarachnoid hemorrhage
The drug nimodipine is used to treat cerebral vasospasm, a complication that sometimes follows subarachnoid hemorrhage. This refers to a constriction of blood vessels in the brain that can significantly reduce blood flow, leading to ischemia and infarction. Although its precise origins are unclear, cerebral vasospasm is thought to be triggered in part by an influx of calcium into the smooth muscles that control blood vessel diameter. Nimodipine is a calcium antagonist, meaning that it works by blocking the entry of calcium into cells. Nimodipine has been shown to reduce infarction and improve outcome in individuals with subarachnoid hemorrhage.

#### Surgical options
Several techniques are used to eliminate the vascular abnormalities linked to hemorrhagic stroke, or at least to reduce the risk that they will rupture. Arteriovenous malformations (AVMs) can be surgically removed through a procedure known as surgical resection. They can also be treated non-invasively (without the need to cut into the skull) using radiosurgery or embolization. Radiosurgery involves directing a beam of radiation at the AVM, while embolization involves injecting artificial emboli (usually made of foam) into the AVM to block it off from its parent vessel.

Clipping and coiling are procedures used to treat intracerebral aneurysms. Clipping involves opening the skull and placing a clip near the aneurysm to separate it from its parent blood vessel. In endovascular coiling, a wire topped with a detachable coil is inserted into a leg artery and threaded into the aneurysm. Once in place, the coil is released into the aneurysm, where it stimulates blood clotting and strengthens the blood vessel wall. Stents are also used in some cases to divert blood flow away from an aneurysm. The carotid and vertebral arteries ascend through the neck and divide into branches that supply blood to different parts of the brain.
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A surgery called carotid endarterectomy involves removing plaque to widen the carotids, a pair of arteries that ascend each side of the neck and are the main suppliers of blood to the brain. Stenosis that narrows a carotid artery by more than 50 percent is considered clinically significant. In some cases, carotid stenosis is first detected after a person experiences a stroke or other symptoms, such as a TIA. It is also sometimes detected in the absence of symptoms, as when a physician presses a stethoscope to the neck and hears a bruit, a sound made by blood flowing past an obstruction. The presence of carotid stenosis can be confirmed by angiography or Doppler ultrasound.

Data from NINDS-funded research show that the risk of ischemic stroke from clinically significant asymptomatic carotid stenosis is about 2 to 3 percent per year (meaning that out of 100 individuals with this condition, two or three will have a stroke each year). The risk of ischemic stroke from clinically significant symptomatic carotid stenosis is much higher — about 25 percent during the first two years following the appearance of symptoms.

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**Nurses’ role in stroke treatment and care**

Nurses play a key role in stroke treatment from the time a patient arrives at an ED until discharge. All emergency nurses and staff should be aware that NINDS recommends that treatment of a patient with acute ischemic stroke should begin within 60 minutes of the person’s arrival, and that time could be even shorter to meet the treatment window requirement of three hours after onset of symptoms.

- They must be able to quickly assess the patient’s symptoms for triage purposes and may help with a neurological assessment (such as the NIH Stroke Scale) and gather history from the patient or his/her family to ascertain the time of symptom onset, a key determinant of whether the person is a candidate for thrombolytic therapy.
- They must be ready to quickly implement orders for brain imaging and other tests a doctor will order to ascertain the origin of the stroke. This may mean alerting the proper departments that a patient will arrive soon and tests must be conducted stat.
- When intravenous thrombolytic therapy is ordered, a nurse will likely administer it. (Physicians generally administer intravenous thrombolysis, which is sometimes used on patients with AIS secondary to occlusion of the MCA.) The nurse also will be part of the critically important team that monitors the patient during the therapy and afterward. The American Heart Association in its Comprehensive Overview of Nursing and Interdisciplinary Care of the Acute Ischemic Stroke Patient report (http://stroke.ahajournals.org/cgi/content/full/8/2911) recommends:
  - TPA be infused 0.9 mg/kg (with a maximum dose of 90 mg) over 60 minutes with 10 percent of the dose given as a bolus over one minute.
  - Blood pressure monitoring is critical during initial treatment and afterward; an elevated BP that cannot be safely lowered to 185/110 mm/Hg will disqualify a patient for thrombolytic therapy; and patients who have received the therapy also must be continuously monitored to ensure a rise does not cause bleeding complications. During administration of tPA, BP should be taken every 15 minutes for the first two hours, then every 30 minutes for the next six hours, and then hourly until 24 hours after treatment. A nurse should increase the frequency of blood pressure measurements if a systolic BP is at or greater than 180 mm/Hg or if diastolic BP is at or greater than 105 mm/Hg.
  - Neurological assessments should be performed every 15 minutes during the infusion and every 30 minutes after for the next six hours, then hourly until 24 hours after treatment.
  - After the administration of tPA, patient monitoring continues. AHA says that in addition to blood pressure and neurological assessments, nurses caring for all stroke patients should:
    - Oversee the patient’s transition from bed rest to mobilization, usually as soon as the patient is considered stable. The report noted that some patients have neurological worsening with movement, and nurses must observe the transition from bed to chair carefully. Early mobilization is encouraged, however, because it lessens the likelihood of complications such as pneumonia, deep vein thrombosis, pulmonary embolism and pressure sores.
    - Pressure mattresses and close surveillance of the skin are recommended to help prevent pressure sores.
    - Monitor patients to avoid dehydration or malnutrition, which may slow recovery.

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**Comparing therapies**

NINDS-supported research has compared the benefits of standard medical therapy alone (treatment with aspirin, blood pressure-lowering drugs, and cholesterol-lowering drugs) with standard medical therapy plus endarterectomy for both types of carotid stenosis. The Asymptomatic Carotid Atherosclerosis Study (ACAS) found that endarterectomy cut the risk of stroke in half among individuals with asymptomatic carotid stenosis of 60 percent or greater. The NINDS North American Symptomatic Carotid Endarterectomy Trial (NASCET) found major benefits for individuals with symptomatic carotid stenosis of 70 percent or greater. Their risk of stroke over a two-year period was cut to less than 10 percent.

Endarterectomy itself is associated with a small risk of stroke because the disruption of plaque during the procedure can send emboli into the bloodstream, or cause a clot at the site of surgery. NINDS supports the investigation of an alternative procedure known as carotid artery stenting, which involves inserting a stent (a tube-like device that is made of mesh-like material) into the carotid artery. The stent is compressed until the radiologist threads it into position, and is then expanded to mechanically widen the artery. It is also equipped with a downstream “umbrella” to catch dislodged plaque. The Carotid Revascularization Endarterectomy vs. Stenting Trial (CREST) is designed to compare these two procedures in individuals with symptomatic carotid stenosis.
or cause additional problems, such as deep vein thrombosis, after a stroke. Problems swallowing are associated with a high risk of pneumonia and death.

- An abnormal gag reflex, impaired voluntary cough, dysphonia, incomplete oral-labial closure, a high stroke scale score or cranial nerve pulses are critical signs. Nurses should perform a water swallow test at bedside before a patient is given food or drink.
- Patients with infarctions of the brainstem, multiple strokes, major hemispheric lesions or mental impairments are at the greatest risk of aspiration.
- Because pneumonia is a frequent problem in seriously affected immobile patients and an important cause of death after stroke, nurses must check for signs of fever and infection. Some measures to prevent aspiration and infection are:
  - Protection of the airway and suctioning.
  - Measures to treat nausea and vomiting.
  - Exercise and encouragement to take deep breaths.
- Urinary tract infections are also common among patients with stroke. Bacteremia or sepsis can appear.
- Screening of urine should occur whenever a patient develops a fever.
- Indwelling catheters may be ordered to prevent incontinence and urinary retention, but their use comes with the risk of urinary infections.
- Acidification of urine may reduce the risk of infection.
- Anti-cholinergic agents may help recover bladder function.
- Nurses must watch for serious complications that arise after a stroke, including:
  - Deep vein thrombosis and pulmonary embolism, which account for about 10 percent of deaths after stroke and generally arise from venous thrombi that developed in paralyzed lower limbs or pelvis. In addition to the potential to cause life-threatening events, deep vein thrombosis slows recovery and rehabilitation after stroke.
  - Early mobilization, anti-thrombotic agents and the use of external compression devices (such as stockings or alternating pressure devices) may lower the risk of the condition.
- Ischemic brain swelling, caused by a cytotoxic reaction mediated by multiple factors, including free radicals. It typically occurs about four days after onset, but some early swelling, called “malignant” swelling, that occurs within 24 hours has been seen. Very few clinical signs predict clinical deterioration from swelling. But researchers have found the following often are present in such cases:
  - A history of hypertension and heart failure.
  - Elevated white blood cell count.
  - Presence of more than 50 percent MCA hypodensity.
  - Involvement of additional vascular territory.
- Hemorrhagic transformation from the ischemic stroke. Hematomas may be associated with neurological decline; small asymptomatic petechiae are usually less problematic.
- The use of all anti-thrombotics, but especially anticoagulants and thrombolytic agents, increases the likelihood of serious hemorrhagic transformation.
- Seizures usually occur within 24 hours of stroke and are usually partial. The risk of late seizures is higher in patients with pre-existing dementia.
- After a patient is stabilized, nurses may be involved in rehabilitation measures, including patient and family education and support.

Post-stroke rehabilitation fact sheet
National Institute of Neurological Disorders and Stroke

In the United States, more than 700,000 people suffer a stroke each year, and approximately two-thirds of these individuals survive and require rehabilitation. The goals of rehabilitation are to help survivors become as independent as possible and to attain the best possible quality of life. Even though rehabilitation does not “cure” stroke in that it does not reverse brain damage, rehabilitation can substantially help people achieve the best possible long-term outcome.

What is post-stroke rehabilitation?

Rehabilitation helps stroke survivors relearn skills that are lost when part of the brain is damaged. For example, these skills can include coordinating leg movements in order to walk or carrying out the steps involved in any complex activity. Rehabilitation also teaches survivors new ways of performing tasks to circumvent or compensate for any residual disabilities. Patients may need to learn how to bathe and dress using only one hand, or how to communicate effectively when their ability to use language has been compromised. There is a strong consensus among rehabilitation experts that the most important element in any rehabilitation program is carefully directed, well-focused, repetitive practice – the same kind of practice used by all people when they learn a new skill, such as playing the piano or pitching a baseball.

Rehabilitative therapy begins in the acute-care hospital after the patient’s medical condition has been stabilized, often within 24 to 48 hours after the stroke. The first steps involve promoting independent movement because many patients are paralyzed or seriously weakened. Patients are prompted to change positions frequently while lying in bed and to engage in passive or active range-of-motion exercises to strengthen their stroke-impaired limbs. (“Passive” range-of-motion exercises are those in which the therapist actively helps the patient move a limb repeatedly, whereas “active” exercises are performed by the patient with no physical assistance from the therapist.) Patients progress from sitting up and transferring between the bed and a chair to standing, bearing their own weight and walking, with or without assistance. Rehabilitation nurses and therapists help patients perform progressively more complex and demanding tasks, such as bathing, dressing and using a toilet, and they encourage patients to begin using their stroke-impaired limbs while engaging in those tasks. Beginning to reacquire the ability to carry out these basic activities of daily living represents the first stage in a stroke survivor’s return to functional independence.

For some stroke survivors, rehabilitation will be an ongoing process to maintain and refine skills and could involve working with specialists for months or years after the stroke.

What disabilities can result from a stroke?
The types and degrees of disability that follow a stroke depend upon which area of the brain is damaged. Generally, stroke can cause five types of disabilities: paralysis or problems controlling movement; sensory disturbances, including pain; problems using or understanding language; problems with thinking and memory; and emotional disturbances.

Paralysis or problems controlling movement (motor control)

Paralysis is one of the most common disabilities resulting from stroke. The paralysis is usually on the side of the body opposite the side of the brain damaged by stroke, and may affect the face, an arm, a leg or the entire side of the body. This one-sided paralysis is called hemiparesis (one-sided weakness is called hemiparesis). Stroke patients with hemiparesis or hemiplegia may have difficulty with everyday activities such as walking or grasping objects. Some stroke patients have problems with swallowing, called dysphagia, due to damage to the part of the brain that controls the muscles for swallowing. Damage to a lower part of the brain, the cerebellum, can affect the body’s ability to coordinate movement, a disability called ataxia, leading to problems with body posture, walking and balance.

Sensory disturbances including pain

Stroke patients may lose the ability to feel touch, pain, temperature or position. Sensory deficits may also hinder the ability to recognize objects that patients are holding and can even be severe enough to cause loss of recognition of one’s own limb. Some stroke patients experience pain, numbness or odd sensations of tingling or prickling in paralyzed or weakened limbs, a condition known as paresthesia.

Stroke survivors frequently have a variety of chronic pain syndromes resulting from stroke-induced damage to the nervous system.
(neuropathic pain). Patients who have a seriously weakened or paralyzed arm commonly experience moderate to severe pain that radiates outward from the shoulder. Most often, the pain results when a joint becomes immobilized because of lack of movement and the tendons and ligaments around the joint become fixed in one position. This is commonly called a “frozen” joint; “passive” movement at the joint in a paralyzed limb is essential to prevent painful freezing and to allow easy movement if and when voluntary motor strength returns. In some stroke patients, pathways for sensation in the brain are damaged, causing the transmission of false signals that result in the sensation of pain in a limb or side of the body that has the sensory deficit. The most common of these pain syndromes is called thalamic pain syndrome, which can be difficult to treat even with medications.

The loss of urinary continence is fairly common immediately after a stroke and often results from a combination of sensory and motor deficits. Stroke survivors may lose the ability to sense the need to urinate or the ability to control muscles of the bladder. Some may lack enough mobility to reach a toilet in time. Loss of bowel control or constipation may also occur. Permanent incontinence after a stroke is uncommon. But even a temporary loss of bowel or bladder control can be emotionally difficult for stroke survivors.

Problems using or understanding language (aphasia)
At least one-fourth of all stroke survivors experience language impairments, involving the ability to speak, write and understand spoken and written language. A stroke-induced injury to any of the brain’s language-control centers can severely impair verbal communication. Damage to a language center located on the dominant side of the brain, known as Broca’s area, causes expressive aphasia. People with this type of aphasia have difficulty conveying their thoughts through words or writing. They lose the ability to speak the words they are thinking and to put words together in coherent, grammatically correct sentences.

In contrast, damage to a language center located in a rear portion of the brain, called Wernicke’s area, results in receptive aphasia. People with this condition have difficulty understanding spoken or written language and often have incoherent speech. Although they can form grammatically correct sentences, their utterances are often devoid of meaning.

The most severe form of aphasia, global aphasia, is caused by extensive damage to several areas involved in language function. People with global aphasia lose nearly all their linguistic abilities; they can neither understand language nor use it to convey thought.

A less severe form of aphasia, called anomic or amnesic aphasia, occurs when there is only a minimal amount of brain damage; its effects are often quite subtle. People with anomic aphasia may simply selectively forget interrelated groups of words, such as the names of people or particular kinds of objects.

Problems with thinking and memory
Stroke can cause damage to parts of the brain responsible for memory, learning and awareness. Stroke survivors may have dramatically shortened attention spans or may experience deficits in short-term memory. Individuals also may lose their ability to make plans, comprehend meaning, learn new tasks or engage in other complex mental activities. Two fairly common deficits resulting from stroke are anosognosia, an inability to acknowledge the reality of the physical impairments resulting from stroke, and neglect, the loss of the ability to respond to objects or sensory stimuli located on one side of the body, usually the stroke-impaired side. Stroke survivors who develop apraxia lose their ability to plan the steps involved in a complex task and to carry the steps out in the proper sequence. Stroke survivors with apraxia may also have problems following a set of instructions. Apraxia appears to be caused by a disruption of the subtle connections that exist between thought and action.

Emotional disturbances
Many people who survive a stroke feel fear, anxiety, frustration, anger, sadness and a sense of grief for their physical and mental losses. These feelings are a natural response to the psychological trauma of stroke. Some emotional disturbances and personality changes are caused by the physical effects of brain damage. Clinical depression, which is a sense of hopelessness that disrupts an individual’s ability to function, appears to be the emotional disorder most commonly experienced by stroke survivors. Signs of clinical depression include sleep disturbances, a radical change in eating patterns that may lead to sudden weight loss or gain, lethargy, social withdrawal, irritability, fatigue, self-loathing and suicidal thoughts. Post-stroke depression can be treated with antidepressant medications and psychological counseling.

What medical professionals specialize in post-stroke rehabilitation?
Post-stroke rehabilitation involves physicians; rehabilitation nurses; physical, occupational, recreational, speech-language and vocational therapists; and mental health professionals.

Physicians
Physicians have the primary responsibility for managing and coordinating the long-term care of stroke survivors, including recommending which rehabilitation programs will best address individual needs. Physicians are also responsible for caring for the stroke survivor’s general health and providing guidance aimed at preventing a second stroke, such as controlling high blood pressure or diabetes and eliminating risk factors such as cigarette smoking, excessive weight, a high-cholesterol diet and high alcohol consumption.

Neurologists usually lead acute-care stroke teams and direct patient care during hospitalization. They sometimes remain in charge of long-term rehabilitation. However, physicians trained in other specialties often assume responsibility after the acute stage has passed, including physiatrists, who specialize in physical medicine and rehabilitation.

Rehabilitation nurses
Nurses specializing in rehabilitation help survivors relearn how to carry out the basic activities of daily living. They also educate survivors about routine health care, such as how to follow a medication schedule, how to care for the skin, how to manage transfers between a bed and a wheelchair, and special needs for people with diabetes. Rehabilitation nurses also work with survivors to reduce risk factors that may lead to a second stroke, and provide training for caregivers.

Nurses are closely involved in helping stroke survivors manage personal care issues, such as bathing and controlling incontinence. Most stroke survivors regain their ability to maintain continence, often with the help of strategies learned during rehabilitation. These strategies include strengthening pelvic muscles through special exercises and following a timed voiding schedule. If problems with incontinence continue, nurses can help caregivers learn to insert and manage catheters and to take special hygienic measures to prevent other incontinence-related health problems from developing.

Physical therapists
Physical therapists specialize in treating disabilities related to motor and sensory impairments. They are trained in all aspects of anatomy and physiology related to normal function, with an emphasis on movement. They assess the stroke survivor’s strength, endurance, range of motion, gait abnormalities and sensory deficits to design individualized rehabilitation programs aimed at regaining control over motor functions.

Physical therapists help survivors regain the use of stroke-impaired limbs, teach compensatory strategies to reduce the effect of remaining deficits and establish ongoing exercise programs to help people retain their newly learned skills. Disabled people tend to avoid using impaired limbs, a behavior called learned non-use. However, the repetitive use of impaired limbs encourages brain plasticity and helps reduce disabilities.

Strategies used by physical therapists to encourage the use of impaired limbs include selective sensory stimulation such as tapping or stroking, active and passive range-of-motion exercises, and temporary restraint of healthy limbs while practicing motor tasks. Some physical therapists may use a new technology, transcutaneous electrical nerve stimulation (TENS), that encourages brain reorganization and recovery of function. TENS involves using a small probe that generates an electrical current to stimulate nerve activity in stroke-impaired limbs.
In general, physical therapy emphasizes practicing isolated movements, repeatedly changing from one kind of movement to another, and rehearsing complex movements that require a great deal of coordination and balance, such as walking up or down stairs or moving safely between obstacles. People too weak to bear their own weight can still practice repetitive movements during hydrotherapy (in which water provides sensory stimulation as well as weight support) or while being partially supported by a harness. A recent trend in physical therapy emphasizes the effectiveness of engaging in goal-directed activities, such as playing games, to promote coordination. Physical therapists frequently employ selective sensory stimulation to encourage use of impaired limbs and to help survivors with neglect regain awareness of stimuli on the neglected side of the body.

**Occupational and recreational therapists**

Like physical therapists, occupational therapists are concerned with improving motor and sensory abilities. They help survivors relearn skills needed for performing self-directed activities—occupations, such as personal grooming, preparing meals and housecleaning. Therapists can teach some survivors how to adapt to driving and provide on-road training. They often teach people to divide a complex activity into its component parts, practice each part and then perform the whole sequence of actions. This strategy can improve coordination and may help people with apraxia relearn how to carry out planned actions.

Occupational therapists also teach people how to develop compensatory strategies and how to change elements of their environment that limit activities of daily living. For example, people with the use of only one hand can substitute Velcro closures for buttons on clothing. Occupational therapists also help people make changes in their homes to increase safety, remove barriers and facilitate physical functioning, such as installing grab bars in bathrooms.

Recreational therapists help people with a variety of disabilities to develop and use their leisure time to enhance their health, independence and quality of life.

**Speech-language pathologists**

Speech-language pathologists help stroke survivors with aphasia relearn how to use language or develop alternative means of communication. They also help people improve their ability to swallow, and they work with patients to develop problem-solving and social skills needed to cope with the aftereffects of a stroke.

Many specialized therapeutic techniques have been developed to assist people with aphasia. Some forms of short-term therapy can improve comprehension rapidly. Intensive exercises such as repeating the therapist’s words, practicing following directions and doing reading or writing exercises form the cornerstone of language rehabilitation. Conversational coaching and rehearsal as well as the development of prompts or cues to help people remember specific words are sometimes beneficial. Speech-language pathologists also help stroke survivors develop strategies for circumventing language disabilities. These strategies can include the use of symbol boards or sign language. Recent advances in computer technology have spurred the development of new types of equipment to enhance communication.

Speech-language pathologists use noninvasive imaging techniques to study swallowing patterns of stroke survivors and identify the exact source of their impairment. Difficulties with swallowing have many possible causes, including a delayed swallowing reflex, an inability to manipulate food with the tongue or an inability to detect food remaining lodged in the cheeks after swallowing. When the cause has been pinpointed, speech-language pathologists work with the individual to devise strategies to overcome or minimize the deficit. Sometimes, simply changing body position and improving posture during eating can bring about improvement. The texture of foods can be modified to make swallowing easier; for example, thin liquids, which often cause choking, can be thickened. Changing eating habits by taking small bites and chewing slowly can also help alleviate dysphagia.

**Vocational therapists**

Approximately one-fourth of all strokes occur in people between the ages of 45 and 65. For most people in this age group, returning to work is a major concern. Vocational therapists perform many of the same functions that ordinary career counselors do. They can help people with residual disabilities identify vocational strengths and develop resumes that highlight those strengths. They also can help identify potential employers, assist in specific job searches and provide referrals to stroke vocational rehabilitation agencies.

Most important, vocational therapists educate disabled individuals about their rights and protections as defined by the Americans with Disabilities Act of 1990. This law requires employers to make “reasonable accommodations” for disabled employees. Vocational therapists frequently act as mediators between employers and employees to negotiate the provision of reasonable accommodations in the workplace.

**Where can a stroke patient get rehabilitation?**

Rehabilitation should begin as soon as a stroke patient is stable, often within 24 to 48 hours after a stroke. This first stage of rehabilitation usually occurs within an acute-care hospital. At the time of discharge from the hospital, the stroke patient and family coordinate with hospital social workers to locate a suitable living arrangement. Many stroke survivors return home, but some move into some type of medical facility.

**Inpatient rehabilitation units**

Inpatient facilities may be freestanding or part of larger hospital complexes. Patients stay in the facility, usually for two to three weeks, and engage in a coordinated, intensive program of rehabilitation. Such programs often involve at least three hours of active therapy a day, five or six days a week. Inpatient facilities offer a comprehensive range of medical services, including full-time physician supervision and access to the full range of therapists specializing in post-stroke rehabilitation.

**Outpatient units**

Outpatient facilities are often part of a larger hospital complex and provide access to physicians and the full range of therapists specializing in stroke rehabilitation. Patients typically spend several hours, often three days each week, at the facility taking part in coordinated therapy sessions and return home at night. Comprehensive outpatient facilities frequently offer treatment programs as intense as those of inpatient facilities, but they also can offer less demanding regimens, depending on the patient’s physical capacity.

**Nursing facilities**

Rehabilitative services available at nursing facilities are more variable than are those at inpatient and outpatient units. Skilled nursing facilities usually place a greater emphasis on rehabilitation, whereas traditional nursing homes emphasize residential care. In addition, fewer hours of therapy are offered compared to outpatient and inpatient rehabilitation units.

**Home-based rehabilitation programs**

Home rehabilitation allows for great flexibility so that patients can tailor their program of rehabilitation and follow individual schedules. Stroke survivors may participate in an intense level of therapy several hours per week or follow a less demanding regimen. These arrangements are often best suited for people who lack transportation or require treatment by only one type of rehabilitation therapist. Patients dependent on Medicare coverage for their rehabilitation must meet Medicare’s “homebound” requirements to qualify for such services; at this time, lack of transportation is not a valid reason for home therapy. The major disadvantage of home-based rehabilitation programs is the lack of specialized equipment. However, undergoing treatment at home gives people the advantage of practicing skills and developing compensatory strategies in the context of their own living environment.

**What research is being done?**

The National Institute of Neurological Disorders and Stroke (NINDS), a component of the federal government’s National Institutes of Health (NIH), has primary responsibility for sponsoring research on disorders of the brain and nervous system, including the acute phase of stroke and the restoration of function after stroke. The NINDS also supports research on ways to enhance repair and regeneration of the central nervous system. Scientists funded by the NINDS are studying how the brain responds to experience or adapts to injury by reorganizing its functions (plasticity).
by using noninvasive imaging technologies to map patterns of biological activity inside the brain. Other NINDS-sponsored scientists are looking at brain reorganization after stroke and determining whether specific rehabilitative techniques, such as constraint-induced movement therapy and transcranial magnetic stimulation, can stimulate brain plasticity, thereby improving motor function and decreasing disability. Other scientists are experimenting with implantation of neural stem cells, to see whether these cells may be able to replace the cells that died as a result of a stroke.

Where can I get more information?
For more information on neurological disorders or research programs funded by the National Institute of Neurological Disorders and Stroke, contact the Institute’s Brain Resources and Information Network (BRAIN) at:

**BRAIN**
P.O. Box 5801
Bethesda, MD 20824
(800) 352-9424
http://www.ninds.nih.gov

Organizations:
**American Stroke Association: A Division of the American Heart Association**
7272 Greenville Avenue
Dallas, TX 75231-4596
strokeinfo@heart.org
http://www.strokeassociation.org
Tel: 1-888-4STROKE (478-7653)
Fax: 214-706-5231

**National Stroke Association**
9707 East Easter Lane
Suite B
Centennial, CO 80112-3747
info@stroke.org
http://www.stroke.org
Tel: 303-649-9299 800-STROKES (787-6537)
Fax: 303-649-1328

**Easter Seals**
233 South Wacker Drive
Suite 2400
Chicago, IL 60606
info@easterseals.com
http://www.easterseals.com
Tel: 312-726-6200 800-221-6827
Fax: 312-726-1494

**National Aphasia Association**
350 Seventh Avenue
Suite 902
New York, NY 10001
naa@aphasia.org
http://www.aphasia.org
Tel: 212-267-2814 800-922-4NAA (4622)
Fax: 212-267-2812

**American Speech-Language-Hearing Association (ASHA)**
2200 Research Boulevard
Rockville, MD 20850
actioncenter@asha.org
https://asha.org
Tel: 800-638-8255
Fax: 301-571-0457

National Rehabilitation Information Center (NARIC)
8201 Corporate Drive
Suite 600
Landover, MD 20785
naricinfo@heitchservices.com
http://www.naric.com
Tel: 301-459-5900/301-459-5984 (TTY) 800-346-2742
Fax: 301-562-2401

**National initiatives**
Health care agencies and authorities have made public education about stroke a priority with national ad campaigns urging people to understand the urgent need to call 911 at the first signs of a stroke in themselves or others. They want people to understand that there is something that can be done to contain or even reverse damage from the dreaded event if they act quickly. Many research studies are under way to try new treatment strategies, including some to determine whether the window for thrombolytic treatment may be longer than three hours. New procedures and medication therapies are being tested.

Emergency responders are being trained in the procedures for handling suspected stroke patients, and physicians, nurses and other health care professionals are sharpening their skills to provide faster and better treatment for patients presenting with stroke symptoms.

The Paul Coverdale Stroke Registry
In 2001, Congress charged the Centers for Disease Control (CDC) with implementing state-based registries that measure and track acute stroke care and to use data from the registries in efforts to improve the quality of that care. Congress further directed that this project be named the Paul Coverdale National Acute Stroke Registry to memorialize the late U.S. Sen. Paul Coverdale of Georgia, who suffered a fatal stroke in 2000 while serving in Congress.

CDC, in consultation with stroke experts and organizations, piloted eight prototype registry projects led by academic and medical institutions across the country to test models for measuring the quality of care delivered to stroke patients. “Wave I” projects, funded in 2001, were located in Georgia, Massachusetts, Michigan, Minnesota, Ohio and North Carolina. “Wave II” projects, funded in 2002, were located in California, Illinois, North Carolina and Oregon. These prototype projects gathered data concerning each step of emergency and hospital care for stroke patients, from emergency response to the patients’ eventual discharge from a hospital. At the end of the three-year pilot period, the results showed that large gaps existed between generally recommended guidelines for treating stroke patients and actual hospital practices. Intensive quality improvement efforts are needed to close those gaps.

In June 2004, CDC provided funds to the state health departments of Georgia, Illinois, Massachusetts and North Carolina to establish statewide Coverdale stroke registries for acute care hospitals in their states. The purpose of these registries was to develop and implement systems for collecting data on acute stroke care provided to patients, analyze the collected data, and use the results of those analyses to guide quality improvement interventions at the hospital level through partnerships with hospital doctors, stroke-care teams and administrators. All acute care hospitals serving the general population in participating states were eligible for the program.

In the first year of program activities, states established partnerships with leading medical experts, various hospital associations, local affiliates of the American Hospital Association and other groups interested in improving health care for stroke patients; developed strategies for identifying and recruiting eligible hospitals; selected and implemented customized Web-based data-collection systems for hospital use; and recruited hospitals to participate in the registry. In the second and third years, states reviewed collected data to identify specific areas of need for quality improvement, worked with hospitals to implement quality improvement interventions to improve care, and evaluated progress toward improving statewide acute stroke care and promoting long-term systemic changes in how that care is provided. By the end of the 2004-2007 project period, more than 180 hospitals were participating in a stroke registry, and the percentages of total statewide stroke admissions treated by participating hospitals ranged from 40 percent to 79 percent among the four states.

In June 2007, CDC expanded funding to six state health departments in Georgia, Massachusetts, Michigan, Minnesota, Ohio and North Carolina for the Coverdale Registry for a new five-year funding period. Illinois will continue to participate in stroke quality improvement activities and provide information to CDC on its progress. In 2007, CDC also came to an agreement with The Joint Commission’s Primary Stroke Center Certification program and with the American Heart Association/American Stroke Association’s Get With The Guidelines – Stroke program to jointly release a set of standardized stroke performance measures and clinical practice guidelines for use by all three programs. This effort will reduce duplication, increase collaboration and encourage hospitals to participate in one or more of the programs. The National Quality Forum endorsed eight of these performance measures in 2008.

**Consensus Stroke Performance Measures**
Hospital performance measures for acute stroke care have been developed based on evidence from multiple clinical trials and in the peer-reviewed stroke literature. The Coverdale registry endorses these measures as a foundation of its work to improve quality of care:

**For hemorrhagic and ischemic stroke patients**
- Deep vein thrombosis prophylaxis by end of the second hospital day.
- Dysphagia screening.
- Assessment for rehabilitation.
Smoking cessation counseling (TIA patients also).
Stroke education (TIA patients also).

For ischemic stroke and TIA patients
- Anti-thrombotic therapy by end of day two and prescribed at discharge.
- Lipid-lowering therapy for patients with strokes of atherosclerotic origin with LDL 100.
- Anticoagulation for atrial fibrillation.
- Use of tPA intravenous thrombolytic therapy – a clot-busting medicine (ischemic stroke patients only).
- Statin medication prescribed on discharge.

The near-term goals of the Paul Coverdell National Acute Stroke Registry program are to:
- Increase the number of states with Coverdell stroke registries.
- Develop and disseminate best practices in hospital recruitment and training, data collection and quality improvement based on lessons learned.
- Encourage the development of statewide systems of care for stroke patients through coordination with emergency medical services and collaboration among statewide partners.
- Communicate with major stakeholders in stroke care to ensure ongoing improvement in the quality of that care.

The long-term goal of this program is to ensure that all Americans receive the highest quality of acute stroke care currently available and to reduce the number of untimely deaths attributable to stroke, prevent stroke-related disability and prevent stroke patients from suffering recurrent strokes.

In addition, the Joint Commission on Accreditation of Healthcare Organization, a nonprofit, independent organization whose primary purpose is to provide voluntary accreditation for health care facilities, in 2003 began a program to provide primary stroke care certification to hospitals. The program was based upon recommendations for primary stroke centers and the American Stroke Center’s statements/guidelines for stroke care. A list of facilities that have earned the primary stroke center accreditation can be accessed at the Joint Commission’s website (http://www.qualitycheck.org/consumer/searchQCR.aspx). Use the “advanced” button to check by city or Zip Code for health care facilities with specialty programs and designations.

Conclusion
Strokes have long devastated lives, and they still do. But finally, there is some hope for those who suffer its effects. An effective treatment is now available for some people, and heightened awareness of that and the need to quickly seek aid when a stroke occurs should mean more people will not only survive a stroke, but also see many of its effects curtailed or reversed. The work will continue as researchers seek more and better treatments for stroke. Health care officials will continue to push the message that healthier choices make for a healthier person. And perhaps fewer and fewer people will hear the dreaded news that a loved one has suffered a stroke – or at least the news won’t seem quite so hopeless.

Glossary

**Acute stroke** – a stage of stroke starting at the onset of symptoms and lasting for a few hours thereafter.

**Agnosia** – a cognitive disability characterized by ignorance of or inability to acknowledge one side of the body or one side of the visual field.

**Aneurysm** – a weak or thin spot on an artery wall that has stretched or ballooned out from the wall and filled with blood, or damage to an artery leading to pooling of blood between the layers of the blood vessel walls.

**Anoxia** – a state of almost no oxygen delivery to a cell, resulting in low energy production and possible death of the cell; see hypoxia.

**Anticoagulants** – a drug therapy used to prevent the formation of blood clots that can become lodged in cerebral arteries and cause strokes.

**Anti-platelet agents** – a type of anticoagulant drug therapy that prevents the formation of blood clots by preventing the accumulation of platelets that form the basis of blood clots; some common anti-platelets include aspirin and ticlopidine; see anticoagulants.

**Anti-thrombotics** – a type of anticoagulant drug therapy that prevents the formation of blood clots by inhibiting the coagulating actions of the blood protein thrombin; some common anti-thrombotics include warfarin and heparin; see anticoagulants.

**Aphasia** – the inability to understand or create speech, writing or language in general due to damage to the speech centers of the brain.

**Apoplexy** – a historical, but obsolete term for a cerebral stroke, most often intracerebral hemorrhage, that was applied to any condition that involved disorientation and/or paralysis.

**Apoptosis** – a form of cell death involving shrinking of the cell and eventual disposal of the internal elements of the cell by the body’s immune system. Apoptosis is an active, non-toxic form of cell suicide that does not induce an inflammatory response. It is often called programmed cell death because it is triggered by a genetic signal, involves specific cell mechanisms and is irreversible once initiated.

**Apraxia** – a movement disorder characterized by the inability to perform skilled or purposeful voluntary movements, generally caused by damage to the areas of the brain responsible for voluntary movement.

**Arteriography** – an X-ray of the carotid artery taken when a special dye is injected into the artery.

**Arteriovenous malformation (AVM)** – a congenital disorder characterized by a complex tangled web of arteries and veins.

**Atherosclerosis** – a blood vessel disease characterized by deposits of lipid material on the inside of the walls of large to medium-sized arteries that make the artery walls thick, hard, brittle, and prone to breaking.

**Atrial fibrillation** – irregular beating of the left atrium, or left upper chamber, of the heart.

**Blood-brain barrier** – an elaborate network of supportive brain cells, called glia, that surrounds blood vessels and protects neurons from the toxic effects of direct exposure to blood.

**Carotid artery** – an artery located on either side of the neck that supplies the brain with blood.

**Carotid endarterectomy** – surgery used to remove fatty deposits from the carotid arteries.

**Central stroke pain (central pain syndrome)** – pain caused by damage to an area in the thalamus. The pain is a mixture of sensations, including heat and cold, burning, tingling, numbness, and sharp stabbing and underlying aching pain.

**Cerebral blood flow (CBF)** – the flow of blood through the arteries that lead to the brain, called the cerebrovascular system.

**Cerebrospinal fluid (CSF)** – clear fluid that bathes the brain and spinal cord.

**Cerebrovascular disease** – a reduction in the supply of blood to the brain either by narrowing of the arteries through the buildup of plaque on the inside walls of the arteries, called stenosis, or through blockage of an artery due to a blood clot.

**Cholesterol** – a waxy substance, produced naturally by the liver and also found in foods, that circulates in the blood and helps maintain tissues and cell membranes. Excess cholesterol in the body can contribute to atherosclerosis and high blood pressure.

“**Clipping**” – surgical procedure for treatment of brain aneurysms, involving clamping an aneurysm from a blood vessel, surgically removing this ballooned part of the blood vessel, and closing the opening in the artery wall.

**Computed tomography (CT) scan** – a series of cross-sectional X-rays of the brain and head; also called computerized axial tomography or CAT scan.

**Coumadin®** – a commonly used anticoagulant, also known as warfarin.

**Cytokines** – small, hormone-like proteins released by leukocytes, endothelial cells and other cells to promote an inflammatory immune response to an injury.

**Cytotoxic edema** – a state of cell compromise involving influx of fluids and toxic chemicals into a cell, causing subsequent swelling of the cell.

**Detachable coil** – a platinum coil that is inserted into an artery in the thigh and strung through the arteries to the site of an aneurysm. The coil is released into the aneurysm creating an immune response from the body. The body produces a blood clot inside the aneurysm, strengthening the artery walls and reducing the risk of rupture.
Duplex Doppler ultrasound – a diagnostic imaging technique in which an image of an artery can be formed by bouncing sound waves off the moving blood in the artery and measuring the frequency changes of the echoes.

Dysarthria – a disorder characterized by slurred speech due to weakness or incoordination of the muscles involved in speaking.

Dysphagia – trouble swallowing.

Edema – the swelling of a cell that results from the influx of large amounts of water or fluid into the cell.

Embolic stroke – a stroke caused by an embolus.

Emboli – a free-roaming clot that usually forms in the heart.

Endothelial wall – a flat layer of cells that make up the innermost lining of a blood vessel.

Excitatory amino acids – a subset of neurotransmitters; proteins released by one neuron into the space between two neurons to promote an excitatory state in the other neuron.

Extracranial/intracranial (EC/IC) bypass – a type of surgery that restores blood flow to a blood-deprived area of brain tissue by rerouting a healthy artery in the scalp to the area of brain tissue affected by a blocked artery.

Functional magnetic resonance imaging (FMRI) – a type of imaging that measures increases in blood flow within the brain.

Glia – also called neuroglia; supportive cells of the nervous system that make up the blood-brain barrier, provide nutrients and oxygen to the vital neurons, and protect the neurons from infection, toxicity and trauma. Some examples of glia are oligodendroglia, astrocytes and microglia.

Glutamate – also known as glutamic acid, an amino acid that acts as an excitatory neurotransmitter in the brain.

Hemiparesis – weakness on one side of the body.

Hemiplegia – complete paralysis on one side of the body.

Hemorrhagic stroke – sudden bleeding into or around the brain.

Heparin – a type of anticoagulant.

High-density lipoprotein (HDL) – also known as the good cholesterol; a compound consisting of a lipid and a protein that carries a small percentage of the total cholesterol in the blood and deposits it in the liver.

Homeostasis – a state of equilibrium or balance among various fluids and chemicals in a cell, in tissues, or in the body as a whole.

Hypertension (high blood pressure) – characterized by persistently high arterial blood pressure defined as a measurement greater than or equal to 140 mm/Hg systolic pressure over 90 mm/Hg diastolic pressure.

Hypoxia – a state of decreased oxygen delivery to a cell so that the oxygen falls below normal levels; see anoxia.

Incidence – the extent or frequency of an occurrence; the number of specific new events in a given period of time.

Infarct – an area of tissue that is dead or dying because of a loss of blood supply.

Infarction – a sudden loss of blood supply to tissue, causing the formation of an infarct.

Interleukins – a group of cytokine-related proteins secreted by leukocytes and involved in the inflammatory immune response of the ischemic cascade.

Intracerebral hemorrhage – occurs when a vessel within the brain leaks blood into the brain.

Ischemia – a loss of blood flow to tissue, caused by an obstruction of the blood vessel, usually in the form of plaque stenosis or a blood clot.

Ischemic cascade – a series of events lasting for several hours to several days following initial ischemia that results in extensive cell death and tissue damage beyond the area of tissue originally affected by the initial lack of blood flow.

Ischemic penumbra – areas of damaged, but still living, brain cells arranged in a patchwork pattern around areas of dead brain cells.

Ischemic stroke – ischemia in the tissues of the brain.

Lacunar infarction – occlusion of a small artery in the brain resulting in a small area of dead brain tissue, called a lacunar infarct; often caused by stenosis of the small arteries, called small vessel disease.

Large vessel disease – stenosis in large arteries of the cerebrovascular system.

Leukocytes – blood proteins involved in the inflammatory immune response of the ischemic cascade.

Lipoprotein – small globules of cholesterol covered by a layer of protein; produced by the liver.

Low-density lipoprotein (LDL) – also known as the bad cholesterol; a compound consisting of a lipid and a protein that carries the majority of the total cholesterol in the blood and deposits the excess along the inside wall of arterial walls.

Magnetic resonance angiography (MRA) – an imaging technique involving injection of a contrast dye into a blood vessel and using magnetic resonance techniques to create an image of the flowing blood through the vessel; often used to detect stenosis of the brain arteries inside the skull.

Magnetic resonance imaging (MRI) scan – a type of imaging involving the use of magnetic fields to detect subtle changes in the water content of tissues.

Mitochondria – the energy producing organelles of the cell.

Mitral annular calcification – a disease of the mitral valve of the heart.

Mitral valve stenosis – a disease of the mitral heart valve involving the buildup of plaque-like material on and around the valve.

Necrosis – a form of cell death resulting from anoxia, trauma or any other form of irreversible damage to the cell; involves the release of toxic cellular material into the intercellular space, poisoning surrounding cells.

Neuron – the main functional cell of the brain and nervous system, consisting of a cell body, an axon and dendrites.

Neuroprotective agents – medications that protect the brain from secondary injury caused by stroke.

Oxygen-free radicals – toxic chemicals released during the process of cellular respiration and released in excessive amounts during necrosis of a cell; involved in secondary cell death associated with the ischemic cascade.

Plaque – fatty cholesterol deposits found along the inside of artery walls that lead to atherosclerosis and stenosis of the arteries.

Plasticity – the ability to be formed or molded; in reference to the brain, the ability to adapt to deficits and injury.

Platelets – structures found in blood that are known primarily for their role in blood coagulation.

Prevalence – the number of cases of a disease in a population at any given point in time.

Recombinant tissue plasminogen activator (rtPA) – a genetically engineered form of tPA, a thrombolytic, anti-clotting substance made naturally by the body.

Small vessel disease – a cerebrovascular disease defined by stenosis in small arteries of the brain.

Stenosis – narrowing of an artery due to the buildup of plaque on the inside wall of the artery.

Stroke Belt – an area of the Southeastern United States with the highest stroke mortality rate in the country.

Stroke buckle – three Southeastern states, North Carolina, South Carolina and Georgia, that have an extremely high stroke mortality rate.

Subarachnoid hemorrhage – bleeding within the meninges, or outer membranes, of the brain into the clear fluid that surrounds the brain.

Thrombolytics – drugs used to treat an ongoing, acute ischemic stroke by dissolving the blood clot causing the stroke and thereby restoring blood flow through the artery.

Thrombosis – the formation of a blood clot in one of the cerebral arteries of the head or neck that stays attached to the artery wall until it grows large enough to block blood flow.

Thrombotic stroke – a stroke caused by thrombosis.
Tissue necrosis factors – chemicals released by leukocytes and other cells that cause secondary cell death during the inflammatory immune response associated with the ischemic cascade.

Total serum cholesterol – a combined measurement of a person’s high-density lipoprotein (HDL) and low-density lipoprotein (LDL).

tPA – see recombinant tissue plasminogen activator.

Transcranial magnetic stimulation (TMS) – a small magnetic current delivered to an area of the brain to promote plasticity and healing.

Transient ischemic attack (TIA) – a short-lived stroke that lasts from a few minutes up to 24 hours; often called a mini-stroke.

Vasodilators – medications that increase blood flow to the brain by expanding or dilating blood vessels.

Vasospasm – a dangerous side effect of subarachnoid hemorrhage in which the blood vessels in the subarachnoid space constrict erratically, cutting off blood flow.

Vertebral artery – an artery on either side of the neck; see carotid artery.

Warfarin – a commonly used anticoagulant, also known as Coumadin®.

APPENDIX

The ischemic cascade

The brain is the most complex organ in the human body. It contains hundreds of billions of cells that interconnect to form a complex network of communication. The brain has several different types of cells, the most important of which are neurons. The organization of neurons in the brain and the communication that occurs among them lead to thought, memory, cognition and awareness. Other types of brain cells are generally called glia (from the Greek word meaning “glue”). These supportive cells of the nervous system provide scaffolding and support for the vital neurons, protecting them from infection, toxins and trauma. Glia make up the blood-brain barrier between blood vessels and the substance of the brain.

Stroke is the sudden onset of paralysis caused by injury to brain cells from disruption in blood flow. The injury caused by a blocked blood vessel can occur within several minutes and progress for hours as the result of a chain of chemical reactions that is set off after the start of stroke symptoms. Physicians and researchers often call this chain of chemical reactions that lead to the permanent brain injury of stroke the ischemic cascade.

Primary cell death

In the first stage of the ischemic cascade, blood flow is cut off from a part of the brain (ischemia). This leads to a lack of oxygen (anoxia) and lack of nutrients in the cells of this core area. When the lack of oxygen becomes extreme, the mitochondria, the energy-producing structures within the cell, can no longer produce enough energy to keep the cell functioning. The mitochondria break down, releasing toxic chemicals called oxygen-free radicals into the cytoplasm of the cell. These toxins poison the cell from the inside-out, causing destruction of other cell structures, including the gated channels of the cell membrane that normally maintain homeostasis to open and allow toxic amounts of calcium, sodium and potassium ions to flow into the cell. At the same time, the injured ischemic cell releases excitatory amino acids, such as glutamate, into the space between neurons, leading to overexcitation and injury to nearby cells. With the loss of homeostasis, water rushes into the cell making it swell (called cytotoxic edema) until the cell membrane bursts under the internal pressure. At this point the nerve cell is essentially permanently injured and for all purposes dead (necrosis and infarction). After a stroke starts, the first cells that are going to die may die within four to five minutes. The response to the treatment that restores blood flow as late as 2 hours after stroke onset would suggest that, in most cases, the process is not over for at least 2 to 3 hours. After that, with rare exceptions, most of the injury that has occurred is essentially permanent.

Secondary cell death

Because of exposure to excessive amounts of glutamate, nitric oxide, free radicals and excitatory amino acids released into the intercellular space by necrotic cells, nearby cells have a more difficult time surviving. They are receiving just enough oxygen from cerebral blood flow (CBF) to stay alive. A compromised cell can survive for several hours in a low-energy state. If blood flow is restored within this narrow window of opportunity, at present thought to be about two hours, then some of these cells can be salvaged and become functional again. Researchers have learned that restoring blood flow to these cells can be achieved by administrating the clot-dissolving thrombolytic agent tPA within three hours of the start of the stroke.

Inflammation and the immune response

While anoxic and necrotic brain cells are doing damage to still viable brain tissue, the immune system of the body is injuring the brain through an inflammatory reaction mediated by the vascular system. Damage to the blood vessel at the site of a blood clot or hemorrhage attracts inflammatory blood elements to that site. Among the first blood elements to arrive are leukocytes, white blood cells that are covered with immune system proteins that attach to the blood vessel wall at the site of the injury. After they attach, the leukocytes penetrate the endothelial wall, move through the blood-brain barrier and invade the substance of the brain, causing further injury and brain cell death. Leukocytes called monocytes and macrophages release inflammatory chemicals (cytokines, interleukins, and tissue necrosis factors) at the site of the injury. These chemicals make it harder for the body to naturally dissolve a clot that has caused a stroke by inactivating anti-clotting factors and inhibiting the release of natural tissue plasminogen activator. NINDS researchers are currently working to create interventional therapies that will inhibit the effects of cytokines and other chemicals in the inflammatory process during stroke.

These brain cells survive the loss of blood flow (ischemia) but are not able to function. These areas of still-viable brain cells exist in a patchwork pattern within and around the area of dead brain tissue (also called an infarct).

NIH stroke scale

(On the following pages)
NIH STROKE SCALE

Patient Identification __ __ - __ __ ___ - __ __ ___ - __ __ ___ - __ __
Pt. Date of Birth __ __ / __ __ / __ __
Hospital ____________________( ___ - ___ )
Date of Exam __ __ / __ __ / __ __

Interval: [ ] Baseline [ ] 2 hours post treatment [ ] 24 hours post onset of symptoms +20 minutes [ ] 7 - 10 days
[ ] 3 months [ ] Other_________________________ ( ___ - ___ )

Time: __ __ : __ __ [ ] am [ ] pm

Person Administering Scale ___________________________________________________________________

Administer stroke scale items in the order listed. Record performance in each category after each subscale exam. Do not go back and change scores. Follow directions provided for each exam technique. Scores should reflect what the patient does, not what the clinician thinks the patient can do. The clinician should record answers while administering the exam and work quickly. Except where indicated, the patient should not be coached (i.e., repeated requests to patient to make a special effort).

<table>
<thead>
<tr>
<th>Instructions</th>
<th>Scale Definition</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1a. Level of Consciousness:</strong> The investigator must choose a response if a full evaluation is prevented by such obstacles as an endotracheal tube, language barrier, orotracheal trauma/bandages. A 3 is scored only if the patient makes no movement (other than reflexive posturing) in response to noxious stimulation.</td>
<td>0 = <strong>Alert</strong>; keenly responsive. 1 = <strong>Not alert</strong>; but arousable by minor stimulation to obey, answer, or respond. 2 = <strong>Not alert</strong>; requires repeated stimulation to attend, or is obtunded and requires strong or painful stimulation to make movements (not stereotyped). 3 = Responds only with reflex motor or autonomic effects or totally unresponsive, flaccid, and areflexic.</td>
<td>______</td>
</tr>
<tr>
<td><strong>1b. LOC Questions:</strong> The patient is asked the month and his/her age. The answer must be correct - there is no partial credit for being close. Aphasic and stuporous patients who do not comprehend the questions will score 2. Patients unable to speak because of endotracheal intubation, orotracheal trauma, severe dysarthria from any cause, language barrier, or any other problem not secondary to aphasia are given a 1. It is important that only the initial answer be graded and that the examiner not “help” the patient with verbal or non-verbal cues.</td>
<td>0 = <strong>Answers</strong> both questions correctly. 1 = <strong>Answers</strong> one question correctly. 2 = <strong>Answers</strong> neither question correctly.</td>
<td>______</td>
</tr>
<tr>
<td><strong>1c. LOC Commands:</strong> The patient is asked to open and close the eyes and then to grip and release the non-paretic hand. Substitute another one step command if the hands cannot be used. Credit is given if an unequivocal attempt is made but not completed due to weakness. If the patient does not respond to command, the task should be demonstrated to him or her (pantomime), and the result scored (i.e., follows none, one or two commands). Patients with trauma, amputation, or other physical impediments should be given suitable one-step commands. Only the first attempt is scored.</td>
<td>0 = <strong>Performs</strong> both tasks correctly. 1 = <strong>Performs</strong> one task correctly. 2 = <strong>Performs</strong> neither task correctly.</td>
<td>______</td>
</tr>
<tr>
<td><strong>2. Best Gaze:</strong> Only horizontal eye movements will be tested. Voluntary or reflexive (oculocephalic) eye movements will be scored, but caloric testing is not done. If the patient has a conjugate deviation of the eyes that can be overcome by voluntary or reflexive activity, the score will be 1. If a patient has an isolated peripheral nerve paresis (CN III, IV or VI), score a 1. Gaze is testable in all aphasic patients. Patients with ocular trauma, bandages, pre-existing blindness, or other disorder of visual acuity or fields should be tested with reflexive movements, and a choice made by the investigator. Establishing eye contact and then moving about the patient from side to side will occasionally clarify the presence of a partial gaze palsy.</td>
<td>0 = <strong>Normal</strong>. 1 = <strong>Partial gaze palsy</strong>; gaze is abnormal in one or both eyes, but forced deviation or total gaze paresis is not present. 2 = <strong>Forced deviation</strong>, or total gaze paresis not overcome by the oculocephalic maneuver.</td>
<td>______</td>
</tr>
</tbody>
</table>

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NIH STROKE SCALE

Interval: [ ] Baseline [ ] 2 hours post treatment [ ] 24 hours post onset of symptoms +20 minutes [ ] 7 - 10 days [ ] 3 months [ ] Other ___________________________ ( ___ )

3. Visual: Visual fields (upper and lower quadrants) are tested by confrontation, using finger counting or visual threat, as appropriate. Patients may be encouraged, but if they look at the side of the moving fingers appropriately, this can be scored as normal. If there is unilateral blindness or enucleation, visual fields in the remaining eye are scored. Score 1 only if a clear-cut asymmetry, including quadrantanopia, is found. If patient is blind from any cause, score 3. Double simultaneous stimulation is performed at this point. If there is extinction, patient receives a 1, and the results are used to respond to item 11.

<table>
<thead>
<tr>
<th>Score</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>No visual loss.</td>
</tr>
<tr>
<td>1</td>
<td>Partial hemianopia.</td>
</tr>
<tr>
<td>2</td>
<td>Complete hemianopia.</td>
</tr>
<tr>
<td>3</td>
<td>Bilateral hemianopia (blind including cortical blindness).</td>
</tr>
</tbody>
</table>

4. Facial Palsy: Ask – or use pantomime to encourage – the patient to show teeth or raise eyebrows and close eyes. Score symmetry of grimace in response to noxious stimuli in the poorly responsive or non-comprehending patient. If facial trauma/bandages, orotracheal tube, tape or other physical barriers obscure the face, these should be removed to the extent possible.

<table>
<thead>
<tr>
<th>Score</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Normal symmetrical movements.</td>
</tr>
<tr>
<td>1</td>
<td>Minor paralysis (flattened nasolabial fold, asymmetry on smiling).</td>
</tr>
<tr>
<td>2</td>
<td>Partial paralysis (total or near-total paralysis of lower face).</td>
</tr>
<tr>
<td>3</td>
<td>Complete paralysis of one or both sides (absence of facial movement in the upper and lower face).</td>
</tr>
</tbody>
</table>

5. Motor Arm: The limb is placed in the appropriate position: extend the arms (palms down) 90 degrees (if sitting) or 45 degrees (if supine). Drift is scored if the arm falls before 10 seconds. The aphasic patient is encouraged using urgency in the voice and pantomime, but not noxious stimulation. Each limb is tested in turn, beginning with the non-paretic arm. Only in the case of amputation or joint fusion at the shoulder, the examiner should record the score as untestable (UN), and clearly write the explanation for this choice.

<table>
<thead>
<tr>
<th>Score</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>No drift; limb holds 90 (or 45) degrees for full 10 seconds.</td>
</tr>
<tr>
<td>1</td>
<td>Drift; limb holds 90 (or 45) degrees, but drifts down before full 10 seconds; does not hit bed or other support.</td>
</tr>
<tr>
<td>2</td>
<td>Some effort against gravity; limb cannot get to or maintain (if cued) 90 (or 45) degrees, drifts down to bed, but has some effort against gravity.</td>
</tr>
<tr>
<td>3</td>
<td>No effort against gravity; limb falls.</td>
</tr>
<tr>
<td>4</td>
<td>No movement.</td>
</tr>
</tbody>
</table>

UN = Amputation or joint fusion, explain: ____________

5a. Left Arm

5b. Right Arm

6. Motor Leg: The limb is placed in the appropriate position: hold the leg at 30 degrees (always tested supine). Drift is scored if the leg falls before 5 seconds. The aphasic patient is encouraged using urgency in the voice and pantomime, but not noxious stimulation. Each limb is tested in turn, beginning with the non-paretic leg. Only in the case of amputation or joint fusion at the hip, the examiner should record the score as untestable (UN), and clearly write the explanation for this choice.

<table>
<thead>
<tr>
<th>Score</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>No drift; leg holds 30-degree position for full 5 seconds.</td>
</tr>
<tr>
<td>1</td>
<td>Drift; leg falls by the end of the 5-second period but does not hit bed.</td>
</tr>
<tr>
<td>2</td>
<td>Some effort against gravity; leg falls to bed by 5 seconds, but has some effort against gravity.</td>
</tr>
<tr>
<td>3</td>
<td>No effort against gravity; leg falls to bed immediately.</td>
</tr>
<tr>
<td>4</td>
<td>No movement.</td>
</tr>
</tbody>
</table>

UN = Amputation or joint fusion, explain: ____________

6a. Left Leg

6b. Right Leg

Rev 10/1/2003
### Strokes Scale

**7. Limb Ataxia:** This item is aimed at finding evidence of a unilateral cerebellar lesion. Test with eyes open. In case of visual defect, ensure testing is done in intact visual field. The finger-nose and heel-shin tests are performed on both sides, and ataxia is scored only if present out of proportion to weakness. Ataxia is absent in the patient who cannot understand or is paralyzed. Only in the case of amputation or joint fusion, the examiner should record the score as untestable (UN), and clearly write the explanation for this choice. In case of blindness, test by having the patient touch nose from extended arm position.

<table>
<thead>
<tr>
<th>Score</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Absent</td>
</tr>
<tr>
<td>1</td>
<td>Present in one limb</td>
</tr>
<tr>
<td>2</td>
<td>Present in two limbs</td>
</tr>
</tbody>
</table>

UN = Amputation or joint fusion, explain:_____________________________

**8. Sensory:** Sensation or grimace to pinprick when tested, or withdrawal from noxious stimulus in the obtunded or aphasic patient. Only sensory loss attributed to stroke is scored as abnormal and the examiner should test as many body areas (arms [not hands], legs, trunk, face) as needed to accurately check for hemisensory loss. A score of 2, “severe or total sensory loss,” should only be given when a severe or total loss of sensation can be clearly demonstrated. Stuporous and aphasic patients will, therefore, probably score 1 or 0. The patient with brainstem stroke who has bilateral loss of sensation is scored 2. If the patient does not respond and is quadriplegic, score 2. Patients in a coma (item 1a=3) are automatically given a 2 on this item.

<table>
<thead>
<tr>
<th>Score</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Normal; no sensory loss</td>
</tr>
<tr>
<td>1</td>
<td>Mild-to-moderate sensory loss; patient feels pinprick is less sharp or is dull on the affected side; or there is a loss of superficial pain with pinprick, but patient is aware of being touched.</td>
</tr>
<tr>
<td>2</td>
<td>Severe to total sensory loss; patient is not aware of being touched in the face, arm, and leg.</td>
</tr>
</tbody>
</table>

**9. Best Language:** A great deal of information about comprehension will be obtained during the preceding sections of the examination. For this scale item, the patient is asked to describe what is happening in the attached picture, to name the items on the attached naming sheet and to read from the attached list of sentences. Comprehension is judged from responses here, as well as to all of the commands in the preceding general neurological exam. If visual loss interferes with the tests, ask the patient to identify objects placed in the hand, repeat, and produce speech. The intubated patient should be asked to write. The patient in a coma (item 1a=3) will automatically score 3 on this item. The examiner must choose a score for the patient with stupor or limited cooperation, but a score of 3 should be used only if the patient is mute and follows no one-step commands.

<table>
<thead>
<tr>
<th>Score</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>No aphasia; normal</td>
</tr>
<tr>
<td>1</td>
<td>Mild-to-moderate aphasia; some obvious loss of fluency or facility of comprehension, without significant limitation on ideas expressed or form of expression. Reduction of speech and/or comprehension, however, makes conversation about provided materials difficult or impossible. For example, in conversation about provided materials, examiner can identify picture or naming card content from patient’s response.</td>
</tr>
<tr>
<td>2</td>
<td>Severe aphasia; all communication is through fragmentary expression; great need for inference, questioning, and guessing by the listener. Range of information that can be exchanged is limited; listener carries burden of communication. Examiner cannot identify materials provided from patient response.</td>
</tr>
<tr>
<td>3</td>
<td>Mute, global aphasia; no usable speech or auditory comprehension.</td>
</tr>
</tbody>
</table>

**10. Dysarthria:** If patient is thought to be normal, an adequate sample of speech must be obtained by asking patient to read or repeat words from the attached list. If the patient has severe aphasia, the clarity of articulation of spontaneous speech can be rated. Only if the patient is intubated or has other physical barriers to producing speech, the examiner should record the score as untestable (UN), and clearly write an explanation for this choice. Do not tell the patient why he or she is being tested.

<table>
<thead>
<tr>
<th>Score</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Normal</td>
</tr>
<tr>
<td>1</td>
<td>Mild-to-moderate dysarthria; patient slurs at least some words and, at worst, can be understood with some difficulty.</td>
</tr>
<tr>
<td>2</td>
<td>Severe dysarthria; patient’s speech is so slurred as to be unintelligible in the absence of or out of proportion to any dysphasia, or is mute/anarthric.</td>
</tr>
</tbody>
</table>

UN = Intubated or other physical barrier, explain:_____________________________
Interval: [ ] Baseline [ ] 2 hours post treatment [ ] 24 hours post onset of symptoms +20 minutes [ ] 7 - 10 days [ ] 3 months [ ] Other [ ]_

11. Extinction and Inattention (formerly Neglect): Sufficient information to identify neglect may be obtained during the prior testing. If the patient has a severe visual loss preventing visual double simultaneous stimulation, and the cutaneous stimuli are normal, the score is normal. If the patient has aphasia does appear to attend to both sides, the score is normal. The presence of visual spatial neglect or anosagnosia may also be taken as evidence of abnormality. Since the abnormality is scored only if present, the item is never unstable.

0 = No abnormality.

1 = Visual, tactile, auditory, spatial, or personal inattention or extinction to bilateral simultaneous stimulation in one of the sensory modalities.

2 = Profound hemi-inattention or extinction to both modalities; does not recognize own hand or orients to only one side of space.

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NOTES

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REFERENCES


1. Cardiovascular disease is the leading cause of death worldwide and has been the leading cause of death since 1900 in the United States.
   - True  False

2. Cardiovascular diseases are mainly caused by a buildup of plaque (atherosclerosis) inside the coronary arteries.
   - True  False

3. Premature (extra) heart beats are dangerous and require immediate treatment.
   - True  False

4. For persons older than 50, a high systolic blood pressure is much less of an important cardiovascular disease factor than diastolic blood pressure.
   - True  False

5. The best way to prevent cardiovascular disease is to exercise, don’t smoke and eat a healthy diet.
   - True  False

6. Computed tomography (CT or CAT scan) is of little use in diagnosing strokes.
   - True  False

7. The thrombolytic drug tPA can be used for all strokes if administered quickly enough.
   - True  False

8. Of all the risk factors that contribute to stroke, the most powerful is hypertension.
   - True  False

9. Acute ischemic stroke comprises about 80 percent of cerebrovascular accidents.
   - True  False

10. Early mobilization of a patient after a stroke is discouraged.
    - True  False
CHAPTER 2
GERIATRIC ASSESSMENT
(12 CONTACT HOURS)

Learning objectives

- Discuss demographics related to the geriatric population.
- Perform a “first glance” assessment.
- Review the importance of providing culturally appropriate care.
- Assess the nutritional status of the geriatric patient.
- Offer the geriatric patient practical medication regimens in the older adult.
- Describe changes in vision, hearing and sensation that affect the aging adult.
- Describe normal age-related changes in the integumentary system.
- Identify common health problems related to cardiovascular functioning.
- Identify lung disorders commonly found in older patients.
- Identify important aspects of assessment of the endocrine system.
- Explain the ways age influences hematologic function.
- Recognize common health problems of the nervous system in the older adult.
- Review age-related issues of the genitourinary system.
- Assess the musculoskeletal system of the geriatric patient.
- Recognize age-related immune system deficiencies related to the aging process.

Introduction

The needs of persons over the age of 65 will continue to place significant demands on the health care system for the foreseeable future. In 2009, it was estimated that nearly 13 percent of the population of the United States was over the age of 65.10 The number of adults living into late adulthood is increasing dramatically. It is predicted that by 2050, the number of people over the age of 60 in developed countries will reach 416 million. According to the World Health Organization, the fastest-growing segment of this population is persons 80 years of age and older.6

Older adults often have one or more chronic illnesses or conditions, such as urinary incontinence, dementia, cardiovascular disease and diabetes mellitus. In fact, nearly 80 percent of older adults have one or more chronic health problems.1 Although older adults make up the majority of those who use health care services, most are able to live independently in the community. This means, however, that nurses must be quite knowledgeable in the delivery of geriatric services in both inpatient and outpatient settings, including such services as preventive care, risk identification, patient education and promotion of maximum health and wellness.

The health care demands of a dramatically aging population require a workforce of nurses skilled in geriatrics. As a result, there has been a significant increase in the amount and depth of gerontological nursing content in baccalaureate schools of nursing during the past 15 years.1 There is a corresponding need for continuing education on gerontological nursing for licensed professionals and nursing assistants. Nurses play a critical role in helping older adults to effectively manage health problems, create and maintain safe and healthy living environments, and live lives of dignity and quality.1 One of the most important ways nurses can do this is to perform a thorough assessment of their geriatric patients. Such assessments require that nurses be astute observers and excellent communicators.

Assessment at first glance

Assessment begins with your first glimpse of the patient. So many things can be observed in these first few moments. Start with the patient’s appearance. How is the patient dressed? Is the clothing appropriate for the time of year and the weather? Are clothes neat and clean? Do they fit properly? Is the patient clean? Do you smell any unusual odors such as urine, which may indicate incontinence problems, or sweat, which may indicate lack of hygiene? Are the patient’s hands and fingernails clean? Is there any evidence of unusual bruising or injury such as lacerations, scars or burn marks?

At first glance, what is the patient’s mobility status? Is he ambulating independently or does he require assistance? Does the patient use any assistive devices such as a cane or a walker? Observe the quality of his gait. Is balance maintained without difficulty? Are movements of all extremities without tremors?

How does the patient respond to the nurse’s initial greeting? Is the response appropriate? Does the patient speak clearly and distinctly? Are his facial features symmetrical? If not, what abnormalities are present? (For example, is one side of the face drooping or is one eyelid drooping?) Is the patient oriented to person, place and time? Does he maintain eye contact (if culturally appropriate)? Is he able to respond to simple questions such as “How are you feeling today?”

Does the patient wear glasses? Does he seem able to see his surroundings without difficulty? Can the patient hear what you are saying, assuming you are speaking clearly and distinctly and in a normal tone of voice? Does the patient wear hearing aids?

Is the patient alone or is he accompanied by a family member or friend? Observe the interaction between the patient and whoever accompanies him. Does the patient seem comfortable with this companion? Do they interact appropriately? Does the patient give any indication that he is intimidated by his companion?

What, briefly, is the patient’s health history? For example, is there a history of heart attack, stroke, diabetes, other conditions? What medications is the patient taking?

What is the patient’s cultural and ethnic background? Is English his first language? If not, how well is the patient able to communicate in English? Will an interpreter need to be present during the assessment to facilitate communication?

Remember that you need to adapt your communication to the specific needs of the geriatric patient. Never assume that because a patient is elderly that he will be unable or unwilling to participate actively in his health care regimen. Communicate directly with the patient whenever possible. Don’t bypass him or belittle him by talking to family or friends instead. Make sure that, if needed, he has his glasses on and hearing aids in place. And always let him know exactly what you are doing during assessment.1

Ask patients how they would like to be addressed. Ask if you may call them by their first names or if they would prefer to be addressed as Mr., Mrs., Ms. Never, ever “talk down” to an elderly patient by calling him or her “sweetie,” “dear,” or other such names. They are not infants or children and should be treated with respect. Introduce yourself by giving your full name and your title/role. For example, “My name is Andrea Burns. I am a registered nurse, and I will be taking care of you today.”

The “first glance” of the patient can provide a great deal of information about the patient’s physical, mental and emotional state. Use this first glance as a foundation for the detailed assessment of the geriatric patient.

Cultural considerations

Cultural considerations must be incorporated into geriatric physical assessment. Failure to provide culturally appropriate and competent care can lead to lack of patient compliance, frustration and even hostility. Patients need and expect that their cultural perspectives will be respected.

The shift in minority demographics in the United States has changed significantly in the past 10 years. According to the United States Census Bureau, the 2000 census indicated that the white, non-Hispanic majority was 69.1 percent.9 In 2008, this percentage had decreased to 65.6 percent.10

In May 2007, Census Bureau data suggested that one in three U.S. residents is a minority. In fact, it is predicted that by 2020, people of color will be the majority population.9
Cultural sensitivity encompasses many issues. Culture is complex and is made up of thoughts, values, beliefs and traditions of racial, ethnic, religious or social groups. Culture influences moral beliefs, traditions, communication, gender and familial roles, expressions of emotion, family interactions, diet, dress and beliefs about health and wellness. The large number of different cultures that exist in the U.S. make it impossible for all health care providers to have an intimate knowledge of all of them. Here are some suggestions to encompass cultural appropriateness into the assessment process:

- Identify the various cultural populations for which you are most likely to provide health care services.
- Familiarize yourself with appropriate cultural responses for these populations. For example, in Middle Eastern cultures, sexual segregation is often very important, and same-sex caregivers should be assigned whenever possible.
- Investigate the availability of interpreters to facilitate communication if the patient has difficulty communicating in English.
- Develop written patient education materials in the most common languages (in addition to English) that are spoken by your patient populations.
- Remember to be sensitive to dietary practices that are important to cultural and religious viewpoints.
- Remember that expression of emotions may vary from culture. Some cultures are vocal and overt about expressing fear or pain, while others are stoic. All expressions should be respected.
- Identify cultural and religious viewpoints concerning death and dying, life-prolonging interventions (such as feeding tubes), treatment of the body after death and funeral practices.
- Consult appropriate resources to gather information about cultural perspectives. One such resource is www.ggapalanti.com. This site offers respectful cultural profiles of various populations, resources, articles and related links. When using Web sites, make sure that they treat all cultures with respect. Be wary of and avoid sources that criticize or make jokes about cultures or religious practices.

The age of a person or the generation he was born into also influences the way health care services are perceived. For example, the “traditional” generation, also known as the “veterans,” are those adults born between 1922 and 1946 and represent the oldest members who access health care in this country. As a rule, these people are more formal in their approach to life and often preferred to be addressed as Mr., Mrs. or other formal titles. They generally have a strong work ethic and a rigid view of hierarchy and respect for authority. This may make it difficult for them to ask questions or participate actively in their health care plans because they often view health care providers as authority figures.

It is important to encourage questions and facilitate active communication between older adults and health care professionals. When possible, a reliable family member or friend should accompany the older adult to facilitate communication when needed.

**Nutritional assessment**

Nutritional assessment is much more than an evaluation of the intake of nutrients and the body’s ability to effectively use nutrients. It starts with the mouth and oral cavity and includes the patient’s ability to taste, smell, the body composition of the older adult, alcohol use, access to food and socioeconomic factors that influence nutritional status.

**Assessment of the mouth and oral cavity**

**Important questions to ask**

The ability to eat depends, in part, on a person’s teeth. Observe your patient’s teeth. Are they his own or does he wear dentures? Are dentures, including partial dentures, clean, and do they fit well? Are his teeth clean? Is there any evidence of chipped, broken or missing teeth and/or dentures? Additional important information that should be obtained about a patient’s dental habits includes:

- **How does he take care of his teeth/dentures?** Is he physically and mentally capable of taking care of his teeth and mouth? Teeth should be brushed and flossed at least twice a day. A soft-bristled toothbrush should be used to properly clean teeth and to avoid damaging gums.

- **How often does he visit a dentist?** The geriatric patient should see a dentist at least annually, with the ideal time frame of every six months. These visits should also include a screening for oral cancers such as cancer of the tongue at each visit.

- **Does the patient use alcohol and/or tobacco products?** Explain to the patient that avoiding these products decreases the risk for oral or lung cancers.

- **Does the patient have bad breath?** What does it smell like? Bad breath (halitosis) may indicate poor oral hygiene or certain disease processes. For example, a fruity smelling breath suggests hyperglycemia.

- **Does the patient report any problems with the oral cavity,** such as painful teeth or gums, bleeding gums, dry mouth, changes in the sense of taste, or problems chewing or swallowing?

- **Does the patient complain of a dry mouth?** This is the most common oral problem in the elderly adult and can be due to mouth breathing, dehydration, oxygen therapy, various diseases, side effects of medication, and head and neck radiation treatments.

**Assessment tip:** A frequent complication of dry mouth is the fungal infection oral candidiasis, more commonly known as thrush.

**Inspection**

Inspect the patient’s lips, teeth, tongue, gums, soft and hard palate, buccal mucosa and the back of the throat. Look for any signs of cracks, bleeding, lesions, ulcers, swelling, induration or broken or decayed teeth. If the patient wears dentures, observe how they fit, whether they are clean, and whether there is any evidence of breakage. Look for signs of leukoplakia, which is a white or gray patch that may develop on the tongue, on the floor of the mouth or on the buccal mucosa. Leukoplakia is most commonly found in elderly patients and is due to irritation from teeth or dentures that rub against the inside of the cheeks or gums or chronic irritation from use of tobacco products. Leukoplakia is usually painless and is generally biopsied to rule out oral cancers.

When inspecting the mouth and oral cavity, remain alert to signs and symptoms of oral cancer. These include:

- A lump or thickening of the lip or in the patient’s mouth.
- A sore in the mouth or on the lip that does not heal.
- White or red patches on the gums, tongue or buccal mucosa.
- Patient complains that there is always a feeling of something “stuck” in the throat.
- Swelling of the jaw or mouth that changes the way dentures fit.
- Pain in the ear or when chewing or swallowing.
- Changes in the patient’s voice.

**Assessment tip:** When inspecting the mouth and oral cavity, make sure that extra light is available to allow good visualization of the tongue, buccal mucosa, lips, teeth and gums.

It is important to be aware of risk factors for the development of oral problems. Diseases or other factors that cause oral problems will affect the patient’s ability to consume food and maintain a state of proper nutrition. Issues and factors that increase the risk for oral problems include:

- Diseases such as cancer, HIV and AIDS, diabetes mellitus, stroke, dementia, renal failure and viruses such as herpes simplex.
- Deficiencies of vitamins including B6, B12, folic acid, C, K, A, and niacin.
- Changes that accompany aging, such as thinning teeth enamel, lines and cracks in teeth, thinner and smoother mucosa that loses elasticity, and a decrease production of saliva.

**Assessment tip:** After inspecting the mouth and oral cavity, palpate the lymph nodes in the neck. Lymph nodes should be small, smooth, round and painless. Tenderness may indicate infection. Enlarged, fixed, hard lymph nodes require further evaluation as these signs may indicate a serious problem, such as malignancy. At the same time, observe the neck for any lesions, moles or bulging areas.

Another important risk factor for oral problems (and corresponding nutritional problems) is lack of money. Elderly adults living on a fixed and/or inadequate income may not have the money to schedule regular dental visits, or purchase dentures and oral hygiene products. Persons with financial problems should be referred to local dental practices that offer services at reduced costs.
hyposmia. These include age-related changes, which the patient is familiar. He can’t identify a scent if he has never smelled it before.

**Body composition changes in the older adult**

There are a number of changes in body composition in the older adult that can have an impact on nutrition and overall health. One such change is the loss of lean muscle mass that occurs with aging. The loss is due to a reduction in physical activity, hormone production and alterations in nutrition. If caloric intake continues at the rate consumed at a younger adult, the older adult will gain weight in the form of fat, not muscle.9

Loss of muscle mass is associated with a reduction in strength and endurance and an increased risk for falls. Research indicates that even a 10 percent loss of muscle mass is linked to increased mortality in older adults.9

Other body changes that directly or indirectly influence body composition include:9,9,14

- Loss of bone mineral density, which increases the risk for osteoporosis in both men and women. Loss of bone density increases the risk of fractures as well as the risk of falls.4
- Decrease in both the size and number of gastric glands and mucus membranes, and reduction in gastric acid production, can lead to atrophic gastritis (irritation of the stomach due to atrophy). The decrease in gastric acid production results in a decrease in the acidity of the stomach. Since iron and vitamin B12 need an acid environment for proper absorption, this lack of acidity can inhibit the absorption of both of these substances.9
- Peristalsis in the intestines slows as the adult ages. If this is compounded by a lack of fluid and fiber intake, lack of exercise or chronic illnesses, constipation can, and often does, occur.13
- Aging diminishes the thirst drive. Because of this, the fluid intake of older adults is often inadequate. Compounded by the aging kidney’s inability to efficiently concentrate urine, this lack of fluid intake often leads to dehydration in geriatric patients. If older patients experience vomiting and/or diarrhea, excessive sweating, or excessive urination due to diuretic therapy, they must be carefully monitored for signs and symptoms of dehydration. Such symptoms include dry skin, poor skin turgor, dark-colored urine, headache, dizziness, dry mucous membranes, increased heart rate and respirations, and confusion.13

- Older adults often experience vision changes that compromise the sense of sight. These include cataracts, macular degeneration and generalized deterioration of vision. Such changes can make it difficult, and unpleasant, for them to shop, prepare food and, at times, eat. Reduced vision may make it necessary for someone to transport elderly people to the grocery store, help them to purchase food and even prepare it. The nurse may need to put the older adult in touch with services such as Meals on Wheels and community groups that assist elders in these activities. Many public transportation companies offer elder services at reduced rates. Older patients need assistance to access community services that will help them with transportation, shopping and meal preparation/delivery.

**Assessment tip:** Older adults are often afraid of being incontinent of urine. Because of this fear, they may limit their fluid intake, which further increases the risk for dehydration.

**Socioeconomic impact on nutrition**

It is important that socioeconomic factors be included as part of the nutritional assessment of the geriatric patient. These have been mentioned briefly in the preceding sections, but deserve additional emphasis.

Nutritional intake is closely linked to socialization. Where we eat, how we eat, and with whom we eat can have as much of an impact as what we eat. When assessing the social aspects of nutrition, consider the following issues:

- **With whom does the older adult eat?** If he eats with others, is it in a home setting or long-term care setting such as assisted living? If he eats with others, is the atmosphere congenial? For example, if the older adult is living with an adult child, is he made to feel welcome and a part of the family’s social interactions? If he eats in a long-term setting, in what type of an environment are meals served? Is the environment conducive to enjoying a meal?

- **If the older adult lives at home, does he have easy access to a grocery store?** Does he drive or does he depend on others to transport him? Is he aware of public transportation options for transportation and how to access them? If needed, is he aware of options such as Meals on Wheels and other similar community services?

- **If the older adult does have access to a grocery store, is he physically capable of
shopping and carrying bags of groceries or does he need help? If he needs help, who is available to help him? Does he have the visual acuity to read and understand food product labels and prices? Does he have the mental acuity to make appropriate food choices?

Another important aspect of nutritional assessment is the financial impact of food purchase:

- **Does the older adult have enough money to purchase healthy foods?** If not, he may purchase whatever “fits” within his budget, even if such foods are not recommended for his state of health. For example, does he purchase microwave dinners that are high in salt because they are cheap and easy to prepare, even though he is on a limited salt diet?

- **Does the elderly adult need help managing his money?** He may have adequate financial resources but is unable to live within his budget due to uncertainty over prices or decreasing mental acuity. Does he have anyone to help him manage his money? What family or community resources are available to assist him with money management?

If there is not enough money to purchase food, the older adult needs to be referred to agencies that may be able to help or to make referrals. Possible sources are veterans associations, area agencies on aging, church groups and government assistance agencies.

**Assessment tip:** Always include socioeconomic evaluation as part of physical assessment. These areas influence every aspect of health. Also note that women are twice as likely as men to live in poverty.

**Nutritional requirements**

Nutritional requirements for older adults correlate with the physical changes that accompany aging. There are generally decreased caloric needs due to decreased physical activity. However, the need for vitamins and minerals does not decrease. In fact, based on food intake, there may actually be a need for vitamin supplements.

The U.S. Department of Agriculture (USDA) Food Pyramid is a tool often used by health care professionals and others to plan balanced diets. Nutrition faculty in the Department of Family, Youth, and Community Sciences, IFAS, University of Florida in Gainesville, Florida, have adapted the USDA’s MyPyramid in a handout titled “MyPyramid for Older Adults.”

This tool is based on an 1,800-calorie diet and should be adapted to the individual needs of each elderly patient. It encourages older adults to choose foods high in fiber to avoid constipation, to drink plenty of fluids to maintain hydration, reduce salt intake, and use fish, nuts and liquid oils instead of saturated fats. Practical suggestions to remain active include going for walks, working in a garden, taking an exercise class at a community center or gym, and playing with pets. These suggestions may be helpful when working with older patients and teaching them about nutritional requirements. Additional examples (based on an 1,800-calorie diet) of good dietary habits include the following. Note that these suggestions should be adapted to the unique needs and health status of each patient.

- Eat 6 ounces of grains per day, such as whole-grain cereals, whole grain breads, rice or pasta. Choose cereals fortified with vitamin B12.
- Eat 2½ cups of vegetables, especially dark-green and orange vegetables, and dried beans and peas.
- Eat 1½ cups of fruit per day.
- Drink 3 cups of milk or other calcium-rich foods daily, such as low fat milk or yogurt or low fat cheeses.
- Eat 5 ounces of lean meat, beans and other sources of protein, such as low-fat meats and poultry, and include fish, eggs, beans and nuts as protein sources. Bake, broil or grill foods rather than fry them.

There are some vitamin requirements specific to the needs of older adults. These include:

- **Vitamin D** is important to maintain bone mineralization and to facilitate proper use of calcium in the body. Inadequate amounts of vitamin D have been linked to increased risk for falls in the elderly. If adults have limited exposure to the sun (e.g. those who reside in long-term care facilities without much time outside), they may be at increased risk for vitamin D deficiency. Good food sources of vitamin D include liver, milk fortified with vitamin D, fish such as salmon, and milk and juices fortified with vitamin D. If vitamin D deficiency is not corrected by diet, older adults may be prescribed vitamin D supplements by a physician.

- **Calcium** intake is important to help maintain or slow loss of bone mineral density. Older adults should have three servings of calcium-rich foods every day.

- **Intake of the B vitamins** is very important. Vitamin B6 is necessary to the metabolism of protein and fat, and vitamin B12 is required for the process of cell division and central nervous system functioning. Older adults should be monitored if taking vitamin B supplements. Excess of vitamin B6 can result in toxic side effects leading to sensory neuropathy.

**Assessment tip:** Older adults should not simply add vitamins to their diet. Any additions of vitamins, minerals or other supplements should be under the supervision of health care professionals. Fat-soluble vitamins, such as D, E, K and A are stored in the body and not excreted the way water-soluble vitamins are. Taking large amounts of fat-soluble vitamins could lead to toxic levels and adverse effects.

Alcohol ingestion can have an impact on nutrition, especially for deficiencies of thiamin, riboflavin, folate and vitamin B6 because alcohol can inhibit nutrient absorption, irritate the stomach and affect metabolism. In cases of significant alcohol use, alcohol may actually be ingested in place of or in preference to food, thus further compounding its negative effects.

In summary, nutritional assessment is critical to identifying problems and correcting them in the older adult. The nurse must evaluate nutritional status carefully, taking into consideration not only the types and quantities of food being ingested, but the social and economic factors that influence nutrition as well.

**Pharmacology assessment and the geriatric patient**

Mrs. Burns is 80 years old. Her physician prescribed Benicar, 20 mg daily, for hypertension. During a routine checkup, her blood pressure was still significantly elevated. When questioned, Mrs. Burns admitted that she only takes the Benicar four times a week instead of daily. She says she does this to save money and to “make the pills last longer.”

Mr. Lord is 70 years old, and has had epilepsy for many years and takes Dilantin to control his condition. He recently had a seizure, the first he has had in many years. During a thorough evaluation, it was discovered that Mr. Lord recently began to take ginseng, an herbal supplement, to “increase my energy. My daughter takes it and says it really helps her. I know it can’t hurt me because it’s ‘natural’ and not really medicine,” he said. What neither Mr. Lord nor his daughter realized is that ginseng and Dilantin interact, and that ginseng reduces the effectiveness of Dilantin.

The preceding scenarios illustrate two common problems with medication adherence among the elderly. Financial concerns may cause an older adult to take less of his medication than prescribed in an attempt to, as Mrs. Burns says, “make the pills last longer.” Sometimes it may be difficult to make trips to the pharmacy, especially if the elder’s physical or mental health makes driving impossible. Seeking and obtaining transportation may be a problem.

Another issue that is impacting medication compliance with increasing frequency is that of adding herbs or other supplements to medication regimens without the knowledge or consent of health care providers. Many people believe that non-prescription agents such as aspirin, herbal supplements, vitamins and minerals are harmless and can be taken without medical supervision. They do not realize that these agents can interact with prescription drugs and cause adverse effects. They also fail to realize that these agents may be harmful by themselves as well.

When conducting a pharmacologic assessment of the older adult, start by determining what prescription medications they are taking. Reconcile the list of medications, making sure you have the most current information. Find out how much the patient and, if appropriate, a family member knows about the patient’s medication regimen. Important questions to ask include:
What are the names of the medications you are taking?

When do you take your medications?

Do you take your medications with food or something to drink? What kinds of food and drinks do you take with your medication?

What kinds of side effects may occur when you take your medication? If side effects take place, what do you do about them?

Do you have insurance that covers some of the cost of your medicine? Do you ever have trouble affording the cost of your medicine?

You also need to find out about other medicines your patient is taking. You need to ask if he takes any medicine that the doctor has not prescribed, such as aspirin, allergy tablets, cold medication and so on. Explain that non-prescription drugs and prescription drugs can interact and cause harmful side effects. Emphasize that he should not take other medicines without his physician’s approval.

It is very important to ask if the patient is taking any herbal preparations, vitamins, minerals or dietary supplements (including weight-loss products or nutritional supplements). These agents can cause harmful interactions with each other, alone, and with prescription and non-prescription drugs.

Assessment tip: Provide simply written instructions about what medications the patient is taking, their actions, when and how to take them, common side effects and what to do if side effects occur. If necessary, a family member or friend should be involved to help the patient adhere to his medication regimen.

After determining what medications (including non-prescription, vitamins, herbs, minerals and so on) the patient takes, if he knows how and why to take them and the possibility of side effects, consider the physiological alterations in the body of the older adult that impact on medication effectiveness.

The body’s ability to metabolize drugs and use them most effectively decreases with age. Here are some aging body changes that influence the effectiveness of medication in the geriatric patient.14

Body water content: As the body ages, there is as much as a 15 percent decrease in water content and an increase in body fat. The extra fat means that the effects of fat-soluble drugs may be increased, and the reduction in water content means that water-soluble drugs exist in more concentrated amounts.

Liver functioning: Hepatic (liver) blood flow, liver mass and liver metabolic activity may decrease with age. It is important that liver functioning be assessed if the patient is taking drugs that are metabolized by the liver or if taking drugs that have the potential to damage the liver.

Renal functioning: Renal function also decreases with age, but this decrease varies considerably among older adults. Since the kidneys excrete most drugs, it is important to be aware of kidney functioning and remain alert to possible build-up of potentially toxic levels of drugs.

Gastric functioning: Aging causes a decrease in gastric motility and gastrointestinal absorption surface. These factors may cause a decrease in or delayed absorption of acidic drugs.

Vision changes: Age-related reduction in visual acuity may make it difficult for older adults to read drug labels, thereby increasing the risk for taking the wrong medication.

Assessment tip: Be sure to include socioeconomic factors when assessing pharmacology factors in elderly adults.

Sexual Assessment

Mr. Grimes, a 78-year-old retired construction supervisor, arrives at his physician’s office for a routine checkup. His blood pressure is unusually high, despite the fact that he was prescribed anti-hypertensives several months ago. When questioned, Mr. Grimes says he “only takes my blood pressure pills a couple times a week.” When asked why, he explains, “Since I’ve been taking those things, I can’t satisfy my wife. When I don’t take them too often, things are better.” Medication side effects can include sexual dysfunction. Such side effects must be discussed with patients at the time of prescription.

Sexuality and sexual functioning are life-long issues for all persons. Health care professionals sometimes forget or disbelieve that these issues are important to geriatric patients. Research shows that interest in sex and sexuality continues throughout the life span.11 Therefore, it is important that sexual assessment be part of the physical assessment of older adults.

First, be aware of changes in the reproductive tract that occur with aging. In men, sperm production and testosterone levels decrease. The time needed to become aroused and to ejaculate increases, and the refractory period lengthens. The firmness and force of ejaculation decreases.9 Oral medications for erectile dysfunction, such as sildenafil (Viagra) and tadalafil (Cialis) are often able to compensate for normal age-related changes in the sexual functioning in men.11 In women, as estrogen levels decrease, the thickness, elasticity and lubrication of vaginal tissues decreases.9 These changes may cause intercourse to become painful. Women may avoid sexual intercourse due to such pain. The use of vaginal lubricants can help alleviate dryness and reduce discomfort.11 Glandular tissue in the breasts decreases, and there is an increase in the amount of time it takes for arousal to occur.9 The vagina shortens, labia atrophy and the cervix may descend into the vagina, which causes discomfort. Orgasms may become less intense and less gratifying. Additionally, post-menopausal women generally return to pre-arousal state more quickly than younger women.11

In addition to normal age-related changes, cardiovascular disease, depression and diabetes have been associated with sexual dysfunction and/or a decrease in libido.11 Persons with these conditions should receive sexual counseling as necessary.

Nurses must also be aware of medications that may cause sexual dysfunction. These include certain types of antihypertensives, selective serotonin reuptake inhibitors (SSRIs) used to treat depression, and beta blockers.11 When performing a pharmacologic as well as a sexual assessment, be sure to explain the potential for these types of side effects.

Sexual assessment requires that a nurse ask patients questions that are highly personal and intimate in nature. If a nurse is uncomfortable with such an assessment, she/he will most likely transmit this discomfort to the patient. The more confident and comfortable the nurse is with sexual assessment, the more at ease will be the patient.11 The nurse must maintain an objective, non-judgmental attitude and conduct the assessment in a quiet, private area.

One framework that may be used when conducting a sexual assessment is the PLISSIT model.11 (To view an online video of a nurse demonstrating the use of the PLISSIT model visit http://links.lww.com/A277)

The first step in the model is P: To seek permission to begin the sexual assessment. Asking for permission helps to preserve the patient’s dignity and to allow him some control over the assessment process. You might begin by asking the patient, “Mr. Grimes, would it be all right if I asked you some questions about your sexual health?”11 After permission is obtained, you could proceed by asking, “What kinds of changes have you noticed in your sexual health since you began taking your heart medication?” Make the questions pertinent to your patient’s situation. If appropriate, you might ask the patient if he would like his sexual partner to take part in the discussion. Respect his response, whether it is “yes” or “no.”

The next step is to provide limited information (LI).13 For example, if specific medications are linked to the patient’s sexual difficulties, information about medication side effects could be provided. Other types of limited information might include discussing normal age-related changes in the reproductive system or the effects of certain diseases on sexual functioning.

Next, offer specific suggestions (SS).11 This means that you will offer specific suggestions tailored to your patient’s situation. For example, if sexual dysfunction is related to painful intercourse due to vaginal dryness, you could recommend the use of vaginal lubricants. If problems are related to medication, referral to the patient’s physician or nurse practitioner for possible medication alterations may be indicated.

The final step in the model is intensive therapy (IT).13 Intensive therapy is indicated when sexual dysfunction requires more than nursing...
interventions. For example, if the patient is exhibiting inappropriate sexual behaviors, (e.g. exposing oneself in public) or has suffered from sexual abuse, intensive therapy is indicated.

In summary, sexual assessment is important for persons of all ages. Sexuality and sexual functioning are important throughout the life span. These are highly sensitive subjects and must be handled objectively, with tact and discretion. A barrier to sexual assessment may be the discomfort of the nurse as well as the patient. Use of an assessment model, such as the PLISSIT model, may help to initiate and direct the assessment and increase the comfort of nurse, patient and patient’s partner.

Resources specific to the geriatric population that may be helpful to nurses working with older adults include the following Web sites. Information is offered pertaining to sexuality as well as many other issues that impact geriatric nursing practice.

- The website for the Hartford Institute for Geriatric Nursing provides information about best practices and geriatric assessment tools and models. The site may be accessed at: www.ConsultGeriRN.org.
- Lippincott’s Nursing Center’s older adults section provides articles, tools and links to sites that specialize in information about geriatric care. This site may be accessed at www.nursingcenter.com/AGNR/olderadults.
- The American Nephrology Nurses’ Association (ANNA) has created a new resource, Spotlight on Older Adults, which contains links, articles, tools and information about continuing education events for nurses specializing in geriatric nursing care. The site is accessed at www.annanurse.org/aging.

Assessing sleep patterns

Sleep stages

A good night’s sleep is important for health and well-being. There are five recurring stages of sleep: four non-REM (rapid eye movement) stages and the REM (rapid eye movement) stage.9,17

The stages of sleep can be described as follows:9,17

- **Stage 1**: Characterized as light sleep or drowsiness, this stage lasts for about five to 10 minutes. If awakened, the person may feel as if he has not been asleep at all.
- **Stage 2**: This stage is a period of light sleep from which the person is easily aroused. Brain waves slow, eye movements stop, and heart rate and body temperature decrease. The body prepares to enter deep sleep.
- **Stages 3 and 4**: These stages are known as slow-wave or delta sleep. Sleep is deep, with Stage 4 being more intense than Stage 3. Stages one through four comprise the period of non-REM sleep and last from 90 to 120 minutes. Each stage lasts from five to 15 minutes.9,17

REM sleep is characterized by rapid respiration, increased heart rate and blood pressure, increased brain activity, rapid eye movements and temporary paralysis of limbs. REM sleep is also referred to as dream sleep because dreaming takes place during this stage. It is believed that REM sleep is necessary for psychological restoration, learning, memory and concentration during the day. This stage occurs in cycles about every 90 to 120 minutes following the first four stages.9,17 The percentage of time spent in REM sleep is greatest during infancy and early childhood and decreases during adolescence and young adulthood with greater increases occurring in old age.17

Sleep assessment in the older adult

A common mistaken belief is that the need for sleep decreases with age. In fact, the elderly adult needs about the same amount of sleep as he did as a young person and in middle age.9 The majority of older adults need between six and 10 hours of sleep each night. Research shows that less than four or more than eight hours of sleep is associated with mortality rates that are higher than those of persons sleeping eight hours.9

When asking the older adult about his sleep patterns, try to avoid “yes” and “no” questions, because these usually do not elicit enough helpful information. For example, if you ask, “Do you have trouble sleeping?” many older adults will simply say “no.” Here are some suggestions for phrasing questions when assessing sleep patterns.

- **“What time do you usually go to bed?” “What time do you usually get up?”** The answers to these questions will give you an idea whether the patient goes to bed and gets up at about the same time each day. A regular bedtime and awakening time is associated with better sleep patterns.
- **“How many times do you wake up during the night?” “What causes you to wake up?”** This is better than asking the patient whether he sleeps through the night. It requires the older adult to think about his answer. He may assume it’s normal to wake up frequently during the night. If he does, this may indicate a health problem.
- **“How many times do you wake up to go to the bathroom during the night?”** The answer to this question can indicate various problems, such as incontinence, enlarged prostate in men or anxiety.
- **“What kinds of things help you to sleep at night?” “What kinds of things prevent you from sleeping at night?”** The answers to these questions may provide you with clues to specific physical or mental health problems. For example, a patient may tell you that some nights he wakes up gasping for air or coughing, indicating a possible cardiovascular or nervous system problem.
- **“How many naps do you take during the day?” “How long do you nap?”** Frequent naps or lengthy naps can disrupt a person’s nighttime sleep patterns.

The preceding questions are a good baseline for questioning older patients about their sleep. Become familiar with some of the more common sleep problems and how they impact the elderly patient’s ability to obtain a good night’s sleep. It is estimated that about 5 million older adults in the United States have a serious sleep disorder.9 Some of the more common problems include the following issues:

- **Anxiety and depression.** These issues can interfere with a person’s ability to fall asleep and/or stay asleep.
- **Substance abuse.** Abuse of alcohol, prescription drugs and/or illegal drugs can profoundly disrupt a person’s sleep patterns.
- **Excessive intake of caffeine.** Excessive intake of caffeine, especially in the evening, can prevent a person from falling asleep or staying asleep.
- **Pain.** Older adults may deal with chronic pain issues. Pain may be due to arthritis, cancer, nervous system disorders, and so on. Elderly patients who are in physical discomfort take longer to fall asleep, stay asleep or find a comfortable sleeping position.
- **Cardiovascular disease and respiratory disease.** These types of diseases may cause orthopnea and shortness of breath. Asking the patient “How many pillows do you sleep on at night” gives you an indication that he needs to sit up or be propped up to sleep without having difficulty breathing.
- **Dementia.** Older persons with dementia experience more sleep problems than other older persons. Sleep is often fragmented, and nighttime wandering may occur.9
- **Urinary issues.** Frequency, nocturia and urgency commonly occur in older adults and increase with age. Older men may experience benign prostatic hypertrophy, which prevents the bladder from emptying completely and often causes the sensation of constantly feeling the urge to void. These issues are compounded by the decreased bladder capacity of the elderly.9
- **Sleep apnea.** Sleep apnea is an intermittent, temporary pause in breathing during sleep. This can occur many times throughout the night and lasts about 10 seconds each time it occurs. These interruptions in breathing can lead to hypoxia. Research shows that older adults who suffer from these kinds of hypoxic episodes are more likely to experience sudden death, stroke, angina and exacerbating hypertension.9 Patients and their sleeping partners should be questioned about the occurrence of the signs and symptoms of sleep apnea, which include heavy, loud snoring; choking, coughing or struggling to breathe while sleeping; extreme sleepiness during the day, headaches in the morning and trouble concentrating.9
- **Medications.** A number of medications can interfere with sleep patterns. When providing pharmacology patient education as well as assessing sleep and rest, be sure to familiarize yourself with medications that may disturb a patient’s sleep. Some drugs commonly associated with sleep interference include decongestants, antihistamines, beta-blockers and beta-agonists.9,14
pain can limit mobility, social interaction, interfere with performance of activities of daily living and interfere with sleep and rest. There are a number of pain assessment techniques in use. Some require the use of numeric pain rating scales while others rely on pictures that illustrate various degrees of pain. Important issues for the nurse to address when conducting a pain assessment include the following.

- Ask the patient to describe the pain, aching, or soreness he is experiencing. For example is the pain sharp or dull? Is it constant or intermittent? Is it burning or “squeezing?” Does it cause any lack of sensation? Does it cause tingling, numbness, or “pins and needles” feelings? Does the pain stay in one spot or does it radiate?
- When does the pain occur? Is it worse at specific times during the day or at night? If so, what is the patient doing or what is happening in his environment when the pain becomes worse?
- What makes the pain better or less uncomfortable?
- What makes the pain feel worse?
- Are there any other symptoms that occur with the pain, such as nausea or vomiting?
- Does the patient take any medications for his pain? What are they and how often does he take them? How well do these medications work to control your pain? Be sure to ask about ALL medications including prescription, over-the-counter, herbal preparations, minerals, vitamins and supplements. Remember that some patients don’t consider items such as herbal preparations, minerals, vitamins and over-the-counter drugs as “medicine.” Are the medications causing any side effects?
- Does the patient do anything specific to alleviate his pain (in addition to medication)? Some patients may drink alcohol or take other drugs (including illegal drugs) to relieve pain. Others may use remedies such as warm milk to induce sleep, relaxation tapes, meditation or prayer. How successful are these interventions?
- What does pain mean to the patient from a cultural and/or religious viewpoint? For example, different cultures value stoicism when confronting pain while others are quite emotionally vocal about expressing pain. Remember to remain objective and respectful of a patient’s cultural and religious beliefs about pain and how it is dealt with.

Many patients may be able to participate in completing pain assessment scales. A numeric pain rating scale generally consists of a scale of 0-10 with 0 indicating no pain and 10 indicating the worst possible pain. The degree of pain worsens as the numbers increase. This type of scale requires that the patient be able to understand your explanation of the scale, correlate his pain to a numeric value, and communicate this correlation to you.

A verbal descriptor scale is one that requires the patient to describe his pain from “no pain,” to “mild,” “moderate,” “severe,” or “as bad as the pain could be.” This requires that the patient be able to understand the descriptive terms used and be able to correlate the terms with his pain, and describe his pain using the given terms without the benefit of visual cues.

A pictorial scale such as the Faces Pain Scale requires that the patient select a visual depiction of pain. For example, the patient is asked to look at a number of different faces that range from a face with an expression of calm or contentment to faces that look increasingly uncomfortable. The patient chooses the face with the expression that best “fits” his current pain experience. This scale does not require the patient to express himself using specific descriptive terms or to understand specific descriptive terms.

**Assessment tip:** A family member, friend or reliable caretaker should be involved in the pain assessment if patients are unable or reluctant to communicate their pain experience.

But what about patients who are unable to understand verbal or visual communications, such as the patient suffering from dementia? Researchers are working to develop valid and reliable pain assessment tools for use with patients suffering from dementia. One such tool is the Pain Assessment in Advanced Dementia (PAINAD) scale, which relies on direct observation of five behavioral indicators of pain. An overview of the five behaviors used to assess pain includes:

- **Breathing** (does not include mechanical ventilation): Ranges from a score of 0 for normal breathing, a score of 1 for occasional labored breathing or short periods of hyperventilation, to a maximum score of 2 for noisy, labored breathing and prolonged periods of hyperventilation.
- **Positive vocalization** (does not include moaning or groaning): Ranges from a score of 0 for none, a score of 1 for occasional moaning or groaning, to a maximum score of 2 for loud moaning or groaning, crying, or calling out.
- **Facial expressions**: Ranges from a score of 0 for no expression or an expression of calm or smiling, a score of 1 for frowning or expressions of sadness, to a maximum score of 2 for facial grimacing, frowning, scowling, etc.
- **Body language**: Ranges from a score of 0 for a relaxed body posture, a score of 1 for tenseness, fidgeting, or, if ambulatory, distressed pacing, to a maximum score of 2 for rigid body posture, clenched fists, pushing or striking out, and/or pulling knees up towards chest.
- **Consolability**: Ranges from a score of 0 for needing no consolation, a score of 1 to the need for reassurance by touch or tone of voice, to a maximum score of 2 for being inconsolable.

Scores for each category are totaled with scores ranging from a minimum total of 0 to a maximum
total of 10. The higher the total number, the more severe the pain. The Harford Institute for Geriatric Nursing Web site offers a detailed explanation of the scale and may be accessed at www.ConsultGeriRn.org. Specific information about the use of the scale may also be found in the publications of the American Medical Directors Association.18

A comprehensive pain management treatment plan is important for anyone dealing with pain. A number of complementary and alternative therapies are being used with increasing frequency. These include acupuncture, herbal supplements, massage therapy, chiropractic care, Yoga, meditation, relaxation therapy, biofeedback, and, in some cases where not prohibited, exercise. Any and all complementary and alternative therapies should be initiated and maintained only under the supervision of the patient’s primary health care provider.

Most patients dealing with pain participate in some type of medication regimen. Be aware of and help the patient and family prepare for and deal with some common side effects of analgesics.

- Some analgesics, particularly opioid analgesics, slow the intestinal tract and can lead to constipation. Stool softeners, adequate fluid intake, and fruit and vegetable intake should help to alleviate the problem of constipation.9,14
- Nausea and vomiting are also fairly common side effects, and an antiemetic may be prescribed for these types of adverse occurrences. Some analgesics cause drowsiness and sedation, and patients should be cautioned against activities that require alertness. In severe pain, morphine may be administered, and pruritis is often associated with its administration. Antihistamines are effective in combating pruritis, but may also cause sedation as a side effect.9,14

In summary, a thorough pain assessment must be conducted as part of a thorough geriatric assessment. Remember that pain is often undertreated in this population, particularly in those elderly adults who cannot or will not communicate about their pain. Patients with dementia are at significant risk for having their pain undertreated.

Involve family, friends and caretakers as part of the pain assessment process as well as its treatment. Many of these individuals (including the patients themselves as well as some health care professionals) may hold the mistaken belief that pain is simply part of the aging process and must, to some degree, be tolerated. Help to educate all of these individuals, including colleagues, about the need for adequate assessment and treatment of pain.

Remain alert to the complications of undertreating pain, including depression and social isolation. Also be sure to monitor and to teach the patient about the side effects of medications used to alleviate pain and how to reduce or eliminate such adverse occurrences.

Use a variety of pain assessment techniques including verbal discussion and the use of valid and reliable pain assessment tools. Remain sensitive to the issue of culture and religion and how they influence the expression of pain and compliance with treatment options.

Finally, remember to involve the patient, family and caregivers in pain assessment and management. Often the key to success in managing pain is the cooperation of the patient and of those with whom he is most involved.

Assessing mental health

Mental health and well-being is as important to the older adult as it is to any other population. Unfortunately, some mental health issues, such as depression and anxiety, may be overlooked in elderly adults. The signs and symptoms of these and other mental health problems may be mistakenly attributed to the aging process or dementia, and, as a result, a thorough assessment is not done. In fact, only about half of older adults with mental health problems actually receive appropriate mental health services.9,15

Assessment tip: When assessing mental health, be sure to evaluate the patient for mental disturbances related to medication side effects. Sometimes adverse occurrences are related to alterations in mental status.

Some health care professionals may hold the mistaken belief that older adults suffer from mental health problems more than younger adults. Actually, older adults demonstrate fewer diagnosable psychiatric disorders than younger persons with the exception of cognitive problems such as Alzheimer’s disease, which show age-related increases.9 Some experts bemoan the fact that many health care professionals are more concerned about a broken bone than a “broken spirit.”7

The geriatric population can experience a number of mental health problems, just as younger persons do. Although some problems may develop in old age, others may have begun earlier in life (e.g. depression, obsessive-compulsive disorder). Let’s look at the normal aging changes that influence mental health and cognition and review some mental health and cognition problems and how they can be identified in the older adult.

Normal age-related changes in mental health and cognition

An older adult’s mental health and cognition stay comparatively stable. The alterations that do take place are usually not dramatic enough to cause major problems with activities of daily living. Serious changes and abrupt loss of cognition usually indicate a physical or mental disorder such as Alzheimer’s disease or stroke.9 Some normal age-related changes in mental health and cognition include the following.9

- The speed with which information is processed decreases with age. This means that older adults take a longer time to learn new information and require that information be repeated.
- The ability to deal with multiple tasks slows.
- The capability with which the older adult can maintain attention and ignore unimportant information decreases with age.
- The use of language is maintained, but word finding and naming ability decreases with age.
- The ability to use abstract thought and demonstrate mental flexibility are associated with some decline as a person ages.
- The ability to acquire practical experience and wisdom continues until the end of life.

Grief and bereavement

Geriatric patients generally must deal with the loss of loved ones, including spouses, siblings, parents and others. Grief is considered to be a normal response to such losses within a two-year period. Grief that lasts longer than two years is considered to be pathological. However, the length of grief varies with cultural norms. The American Psychological Association’s standard of care concerning grief in the older adult encourages the health care professional not to focus on time, but on the way grief is presented. Profound depression, extensive guilt, overwhelming senses of loss, preoccupation with death, difficulty performing activities of daily living and social incapacitation indicate pathological grief and require medical intervention.9

Depression

While the prevalence of major depression declines with age, symptoms of depression increase. Eight to 20 percent of older adults living in the community and up to 37 percent in primary care settings experience depressive symptoms.19 Depressive symptoms are often associated with chronic illness and pain.9

Older adults suffering from depression often report numerous somatic complaints, including chronic pain. They may not consider themselves depressed and focus on physical rather than mental symptoms.9

Assessment tip: Older people may feel that it is a sign of weakness to report feelings of depression. They may believe it is more “acceptable” to have a physical illness, thus the focus on physical complaints. Your first clue to depression in older adults may be the reporting of somatic complaints.

A number of tools for the assessment of geriatric depression are available. One such tool is the Geriatric Depression Scale, which consists of 30 questions (a shortened 15-question version may also be used) that can be answered with “yes” or “no.”9 Examples of questions include:

- Are you basically satisfied with your life?
- Do you feel full of energy?
- Do you feel happy most of the time?
- Do you think that most people are better off than you are?

Criteria for major depression as noted in the Diagnostic and Statistical Manual of Mental Disorders-IV-TR19 include:

- Depressed mood or loss of interest or feelings of loss of pleasure.
Symptoms must last for at least two consecutive weeks and indicate a change from previous mood and functioning.

At least five of the following: depressed mood, changes in sleep patterns, reduced feelings of interest or pleasure, feelings of guilt or worthlessness, loss of energy or fatigue, inability to concentrate, changes in weight or appetite, psychomotor agitation or retardation, and suicidal thoughts.

The incidence of depression is twice as high in older women than in older men. Some of the possible reasons for this difference is that older women are more likely to experience loneliness, financial problems and a reduction in independence cause by functional disabilities.

**Assessment tip:** Depression is a major risk factor for suicide. Adults age 65 and older have the highest suicide rates of all age groups. Suicide is highest among caucasians, followed by Asians, Hispanics and non-Hispanic blacks. Older adults suffering from alcoholism have a greater risk for suicide as well. Nurses must not only assess for depression but for suicidal ideation!

When evaluating elderly patients for depression, be sure to check on the potential for depressive side effects of certain medications. Medications that can cause depression include:21

- Antihypertensives, such as reserpine.
- Hormonal replacement therapy, including estrogen and progesterone.
- Cardiac agents, such as digitalis.
- Analgesics, such as codeine.
- Anti-anxiety agents, including diazepam.

**Dementia**

Dementia is a syndrome that leads to a decline in multiple cognitive abilities. The presenting signs and symptoms range from mild cognitive impairment to complete incapacitation.

Dementia is both chronic and terminal, because the syndrome progresses to causing the patient to become completely dependent in all aspects of daily living. There is no consistent course, and the rapidity with which the disease will progress cannot be predicted.9

According to the Diagnostic and Statistical Manual of Psychiatric Disorders – Text Revision 4th edition9, the diagnostic criteria must include both a decline in memory and at least one of the following:

- The ability to understand spoken or written language and to generate understandable speech.
- The ability to recognize or identify objects (assuming such ability is not impaired by other disease processes).
- The ability to perform motor activities (assuming such activities are not impaired by other disease processes).
- The ability to think abstractly, make appropriate judgments, and plan and execute complex tasks.
- The decline in cognitive ability must be of a severity to interfere with normal activities of daily living.

There are a number of types of dementia, with the most common being Alzheimer’s disease (AD). It is responsible for about 50 percent to 70 percent of cases and has a subtle onset. The exact etiology of AD is unknown, but researchers believe that genetic and environmental components may play a role in its development.9

There are three stages of dementia: mild, moderate, and severe. Six aspects of cognition are evaluated to determine staging. These six aspects are memory, orientation, judgment and problem solving, community affairs, home and hobbies, and personal care. Diagnosis is based on assessment of these aspects because there is not a definitive diagnostic study or studies that can confirm diagnosis.9

Treatment is aimed at slowing the progression of the dementia and improving cognitive function. Medications such as Namenda and Exelon are currently used to treat cognitive impairment. Alternative therapies, such as ingestion of ginkgo biloba and various vitamins and minerals, are under investigation.9

**Assessing for elder abuse**

Mrs. Dash is an 80-year-old female who lives with her daughter, son-in-law and three grandchildren. She was recently hospitalized for a total hip replacement and infection of the surgical wound. After discharge, she returned to her daughter’s home. A visiting nurse arrives this morning to assess Mrs. Dash’s wound and perform a dressing change. Mrs. Dash lives in a self-contained apartment attached to the main house via a short hallway. Her daughter provides Mrs. Dash with housecleaning services and brings her meals three times a day. Mrs. Dash’s apartment is spotlessly clean. Mrs. Dash is dressed in a clean housedress, and is wearing make-up and jewelry. She does not make eye contact with the visiting nurse and has a sad expression on her face. Her daughter is present and interacts with the visiting nurse, asking if her mother is “healing.” She does not interact with Mrs. Dash. One of the grandchildren stops in to ask for a ride to a sports event. The grandchild does not interact with Mrs. Dash, but rolls her eyes and mutters something about “that old woman is more trouble than it’s worth.” Mrs. Dash’s daughter prepares to leave and casually says, “So long, Mom,” and leaves without looking back. Mrs. Dash looks at the visiting nurse and says sadly, “They take care of me, but no one really cares about me. There is no love. They don’t like me.” Mrs. Dash is suffering from emotional neglect, sometimes characterized as a form of elder abuse.

When nurses hear the term “elder abuse,” they often picture an older adult who is bruised, in poor physical condition and may be dressed in dirty clothes. But there are many forms of abuse, not all of them readily apparent. Elder abuse can take place in any setting: the patient’s home, an acute-care hospital or long-term care facility. It occurs among all socioeconomic groups. As nurses, we must be aware of the various types of abuse and how to protect the elderly adult from the effects of abuse.

**Physical abuse**

Physical abuse is defined as the use of physical force to intentionally inflict physical injury or pain. Actions such as hitting, pushing or shaking are forms of physical abuse.9

Signs of physical abuse include bruising, fractures, abrasions, lacerations and cuts. But it can be difficult to distinguish accidental injury from physical abuse. The elderly adult’s skin contains only small amounts of subcutaneous fat, and blood vessels are thin and fragile.7 This makes the older person susceptible to accidental bruising, which can be difficult to distinguish from physical abuse. However, research shows that 90 percent of accidental bruising occurs on the extremities. Accidental bruises rarely, if ever, occur on the neck, ears, genitals, buttocks or soles of the feet.22

Low bone density and the existence of osteoporosis place the elderly at high risk for fractures. To date, no particular pattern of abuse fractures has been identified.22 The location, frequency and health history of the older adult with fractures must be evaluated to identify suspected abuse.

When evaluating abrasions, lacerations and cuts, it is important to describe them accurately. Many nurses refer to any wound as a laceration. When documenting these kinds of trauma, it is important to be accurate.22

- **Abrasion:** A scraping injury that can occur if the older is pulled or dragged across a surface (e.g. a carpet) that abrades the skin.22
- **Laceration:** Full-thickness splitting open of the skin with ragged edges that occurs when the individual is traumatized by blunt force.22
- **Cut:** An incision made by a sharp object that has smooth, clean edges.22

**Sexual abuse**

Sexual abuse is defined as any type of nonconsensual sexual intimacy.9 Examples include rape, molestation, sexual harassment, unwanted touching, sodomy, coerced nudity and nonconsensual explicit sexual photography. Signs and symptoms of sexual abuse include:9,22

- Bruises around the genital area and/or breasts.
- Unexplained vaginal or anal bleeding.
- Unexplained occurrence of venereal disease or genital infections.
- Torn, stained or bloody undergarments.
- Elder’s verbal report of sexual abuse.

**Emotional or psychological abuse**

Emotional or psychological abuse is defined as infliction of distress, anguish or sadness via verbal and/or non-verbal acts.9 Examples of elder emotional or psychological abuse include yelling, threatening, swearing, name calling, insults, intimidation and humiliation. Other forms of emotional abuse include isolating the older adult from family and friends, preventing him from pursuing his regular social activities.
(e.g. attending church, visiting a senior citizen’s center), isolating him from others in the home, and/or giving the older adult the “silent treatment” and not providing any affection.23

Signs and symptoms of emotional or psychological abuse include sadness, emotional upset or agitation, withdrawal and verbal reporting of emotional abusive behaviors.9,22,23

Signs and symptoms of neglect include malnutrition, dehydration, poor personal hygiene, untreated health problems, unsanitary or unsafe living conditions, history of being left alone or choosing to be alone, and reports of being neglected.22,23

Abandonment
Abandonment is the desertion of an elderly person by someone who is responsible for providing care to the elder or who has physical custody of the elder.9,23 In such cases, the elder is simply deserted or abandoned at a hospital (e.g. emergency department), long-term care facility, shopping center or other public location.9 In addition to being abandoned, the elderly adult may also exhibit signs and symptoms of other types of abuse.

Financial or material abuse
Financial or material abuse is defined as illegal or improper use of an older adult’s money, property or other assets. The person committing this abuse does so for personal or monetary gain or benefit.9 Examples of this type of abuse include unexplained disappearance of personal items, unusual withdrawals of money from savings or checking accounts, or changes in property ownership. As a result of financial losses, elders may not be able to pay bills or buy food and medicine.

Risk factors for elder abuse
Elder abuse can occur within all socioeconomic, cultural and intellectual groups. However, research shows that certain characteristics surface most commonly among abuse victims. These include:9,23

- **Sex:** Women are more likely to be victims of elder abuse than men.
- **Age:** Victims of elder abuse are likely to be more than 75 years of age.
- **History of violence:** Victims of elder abuse are more likely to be prior victims of abuse, such as child abuse or spousal or intimate partner abuse. If the elder abuse victim was himself an abuser (e.g. abused his children), he is more likely to be a victim of elder abuse committed by those he abused in the past.
- **Functional status:** Elders whose physical and/or mental status is impaired are more likely to be abused.
- **Poor social network:** Elders who have fewer than three significant others are more likely to suffer abuse.
- **Economic status:** Elders who are poor are more likely to be abused.
- **Education:** Older adults who have less than an eighth-grade education are more likely to be abused.
- **Minorities:** Members of minority groups have statistically higher rates of elder abuse.

Characteristics of abusers
Some common characteristics of abusers include the following:9,23

- **Sex:** Abusers are more likely to be men.
- **Substance abuse:** Abusers are more likely to have a history of substance abuse, including alcohol abuse.
- **Mental health:** Abusers are more likely to suffer from mental illness.
- **Family status:** Elders are more likely to be abused by members of their own families.
- **Social network:** Abusers have a poor social network and are more likely to be dependent on the elder for financial or shelter or other needs.
- **Caregiver stress:** Caregivers who are overwhelmed by the burden of caring for the older adult may end up abusing the person for whom they are caring.
- **Cycle of family violence:** Caregivers may have been abused by the elder they are now abusing.

Screening for elder abuse
Evaluate signs and symptoms that may indicate abuse. Monitor those who provide care for elderly adults. Do they show signs and symptoms of stress and difficulty coping? Is there a history of abuse in the elder or caregiver’s family?

There are a number of elder assessment screening tools available for use. The Hartford Institute for Geriatric Nursing recommends the Elder Assessment Instrument (EAI) as a screening tool in the clinical setting.9 This is a 40-item tool used to determine whether the elderly patient needs to be referred for suspected elder abuse.9

Elders are often reluctant to report abuse. They may be afraid of retaliation by the abuser. They may believe that they have done something to deserve the abuse or feel guilty about being an abuser themselves at some point in their lives. Abused elders may also be reluctant to report abuse if they are dependent on the abuser for care, shelter or financial help.

Assessment tip: The elder and the suspected abuser should be interviewed separately. This may reveal inconsistencies in reported histories or explanations of signs and symptoms of abuse. If the suspected abuser refuses to allow separate interviews, the suspicion of abuse increases.8,9

Nurses must be aware of local elder abuse/mistreatment reporting laws. Many states have mandatory reporting laws, and health care professionals must report suspected cases of elder abuse.9 Know your organization’s policies and procedures regarding the reporting of elder abuse, and familiarize yourself with contact information for local departments on aging and adult protective services. For state reporting numbers, visit the National Center on Elder Abuse Web site at www.ncea.aoa.gov or call the Eldercare Locator at 1-800-677-1116.

Assessment tip: You don’t need to prove that abuse is occurring. You do need to report your suspicions. The experts in abuse will follow up to investigate your suspicions.

Overview of assessment of body systems
Basic physical assessment techniques, such as inspection, palpation and percussion, are similar for all age groups. This overview of the assessment of body systems focuses on those issues that are particular to the geriatric population.

Vision, hearing and touch
Vision
The first step in assessing the vision of an older adult is observation. Elderly persons who have stained clothing, poorly combed hair or excessive or poorly applied makeup may have vision impairment.8 A Snellen chart may be used to assess visual acuity, or you may ask the patient to read from a newspaper or other printed material with various size prints.

Assessment tip: Be sure that the patient is wearing his glasses or contact lens when assessing vision. Assess vision with and without corrective lenses. It is estimated that 92 percent of persons over 70 wear glasses, 18 percent also use a magnifying glass for close work, and 14 percent of persons 70-74 have difficulty seeing even with corrective lenses. Thirty-two percent of persons over 85 have trouble seeing even with corrective lenses.9

There are a number of normal age-related changes pertaining to the appearance of the eye and vision. These include the following issues:4,9

- **The eye’s ability to adapt to a darkened room**

- **The eye’s ability to adapt to a darkened room**
The elder's pupils become sluggish as the pupils decrease in size and become less responsive with age.

**Assessment tip:** As always, include medication evaluation as part of your assessment. Some drugs, such as Tamoxifen and thiazide diuretics, can interfere with vision.4,14

There are several visual problems that are commonly seen in the older adult. Nurses must be aware of these problems and their signs and symptoms so that appropriate referrals may be made.

- **Cataracts:** Cataracts are the most common causes of correctable vision loss.2,4 A cataract is an opacity of the lens that develops gradually without pain. It decreases the amount of light able to reach the retina, thus inhibiting vision. The patient experiences painless, gradual blurring and loss of vision; may see halos around objects; and have difficulty distinguishing colors. The pupil of the eye appears hazy. Cataracts are the leading cause of blindness in the world. Surgery is the treatment of choice, and prognosis is usually good. Risk factors include increased age, diabetes, eye trauma, long-term use of corticosteroid medications, smoking and alcohol use, and Caucasian race.4,24

- **Glaucoma:** This is a group of disorders characterized by an increase in intraocular pressure (IOP) that can damage the optic nerve. Untreated glaucoma can lead to peripheral vision loss and blindness. Its onset can be slow and insidious (chronic open-angle glaucoma) or abrupt (angle-closure glaucoma), which is a medical emergency. Treatment includes medications and/or laser therapy. Risk factors include IOP, being older than 60 years of age; a family history of the disease; personal history of hypertension, diabetes, myopia, or migraines; and African-American ancestry.4,8,24

- **Age-related macular degeneration (ARMD):** ARMD is the leading cause of blindness in persons over the age of 65. It is the atrophy of the macular region of the retina. The dry form of ARMD is characterized by retinal pigment degeneration and is slow and progressive and associated with a mild vision loss. The wet form involves the leakage of blood or serum from blood vessels beneath the retina. It is not as common as the dry form but is responsible for the majority of severe vision loss associated with ARMD. The primary symptom is a change in central vision, such as distortion of straight lines or bland areas that appear in the center of printed pages. There is no treatment for the dry form, but the wet form may be treated with laser treatments or injections.8,9,24

- **Diabetic retinopathy:** This is a microvascular disease of the eye associated with diabetes. The ocular microvascular system is damaged, and transport of oxygen and nutrients to the eye is inhibited. Patients experience a gradual vision loss. Treatment consists of laser therapy.9

**Hearing**

Hearing loss is quite common in the elder patient. It is estimated that more than 30 percent of older persons between 65 and 74 have some degree of hearing loss. This percentage increases to 66 percent in persons over 75. In addition to age, risk factors for hearing loss include smoking, history of middle ear infections, tumors, the buildup of ear wax and long-term exposure to loud noises.9

Normal aging changes that influence hearing include:9

- The skin of the external ear wrinkles and sags.
- Cerumen is drier and harder and tends to accumulate in the ear more than in younger adults.
- Loss of nerves and sensory organs associated with hearing.

**Assessment tip:** When assessing hearing, be sure to assess for the presence of excessive ear wax, which may hinder hearing.

Hearing is assessed in the same ways as with other adult age groups. The use of a tuning fork and covering one ear and whispering two-syllable words toward the uncovered ear are two of the ways to assess hearing.

**Assessment tip:** As with all assessment evaluations, be sure to review the patient's medications to determine whether any of them may affect hearing.

Tinnitus is a common problem in older adults. It is a ringing sound in the ear and can happen with or without accompanying hearing loss. The problem may be self-limiting or chronic. Tricyclic antidepressants may be prescribed as part of the treatment as well as relaxation techniques, biofeedback and counseling to deal with the discomfort.9

**Touch**

The sense of touch or physical sensation decreases with age. This is because nerve impulses are conducted at a slower rate in the elderly. There is also a reduction in the function of peripheral nerves. Medications used to calm or sedate may also contribute to a decrease in the sense of touch.9

These physiological changes lead to a decreased ability to perceive pain and temperature, which, in turn, can increase the risk for injury. For example, the older adult may not perceive the temperature of water in the bathtub or shower to be too hot, increasing the risk for burns. If the sense of pain is diminished, the elderly patient may not be aware that he has injured himself after falling or other types of blunt trauma.

The sense of touch is also important in conveying affection, and in some cultures, to communication in general. A loss of physical sensation may be detrimental emotionally as well as physically.

**Assessment tip:** Some diseases, such as diabetes mellitus, can cause peripheral neuropathies that add to the loss of the sensation of touch.9

One of the simplest ways to assess touch is to use a wisp of cotton. Patients close their eyes and are asked to indicate when they feel the sensation of touch. The nurse touches parts of the body, such as the face, the arms, the legs and the back. Additional techniques are to touch various areas of the body with a pin alternating with a wisp of cotton. The patient is asked to say whether he feels a sharp sensation (when touched with a pin) or dull (with the cotton wisp).9,24

Some nurses find it helpful to use objects of various sensations, such as sand paper, a piece of silk or fur and ask the patient if he feels a rough or a soft sensation. Tubes of hot and cold water may be placed against the patient's skin as he is asked to state whether he feels a cold or a hot object.9,24

**Assessment tip:** Teach older adults to examine their skin, especially over bony prominences, the soles of their feet and between fingers and toes for open or broken areas of skin. Because of the decrease in the sensation of touch, open areas may not be noticed until they are severe and/or infected.

**The integumentary system**

The integument, or the skin, is the body's largest organ and consists of three layers: the epidermis, the dermis and subcutaneous layers. The epidermis is the outermost layer of the skin and has up to five layers (depending on the specific part of the body). The dermis is the second layer of the skin, is made up of connective tissue, has an abundant blood supply, and lymph and neurosensory receptors. It supports and nourishes the dermis. The subcutaneous layer lies below the dermis, attaches to muscles and gives shape to the body and provides a protective cushion for bones and internal organs. There are also a number of accessory structures that are part of the integumentary system. These are the hair, nails, sebaceous glands (which produce sebum for skin lubrication) and eccrine glands that produce sweat.4,9

The skin is very important to health and wellness. It is responsible for:9

- Regulation of body temperature.
- Regulation of body fluids.
- Provision of a barrier to infection and promotion of the immune system.
- Production of vitamin D synthesis.
- Provision of sensory reception.

There are a number of age-related changes that affect how the integumentary system functions. Nurses need to be aware of these changes not only for their impact on physical health, but on self-perception and self-esteem as well.

- **Thickness and elasticity:** Both decrease with age, which leads to the appearance of wrinkles and causes the skin to sag, especially the skin of the face, neck and upper arms. Smoking is associated with an increase in wrinkling of the skin.9

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The epidermis: The epidermis thins, and moisture is lost. The skin begins to have a dry and rough appearance. The rate of cell growth is decreased, which leads to an increased risk for infection. This decrease combined with a lack of moisture makes the skin more susceptible to damage. Liver or “age” spots appear and the number of moles and freckles may increase. The cosmetic aspects of these changes may have a negative impact on the older adult’s self-image and self-esteem.4,9

The dermis: Beginning in a person’s 30s, the dermis begins to decrease in thickness and effectiveness. The connective tissue decreases in function, which causes a loss of skin turgor that progresses with age. The capillaries thin, which leads to bruising. There is an accompanying reduction in sensation that increases the risk for injuries such as burns, infections and pressure sores.4,9

Subcutaneous layer of skin: This layer increases in some parts of the body and decreases in others, resulting in changes in fat distribution. It thins in the face, neck, hands and lower legs. With age, fat distribution becomes more pronounced in the abdomen and thighs in women, and in the abdomen in men.9

Hair and nails: The color of the hair becomes gray or white and becomes thin. There is a loss of axillary and pubic hair, and alopecia, or baldness, appears. Men generally experience more obvious loss of hair from the head than do women. Balding may have a significant impact on self-esteem. Women may also begin to experience the growth of facial hair on their faces. Nails become dull, and yellow or gray. They become thick and break or split easily.4,9

Damage from sun exposure: Persons who spend a lot of time in the sun, whether because of their occupations or simply from their desire to acquire a deep, dark tan, are at risk for a number of health problems, particularly skin cancer. It is estimated that more than 90 percent of skin cancers are related to exposure to the sun. The cumulative effects of years of sun exposure increase the amount of age-related changes, such as wrinkles and freckles, and often make people appear older than they really are. Damage done by the sun is not reversible.9

Assessment tip: Some drugs increase a person’s sensitivity to sunlight. Some examples are antibiotics, antihistamines, antidepressants and antiarrhythmics. As always, educate patients about the risk for sun sensitivity if they are on medications that increase this problem.9

Skin cancer is a common problem among older adults. It is important that nurses recognize potentially malignant lesions and initiate appropriate follow-up and treatment. Skin cancer is the most common type of cancer in the United States. Its effects range from mild, easily curable lesions, to devastating, life-threatening malignancies.

Basal cell carcinomas: Basal cell cancer is the most common type of skin cancer in Caucasians. It is primarily due to sun exposure. Fortunately, if diagnosed early, basal cell cancer has a cure rate of 95 percent.24 When assessing the patient’s skin, be alert to the presence of basal cell cancers. This type of skin cancer can occur on any exposed surface of the skin, but is most common on the face, head, neck, nose, and ears.9

There are three types of basal cell cancers. They are:24

1. Nodululcerative lesions: Usually found on the face, these lesions are small, smooth, ink and translucent papules. As they grow, their centers become depressed with firm, elevated borders. They seldom metastasize, but if untreated they can become infected or lead to hemorrhage if they move into large blood vessels.

2. Superficial basal cell lesions: Commonly found on the chest and back, these cancers are oval or irregular in shape, lightly pigmented and have clearly defined, slightly elevated threadlike borders. They look scaly and may be mistaken for psoriasis or eczema. These lesions are associated with ingestion or exposure to arsenic-containing substances.

3. Sclerosing basal cell lesions: These lesions are waxy, yellow to white plaques and do not have clearly defined borders. They are most often found on the head and neck and appear in patches.

Report suspicious lesions for medical follow-up. Diagnosis is based on appearance and biopsy. Treatment involves careful excision and possibly chemotherapy and/or radiation, depending on the extent of the lesion.24

Squamous cell cancer is the second most common type of skin cancer in Caucasians and the most common type of skin cancer in persons with dark skin.9 It is an invasive tumor that has the potential to metastasize. Clues to the existence of squamous cell cancer are changes in existing skin lesions (e.g. moles, warts) or the appearance of a new lesion that ulcerates and fails to heal. This type of skin cancer, if diagnosed and treated early, has a high cure rate. But if it spreads, it can lead to disability or death.24

Squamous cell cancer often develops on the face, ears and dorsa of the hands and forearms. Risk factors for this type of skin cancer include sun overexposure or overexposure to X-rays, radiation therapy, chronic irritation of the skin, and ingestion of arsenic-containing substances. It is most commonly found in fair-skinned white men older than 60 years of age.24

Diagnosis is based on appearance and biopsy. Treatment includes excision, and if the tumor is extensive, radiation therapy, or possibly chemotheraphy.

Malignant melanoma is the most serious of all skin cancers and is responsible for more than 75 percent of all deaths due to skin cancers. Melanoma lesions may grow from an existing mole or appear as a new lesion. In appearance, melanoma lesions grow and become brown, black or multicolored. They develop nodules or plaques with irregular black outlines. Melanomas may crust or bleed and are usually larger than 6 mm in diameter.9

Appearance and biopsy confirm diagnosis. These lesions are treated with surgical resection that may include removal of the lymph nodes. Chemotherapy may also be part of the treatment plan, depending on the size and extent of the lesion.24

Part of your assessment should include patient education regarding the prevention of skin cancers. Advise patients to avoid exposure to the sun, especially between the hours of 10 a.m. and 4 p.m. Sunscreen should be used year-round, and clothing should cover the arms and legs when spending time in the sun. A broad-brimmed hat should be worn to protect the face and scalp. Patients should perform regular skin checks to monitor the appearance of new lesions or changes in old ones. Be sure to explain the potential for photosensitivity that some medications can cause. Encourage that patient to have an adequate intake of vitamin D, because this vitamin may actually lower the risk of certain cancers.24

Older adults are also susceptible to skin breakdown and skin infections. Because of the fragility of the elderly person’s skin and decreasing sensation, older adults are at high risk for skin breakdown. A slight cut may go unnoticed until it becomes infected. Sitting or sleeping for long periods of time in one position may lead to redness and even breakdown of the skin over bony prominences. Persons who rely on wheelchairs for their mobility are at particular risk for skin breakdown over the sacrum and gluteal areas.

Teach patients how to prevent or reduce their risk for skin breakdown. Here are some points to include in your teaching.

Eat a nutritious diet. Proper nutrition helps all body systems to maintain a healthy balance.

Encourage adequate hydration. Older adults dehydrate easily and need adequate amounts of fluid. Discourage excessive intake of caffeine and alcohol.

Avoid sitting or lying in one position for extended periods. Change positions frequently. If using a wheelchair for mobility, change your position by lifting the weight off the buttocks several times every hour.

Massage bony prominences such as the heels, hips and elbows. Use moisturizing lotion. Use gentle motions. Vigorous massage may bruise or tear the skin. Avoid lotions with large amounts of perfume because these can further dry the skin.

Examine the skin for reddened areas, cuts, abrasions, and lacerations. Seek medical attention for such areas that fail to heal, bleed, swell, become red and warm to the touch, or drain pus or foul-smelling discharge.

Elite CME
Avoid having bath or shower water too hot. Older persons’ skin burns easily.

Examine the skin for changes in moles, lesions, and freckles. Note any newly developing moles, lesions or freckles.

Avoid wearing clothing that is too tight or rubs or irritates the skin. This can lead to skin breakdown.

Avoid wearing shoes that are too tight or too loose. Tight shoes can damage the skin. If shoes are too loose, they may rub up and down with walking, which can also cause skin irritation.

Avoid wearing jewelry or watches that rub and irritate the skin.

**Assessment tip:** Help elders to identify a family member, close friend or caregiver to help perform skin examination and skin care as needed. It may not be possible to examine the entire body without help.

The cosmetic skin changes due to aging may cause a negative change in body image in the older adult. Monitor older adults for signs of depression or unrelieved stress and anxiety related to appearance. Never assume that because a patient is “old,” he may not be concerned about his physical appearance. Remember that pride in appearance is a life-long trait and should be considered when working with patients of all ages.

**The cardiovascular system**

Cardiovascular disease is the No. 1 cause of death in the United States. Nurses, when assessing the geriatric patient’s cardiovascular system, should not only be alert to normal aging changes and pathology, but also to opportunities to teach patients ways to enhance their cardiovascular health throughout the life span.

Mr. Lewis is 80 years old. He is hypertensive, has an elevated cholesterol, and suffered a moderately significant myocardial infarction one year ago. He takes his medication on schedule but does not follow his recommended low-fat, low-cholesterol diet. Mr. Lewis arrives at his physician’s office for a routine check-up. His nurse performs the initial assessment and reviews his lab work, which indicates his cholesterol is still higher than normal, even though he takes his medication as prescribed. Mr. Lewis explains: “I eat bacon and eggs every morning. I’m not supposed to, but I’ve eaten bacon and eggs every morning for 60 years and I’m not changing now. Those egg substitutes are terrible!” Should the nurse re-emphasize the importance of eliminating his morning breakfast eggs as recommended by the dietician? Or is there a compromise that can be reached with her geriatric patient?

This scenario illustrates one of the challenges of geriatric nursing practice. The nurse knows the clinical importance of adhering to his diet. But sometimes a compromise must be reached. As part of cardiovascular assessment (and patient education), the nurse must be able to work with, not in opposition to, her patient’s pursuit of health and wellness. Mr. Lewis may not be willing to eliminate eggs from his diet, but would he be willing to reduce the number of times a week he eats eggs? How much input has he had in his plan of care? What options has he been offered? Remember that the patient is the most important partner in the establishment of, and adherence to, an effective treatment plan.

**Age-related changes in the cardiovascular system**

It can be challenging to distinguish between disease pathology and normal aging changes in the cardiovascular system. A decrease in cardiac tolerance may be due to disease or simply an effect of the aging process.

However, age does not necessarily equate with cardiac health. A middle-aged person who eats a diet high in saturated fat, smokes and leads a sedentary lifestyle may very well have poorer cardiac functioning than an elderly person who has maintained an active lifestyle, exercises and eats a “heart healthy” diet. Here are some normal cardiovascular changes that are associated with aging.4,9

- Heart valves lose elasticity and stiffen, thus decreasing cardiac conductivity.
- Left ventricular wall thickens.
- Increased potential for postural hypotension.
- Increased risk for arrhythmias.
- Arterial elasticity decreases, which increases the risk for systolic hypertension and left ventricular hypertrophy.
- Increased risk for “silent” heart attack.
- Decreased blood perfusion to vital organs and the periphery of the body. This is due to arterial “stiffening,” and may make it difficult to palpate some peripheral pulses.
- Veins thicken, allowing for increased valvular reflux (backflow of blood) and increasing the risk for varicosities and dependency edema after sitting or standing for long periods of time.
- Decreased cardiac ability to handle stressful activities, such as shoveling snow.

**Assessment tip:** You may hear bruits (swishing or blowing sounds) over arteries such as the carotid arteries in elderly patients who have atherosclerosis. Pay special attention to this finding because there is a high incidence of stroke associated with bruits.4

Although the preceding normal aging changes must be acknowledged, nurses should not expect older adults to experience a debilitated cardiac system because of aging alone. By remaining physically active, not smoking, maintaining a normal weight, eating a healthy diet, and controlling blood pressure and cholesterol, geriatric patients can lead healthy lives and maintain a healthy cardiac status. However, chest pain, abnormal fatigue and significant sleep disturbances are not normal and may indicate cardiac pathology. Let’s review some of the more common cardiac problems seen in elderly persons: hypertension and myocardial infarction (heart attack).

**Hypertension**

About 25 percent of American adults have hypertension. Untreated, high blood pressure can lead to stroke, heart attack, blindness and renal dysfunction. It increases the workload of the heart, which can lead to heart failure and pulmonary edema.24

The National Institutes classify blood pressure based on stages as follows:1,2,24

<table>
<thead>
<tr>
<th>Systolic</th>
<th>Diastolic</th>
<th>Stage</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;120 mm Hg</td>
<td>&lt;80 mm Hg</td>
<td>Normal</td>
</tr>
<tr>
<td>120-139 mm Hg</td>
<td>Or 80 to 89 mm Hg</td>
<td>Pre-hypertension</td>
</tr>
<tr>
<td>140 to 159 mm Hg</td>
<td>Or 90 to 99 mm Hg</td>
<td>Hypertension Stage 1</td>
</tr>
<tr>
<td>&gt;160 mm Hg</td>
<td>Or &gt; 100 mm Hg</td>
<td>Hypertension Stage 2</td>
</tr>
</tbody>
</table>

**Assessment tip:** A systolic blood pressure greater than 140 mm Hg is a more significant cardiovascular disease risk factor than diastolic blood pressure.

If blood pressure readings indicate hypertension, make sure that the cuff size is appropriate for the patient’s arm circumference and that the cuff is properly applied. Check blood pressure in standing, sitting and supine positions. Ask the patient whether he drank beverages containing caffeine or if he is stressed or emotionally upset, which can cause an elevated reading. Do not initiate treatment based on one reading, especially if dietary or emotional factors influence readings.2,4,24

Patient education for older adults should include these items:24

- Maintain a healthy weight.
- Reduce salt intake.
- Stop or do not start smoking.
- Initiate a medically approved exercise program.
- Increase potassium, especially if taking potassium-depleting diuretics. Fruits and vegetables are good sources of potassium.
- Reduce stress. A consult concerning methods of relieving stress (counseling, relaxation techniques, etc.) may be necessary.

**Assessment tip:** Remember that the patient must be a partner in developing treatment regimens! His cooperation is essential if treatment and patient education are to be effective.

**Heart attack**

Most nurses are aware of the signs and symptoms of heart attack. Many patients are aware of them as well. Most clinicians and even laypersons think of crushing, substernal chest pain; jaw pain; pain that radiates to the left arm, neck, jaw or shoulder; sweating; nausea; vomiting; and some respiratory discomfort as typical presenting symptoms.22 However, these typical symptoms may not be present. In fact, women often present with atypical symptoms. Let’s review the atypical symptoms as part of the assessment process because such signs and symptoms may not be as familiar as the typical symptoms.
**Women and heart attack**

After a woman experiences menopause, she is at as much risk as men. Women are typically older than men when they present with symptoms of cardiovascular disease. This is because, prior to menopause, estrogen seems to offer some protection against cardiovascular disease. Therefore, the earliest presenting age of symptoms is generally older, but this depends on the age of the woman when she experienced menopause.

One in four women die of heart disease in the United States. (One in 30 die of breast cancer). Twenty-three percent of women die within one year after having their first heart attack, and within six years of having a heart attack, approximately 46 percent of women become disabled with heart failure. About 66 percent of women who have heart attacks fail to make full recoveries.9

These statistics illustrate how important it is for older women to be assessed for heart disease. Part of this assessment is to identify those atypical symptoms of heart attack in women, who are more likely to experience:9,24,25

- Indigestion or “gas-like” pain.
- Feelings of “tightness” in chest.
- Fullness or pressure in the chest.
- Discomfort in the back, neck, stomach or jaw.
- Dizziness.
- Shortness of breath.
- Nausea.
- Cold sweat.
- Unexplained feelings of weakness and extreme fatigue.
- Pain or discomfort between the shoulder blades.
- Sense of impending doom.

Women may also experience the typical symptoms the same as men. But their atypical symptoms are just as significant as those experienced by men. It is imperative that nurses teach their female patients about the symptoms women are likely to experience when having a heart attack. If they do not recognize signs and symptoms indicating a medical emergency, they may delay or refuse to seek help. In fact, findings from recent research show that women wait an average of 22 minutes longer than men to seek help when having a heart attack.9 This delay can cause serious complications, including death. The sooner treatment is initiated, the better are the chances of reducing damage to the heart and resulting complications.

In summary, cardiac status in older adults does not necessarily deteriorate enough to adversely affect health and well-being. Leading a “heart-healthy” life can promote cardiac wellness throughout the life span.

**The respiratory system**

As with the cardiovascular system, it can be difficult to distinguish normal age-related changes from pathology in the older person’s respiratory system. The following changes in lung physiology and structure occur with normal aging and can influence the effectiveness of respirations.9

- Decrease in lung elasticity, reducing the ability of the lungs to recoil.
- Decreased airway clearance, cough reflex and laryngeal reflex.
- Chest muscles are decreased in strength; chest wall stiffens.
- Ciliary action decreases, which increases the risk of respiratory infection as well as aspiration.
- Decreased ability of the lungs to respond to elevated levels of carbon dioxide.
- Immune system antibody production decreases, thus increasing susceptibility to lung infections.

**Assessment tip:** Smoking contributes to all forms of lung disease. Help patients to quit smoking. Be aware of smoking cessation programs that patients can access.

Here are some patient education items to help patients avoid or reduce the risk for lung disease.9,24

- Stop smoking!
- Avoid contact with family and friends if they are ill.
- Wash hands frequently. Carry antibacterial hand wash and use it when in public.
- Receive the pneumonia vaccine if not contraindicated.
- Drink plenty of fluids to maintain hydration and keep lung secretions moist.
- Take 10 deep breaths every hour to expand lungs.

Let's look at some lung diseases that are often found in older patients and treatment issues impacted by age.

**Pneumonia**

Pneumonia, an acute infection of the lungs, is among the leading causes of death in the United States.24 Prognosis is usually good for persons with normal lung function. However, age-related changes in the respiratory system can make it difficult for elderly patients to recover.

Currently the vaccination for pneumonia is recommended for all individuals aged 65 and older and for all adults who are dealing with chronic illnesses or have suppressed immune systems. The vaccine is about 80 percent effective, but effectiveness does decrease over time.9

Patients who are immobile after surgery, have limited mobility due to physical deterioration or who lead a sedentary lifestyle are at risk for lung disease. Encourage patients to change position, become and stay ambulatory, and take frequent deep breaths. As always help patients access smoking cessation programs if they smoke!

**Assessment tip:** A word about influenza.

Encourage elderly patients to be vaccinated against the flu annually. They may think that it is not a serious illness, but it can be fatal, especially in those of advanced age!

**Chronic obstructive pulmonary disease**

Chronic obstructive pulmonary disease (COPD) is chronic airway obstruction that is the result of emphysema, chronic bronchitis, asthma or any combination of these diseases.24 Smoking is probably responsible for more than 90 percent of diagnosed cases of COPD.9 Other contributing factors include chronic respiratory infections, air pollution and inflamed lung tissues.24

COPD also compromises cardiac function, placing strain on the right ventricle, which is responsible for pumping blood into the lungs.9 Older patients are particularly vulnerable to compromised cardiac function as a result of COPD.

The earliest clue to the presence of COPD is an early morning cough that produces clear sputum. Periods of wheezing may occur if the patient has a “cold.” As the disease progresses, shortness of breath develops and becomes progressively worse.9,24 The usual progression of COPD looks like this:

- There are usually no symptoms within the first 10 years after the patient starts to smoke.
- At about 10 years after starting to smoke, the patient develops a chronic cough that produces a clear sputum.
- At the age of 40 or 50, the patient begins to exhibit dyspnea.
- At about the age of 50, patients begin to be vulnerable to respiratory infections with progressively longer recovery times.
- As COPD progresses, shortness of breath occurs with the most minor activities, such as making a bed.

**Assessment tip:** Elderly patients who suffer from COPD often have calluses on their elbows. This is the result of leaning over tables to stretch out their upper body so that more air can enter and leave the lungs during respiration.9,25 Be alert for this sign. Watch for signs that your patient is attempting to stretch out his torso to facilitate breathing.

**Lung cancer**

Lung cancer is the most common cause of cancer deaths in men and women. The most current available statistics show that in 2004, lung cancer was responsible for more deaths than breast cancer, prostate cancer and colon cancer combined.9,26 Once more predominant in men, lung cancer rates in women are rapidly increasing as the incidence of female smokers increases.

Lung cancer is largely preventable.24 Smoking is the biggest risk factor for developing the disease. The pollutants in tobacco smoke cause progressive lung cell degeneration. Lung cancer is about 10 times more common in smokers than non-smokers, and 80 percent of patients with lung cancer are smokers.24

Symptoms of lung cancer mimic symptoms of other lung diseases. Chronic cough, shortness of breath, coughing up blood, fatigue, weight loss and frequent lung infections are common symptoms.9,24 Older patients may undergo surgical removal of the tumor, part of the lung,
or the entire lung depending on the extent of the tumor and the patient’s general condition. Radiation and chemotherapy may also be necessary.\(^{9,24}\)

**Pulmonary embolism**

Pulmonary embolism is not a disease but a complication of primarily hospitalized patients. It occurs when part of the pulmonary arterial bed is obstructed by a dislodged thrombus, an air bubble, or tissue fragment of lipids.\(^{9,24}\) Pulmonary embolism results in about 100,000 deaths every year and is the third leading cause of death in the United States.\(^9\) Symptoms of pulmonary embolism include rapid respirations, dyspnea, chest pain, hypoxia, decreased cardiac output and possibly shock.\(^{9,24}\)

Risk factors for pulmonary embolism include immobility, surgery, obesity, clotting disorders, dehydration, atherosclerotic changes in the elderly person’s circulatory system and atrial fibrillation.\(^9\) Many of these risk factors are found in the elderly population as part of normal aging changes. Teach your patients how to avoid this complication, especially if you know they are facing upcoming surgery.

- Teach and facilitate the patient’s ability to perform active range of motion exercises.
- If the patient is unable to perform active range of motion, teach caregivers how to perform passive range of motion exercises.
- Facilitate the administration of low-dose anticoagulant therapy.
- Implement compression stockings as appropriate.
- Encourage early postoperative ambulation.
- Teach patients to change position and move lower extremities frequently.

**Smoking cessation**

Since smoking cessation is so critical to the prevention of and reducing the effects of lung disease, it is worthwhile to spend some time discussing ways to facilitate the process.

Some older adults (and some health care professionals as well) may believe that if they have smoked most of their lives, it will do no good to stop now. This is not true! The effects of smoking can actually begin to reverse themselves. If older adults stop smoking, their risk of heart attack, stroke and cancer goes down. Circulation improves and so does lung function. Eliminating tobacco products can also help to keep diseases such as COPD and bronchitis from getting worse.\(^9\)

Some older adults may think that they are more likely to return to smoking after they have quit. In fact, research shows that older smokers are much more likely than younger smokers to stay away from tobacco products. Older smokers also seem to know more about the health benefits of quitting smoking.\(^9\)

How can you help older patients to stop smoking? Here are some suggestions.

- Involve the patient’s family, friends and/or caregivers. It is not easy to quit smoking, and the support of significant others in the patients’ lives can be a big help.
- Find out if the patient lives with or has frequent contact with people who smoke. It is very difficult to stay away from tobacco products if constantly in the company of others who are smoking. If possible, the patient may be able to avoid the company of others who smoke.
- Consult with the patient’s physician or nurse practitioner about prescription and non-prescription aids for smoking cessation.
- Keep an objective, non-judgmental attitude. Stopping smoking is difficult, and feeling that nurses and other health care professionals disapprove of them or their behaviors only makes the process more difficult. Patients need encouragement and support to stop smoking.
- Find out about reputable smoking cessation programs in the community and on the Internet. Support groups can be very helpful. Many older adults often explore the Internet and seek out health information online. There are many excellent health resources on the Web. However, there are also many fraudulent, inaccurate sources of information. Familiarize yourself with websites that are good sources of information and support for those trying to quit smoking. Older adults who have limited access to transportation or who have limited mobility may rely on the Internet for information and communication with others. Be able to guide them towards reliable online sources of smoking cessation programs.

**The endocrine system**

The endocrine system is responsible for managing the body’s metabolic functioning. The endocrine glands manufacture and release hormones that trigger cellular responses and actions.\(^9\)

Normal age-related changes in the endocrine system include: \(^{9,24}\)

- Decreased pancreatic secretion of insulin.
- Decreased body sensitivity to insulin, which causes changes in blood glucose levels.
- The peripheral tissues of the body become resistant to insulin. This resistance is especially evident in persons who are obese.
- Changes in thyroid function that can cause systemic problems.

The normal age-related changes in the endocrine system most predominantly affect the body’s use of insulin and the ability of the thyroid to function. Therefore, let’s look at the effects of diabetes mellitus and thyroid malfunction.

**Diabetes mellitus**

Diabetes mellitus (DM) is quite prevalent, and its incidence is increasing in people who are over the age of 65. This increase is especially evident in persons who belong to racial and ethnic minorities.\(^9\)

Type 1 DM is usually an autoimmune disease and most often affects children and young adults. Type 2 DM most often begins as insulin resistance because of changes in the endocrine system and is linked to old age, family history and obesity. The incidence of type 2 DM is increasing in the geriatric population.\(^{9,24}\)

**Risk factors for DM 2** include the following factors: \(^{9,24}\)

- Over 45 years of age: risk increases with age.
- Obesity.
- Inactive lifestyle.
- Hypertension.
- Family history of DM.
- Elevated cholesterol.
- Persons of African American, Hispanic, Pacific Islander, Asian American, and Native American origin.
- Impaired glucose tolerance.

Signs and symptoms include fatigue, polyuria, dehydration, thirst, poor skin turgor, dry mucous membranes and unexplained weight loss.\(^{24}\) Older patients with DM may most often exhibit the following:

- Excessive thirst: This is a cardinal symptom. However, older adults may not report excessive thirst because the thirst mechanism functions less effectively in older adults than in younger adults.
- Excessive hunger.
- Blurred vision.
- Vaginal infections.
- Frequent urinary tract infections in women.
- Skin infections.
- Difficulty healing.

**Assessment tip**: To help prevent urinary tract infections, encourage older patients to drink cranberry juice, which is believed to stop bacteria from sticking to the lining of the bladder.\(^9\)

The treatment regimen for DM in older adults is similar to that of younger adults. There are a few issues that deserve special emphasis in the older population, however. These include the following: \(^{9,24}\)

- **Meticulous foot care**: The older person must be taught (or his caregiver taught) to examine his feet for any open areas, cracks or evidence of compromised skin integrity. Feet should be washed and carefully dried every day. Special attention should be given to the areas between the toes, which are harder to keep dry. Socks should be changed daily and be kept clean and dry. Referral to a podiatrist is appropriate. Older persons with DM should not cut their own toenails because of the risk of cutting the skin of the feet, thus increasing the risk of infection and should visit a podiatrist regularly to have their toenails cut and feet evaluated. Shoes should be fit by someone who is familiar with the problems of DM. If cost is an issue, refer patients for financial counseling. Nurses should be aware of podiatrists in the community who make special arrangements for older persons in financial difficulty. Teach the patient never to walk barefoot.
- **Checking blood glucose**: Evaluate the older adult’s ability to perform blood glucose
monitoring and evaluate the results. As necessary, teach other family members or caregivers to perform this task.

- **Medications**: Teach patients, families and/or caregivers about the medications the patient is taking and the potential for side effects.

- **Diet**: The dietician should be involved in helping the patient understand dietary implications. If the patient is unable to adhere to dietary restrictions, programs such as Meals on Wheels may be initiated.

- **Signs and symptoms**: Teach patients, family members and caregivers the signs of hyperglycemia and hypoglycemia and what to do in the event of occurrences.

- **Blood pressure**: Help the patient to adhere to blood pressure management regimen. If he is not hypertensive, teach him ways to avoid developing high blood pressure.

- **Exercise**: In conjunction with the patient’s physician, physical therapy and others, nurses must help the patient to design an exercise program appropriate for his state of health and wellness.

Management of DM is a lifelong endeavor. The nurse must help the patient, family and caregivers to adapt to the lifestyle modifications necessary for the maintenance (or achievement) of a maximum state of health and well-being. The elderly patient may have difficulty adjusting to some aspects of the ongoing nature of DM management. Physical limitations may prevent him from performing foot care or administering insulin, if needed. Nurses need to make sure that the patient has adequate resources and support systems to help him manage his care.

**Thyroid problems**

The incidence of thyroid disorders increases with age. As a person ages, the thyroid slowly loses its ability to function and begins to atrophy. It becomes more nodular, and the occurrence of thyroid nodules and hyperthyroidism increases significantly with age. The thyroid antibody levels rise with age, which makes it difficult to determine whether such elevation is pathological or part of the aging process. Hyperthyroidism rates are similar for younger persons and older adults, but the disease may produce less obvious symptoms in the elderly, making diagnosis problematic. The incidence of hyperthyroidism is quite a bit higher in women compared to men in all age groups, and is higher in the elderly who live in long-term care facilities than older persons who live in the community.9

Some important points about hyperthyroidism in the older adult are:9,24

- Hyperthyroidism is harder to diagnose in the elderly compared to younger people because older adults present fewer signs and symptoms. Additionally, their symptoms may be different than those of younger persons.
- The predominant symptoms of hyperthyroidism in older people are rapid heart rate, weight loss, fatigue, apathy, changes in sleep patterns, mood changes, changes in bowel movements, visual disturbances and weakness. The thyroid is usually not enlarged nor is it easy to palpate. By contrast, the predominant symptoms in younger persons are nervousness, anxiety, heat intolerance, sweating and an enlarged thyroid.
- About 27 percent of older persons who have hyperthyroidism present with some type of cardiac symptoms such as atrial fibrillation, chest pain, angina and even heart failure. These symptoms may be mistaken for active cardiac disease, and the actual cause, hyperthyroidism, may be overlooked or not even considered.

Nurses need to be aware of conditions, such as hyperthyroidism, that mimic other conditions common in the elderly population. Treatment of hyperthyroidism in older adults generally consists of ingesting radioactive sodium iodide instead of surgery. If treatment results in hypothyroidism, thyroid replacement therapy is initiated.9,24

Hypothyroidism is rather common. Here are some points about hypothyroidism in the elderly population.9,24

- The older person who is diagnosed with hypothyroidism is typically a female over the age of 50.
- Older persons who have hypothyroidism present with fewer symptoms than do younger people. Generally, their symptoms are rather non-specific and can be attributed to a variety of other health problems.
- The symptoms of hypothyroidism most often noted in older people include mental deterioration, new patterns of incontinence, reduction in mobility and difficulty coping.
- Untreated hypothyroidism may lead to hypertension and hyperlipidemia, both of which are common in the elderly population. A life-threatening complication of untreated hypothyroidism is myxedema coma, a life-threatening medical emergency. In myxedema coma, mental confusion deteriorates to stupor and coma and significant electrolyte imbalances. Emergency intensive care hospitalization is required if this potentially lethal complication develops.

The goal of treatment of hypothyroidism in the older adult is to alleviate symptoms and return the thyroid-stimulating hormone (TSH) to normal levels. However, TSH replacement must be done with caution because an increase in levels may trigger significant cardiac problems.9

In summary, thyroid problems in the older patient are often difficult to diagnose. Presenting signs and symptoms may be subtle and mimic a variety of diseases and disorders commonly found in this population. It is important to rule out conditions such as heart disease and to determine whether two or more problems co-exist simultaneously.

Unfortunately, because of the vagueness of clinical presentation, thyroid disorders are often overlooked in the elderly patient. Nurses have excellent opportunities to serve as advocates for patients and to remain aware of the possibility of thyroid disease when they perform geriatric assessment. If thyroid disease is suspected, nurses should advocate for laboratory assessment of thyroid hormone levels.

Some of the nurse’s responsibilities include the provision of careful patient education. Patients will most likely be on some type of medication for the remainder of their lives. They need to understand the importance of taking their medication as prescribed. They also need to be aware of the signs and symptoms of hyper- and hypothyroidism. Patient education efforts should focus on disease management and adherence to treatment regimens.

**The hematologic system**

The main function of the hematologic system is the ability of the circulating blood to transport oxygen and nutrients to the body’s internal organs and peripheral tissues and to remove carbon dioxide and waste products.9

There are a number of age-related changes that occur in the hematologic system. These include the following:9,24

- As the body ages, the bone marrow’s ability to manufacture red blood cells (RBC) swiftly in the event of blood loss or disease slows. This does not usually have a major impact on health and wellness unless the blood loss or disease process is extensive.
- Hemoglobin and hematocrit values are slightly decreased, but should remain within normal ranges.
- There is a reduction in the number of stem cells.
- There is a decreased production of intrinsic factor, which can trigger pernicious anemia.
- Cellular immunity decreases.
- The functional ability of the lymphocytes decreases.

The most common hematologic disorder is anemia. Although common in older adults, anemia is not a normal age-related change, contrary to what some health care professionals may believe. Anemia is a sign of disease, and if it occurs, it cannot be successfully treated until the underlying cause is addressed.9,24

Anemia exists when there is an inadequate amount of hemoglobin to meet the body’s needs. It is defined as a reduction in the number of circulating RBCs. This reduction can be due to loss of blood, an abnormally high rate of RBC destruction, or an inadequate or impaired production of RBCs.9

There are several types of anemia. Some of those most commonly found in elderly patients are as follows:

**Pernicious anemia**

Pernicious anemia is characterized by a decreased gastric production of hydrochloric acid and a deficiency of intrinsic factor.24 Factors that contribute to this problem are small bowel disease, infection, excessive use of antacids, overgrowth of intestinal bacteria and a strict vegetarian diet.9 The incidence of pernicious anemia increases with age. As people age, the
body’s ability to absorb vitamin B12 diminishes. This vitamin is necessary for RBC growth.24

Signs and symptoms of pernicious anemia include:24

- Cardinal signs of weakness, sore tongue, and numbness and tingling of the extremities.
- Lips, gums and tongue seem to be bloodless.
- Patients are quite vulnerable to infections.
- The sclera and skin may be jaundiced.
- GI symptoms may include nausea, vomiting, weight loss, diarrhea, flatulence and constipation. The tongue may become inflamed, and the gums may bleed.
- Neurologic symptoms: Weakness, poor coordination, ataxia, dizziness and loss of bowel and bladder control.
- Cardiovascular symptoms: Reduced hemoglobin levels, decreased cardiac output, rapid heart rate and arrhythmias.
- Musculoskeletal symptoms: Scissors gait may develop as a late sign if pernicious anemia goes untreated.

Pernicious anemia is treated with a high dose of parenteral vitamin B12 replacement therapy. This triggers rapid regeneration of RBCs. After hemoglobin levels return to normal and the patient’s condition stabilizes, vitamin B12 can be administered monthly at maintenance level doses. In addition to supplement administration, the patient’s diet should be rich in foods high in folic acid such as beans, nuts, whole grains and green leafy vegetables.9,24

**Malignancies of the hematologic system**

Malignancies of the hematologic system are associated with overproduction of lymphoid and myeloid cells linked with bone marrow failure. They are characterized by the accrual of large numbers of white blood cells (WBC) in the bone marrow, liver, spleen, lymph nodes and central nervous system.9

**Acute leukemia**

Acute leukemia is a proliferation of the precursors of WBCs in bone marrow or lymph tissue. They accumulate in bone marrow, body tissues and peripheral blood. With treatment, children between the ages of 2 and 8 have the best chance of survival (about 50 percent). Adults, however, generally survive about only one year after diagnosis, even with treatment.24

Onset in children is quite dramatic. In older adults, the onset is more gradual, with presenting symptoms of weakness, pallor and acute confusion. The liver, spleen and lymph nodes are found to be enlarged upon palpation. Persons of advanced age have a poor prognosis. Treatment involves the administration of various combinations of drugs to inhibit WBC production. Bone marrow transplant is rarely initiated in persons over the age of 65. Infections are a leading cause of death in older patients, who, even with treatment, relapse within one year.9

**Chronic lymphocytic leukemia**

Chronic lymphocytic leukemia (CLL) is a progressive disease that is common in the elderly. It is characterized by uncontrollable spread of abnormal lymphocytes in blood, bone marrow and lymphoid tissue. Almost all patients diagnosed with CLL are over the age of 50.24

Typical symptoms include fever, fatigue, malaise and lymph node enlargement. As the disease reaches advanced stages, fatigue, weight loss, bone pain and liver or spleen enlargement become apparent. Treatment consists of chemotherapy and radiation. Curiously enough, early treatment is not associated with increased survival. Thus, treatment is not initiated in older persons until they manifest weight loss, night sweats, fever or enlarged lymph nodes.9

**Lymphomas**

Hodgkin’s disease is a malignancy of the lymphoid tissue characterized by painless, progressive enlargement of lymph nodes, spleen and other lymphoid tissue. This disease is most common in young adults, but its incidence peaks in two age groups: persons who are between 15 and 35 and people over 50.24

It is believed that there is a viral connection associated with the development of Hodgkin’s disease, with the Epstein-Barr virus as the focus of attention. Risk factors include a family history of infectious mononucleosis and an immune system that is compromised.24

Symptoms include painlessly enlarged lymph nodes, persistent fever, night sweats, fatigue, weight loss, pruritis and anemia. The disease is treated with radiation, chemotherapy, or both and depends on the stage of the disease. Older adults usually receive chemotherapy for six to eight months.9,24

**Non-Hodgkin’s lymphoma** is a malignancy of lymphoid tissue but is not diagnosed as Hodgkin’s disease. It is more systemic in nature than Hodgkin’s disease, and prognosis is usually poorer. Normal lymphoid tissue is replaced by cancerous cells. This compromises the immune system and leads to infections.9,24

The first symptoms of the disease are usually swelling of the lymph glands, enlarged tonsils and adenoids, and painless, rubbery nodes in the cervical supraclavicular areas. Fatigue, malaise, weight loss, fever and night sweats may also be present.24

The cause of non-Hodgkin’s lymphoma is unknown, but a viral link is suspected. Persons with impaired immune system abnormalities or those taking phenytoin seem to be at increased risk to develop the disease.9 Treatment includes chemotherapy and, in localized cases, radiation. Another option is the administration of monoclonal antibodies, specifically rituximab.24

Both types of lymphoma may be curable, depending on the stage of the malignancy, with radiation and aggressive chemotherapy. However, older adults may not be able to tolerate such intense treatment. The geriatric patient may need assistance with activities of daily living as he undergoes treatment for the disease, which may take six months or longer.9

Patients should also take every precaution to avoid infection. They should avoid crowds, and family members and friends who are ill, even with minor infections such as colds, should not come into contact with the patient.

**The nervous system**

The nervous system consists of two systems: the central nervous system and the peripheral nervous system. The central nervous system consists of the brain and the spinal cord. It is responsible for the integration of all nervous system activities.9

Parts of the brain include the cerebrum, the brain stem, the cerebellum, the limbic system and the reticular activating system (RAS).9 The cerebrum contains the nerve center that controls...
intelligence and motor and sensory function. The brain stem serves as the relay center for messages between the various parts of the nervous system. The cerebellum is responsible for maintaining muscle control, balance and coordination. The limbic system initiates the basic human drives such as hunger, emotional and sexual arousal and aggression. The RAS assesses all incoming sensory information and sends it to the appropriate areas of the brain for interpretation. It is also imperative for maintaining consciousness.4,9

The brain is divided into the right and left hemispheres, which are further divided into four lobes: frontal, temporal, parietal and occipital.4,9 It is important to know the functions of the various lobes because damage to one or more locations affect various body system functions.

- The frontal lobe is responsible for personality, judgment, abstract reasoning, some aspects of language (Broca’s area), motor function, problem solving, reasoning and memory.4,9
- The temporal lobe is responsible for language comprehension (Wernicke’s area), some memory recall and hearing.4,9
- The parietal lobe integrates sensory information such as temperature and taste. It also interprets, size, shape, texture and distance.4,9
- The occipital lobe interprets visual stimuli.3,9

The spinal cord reaches from the first cervical vertebra to the lower border of the first lumbar vertebra. The spinal cord is the major pathway for messages that travel back and forth between the brain and the body’s peripheral areas.4

The peripheral nervous system is composed of the cranial nerves, spinal nerves, the somatic and autonomic nervous system, and the reflex arc. There are 12 pairs of cranial nerves that transmit motor and/or sensory communications between the brain or brain stem and the head and neck.4 There are 31 pairs of spinal nerves that transmit messages to and from various regions of the body.4,9 The somatic nervous system functions as the link between the brain via the spinal cord to muscles and sensory receptors. The autonomic nervous system is responsible for maintaining homeostasis.9

It can be a challenge to differentiate between normal aging changes of the central nervous system and pathology. The impact of aging on the nervous system varies quite a bit among elderly adults. Experts recommend that health care professionals “not treat normal aging changes as disease. A common myth is that cognitive decline is inevitable.”9 There are some age-related changes in memory and attention, but older adults retain the ability to learn new things and live independently as long as neurological disease and pathologies do not occur.9

Here are some normal age-related changes of the nervous system.4,9

- Decrease in size and weight of the brain.
- Decrease in number of neurons.
- Decrease in short-term memory.
- Decrease in blood flow to the brain.
- Decrease in coordination.
- Decrease or absence of deep tendon reflexes.
- Decrease in responses and movements.
- Increase in pain threshold.
- Increase in incidence of physiologic tremor.
- Decreased reaction time.
- Sleep disturbances become more common, including insomnia and loss of REM sleep.
- Incidence of mood disorders and depression increase.

Normal age-related changes may mimic pathological changes. Here are some common diseases of the nervous system seen in elderly persons.

**Parkinson’s disease**
Parkinson’s disease is a chronic, progressive disease characterized by progressive muscle rigidity, involuntary tremor, akinesia and dementia. Complications include aspiration pneumonia, infection, injury from falls, urinary tract infections and compromised skin integrity. Parkinson’s disease in found in two out of every 1,000 people. It usually develops after the age of 50, but can occur in children and young adults.24

The cause of Parkinson’s disease is not known, but research suggests that exposure to environmental toxins or genetic predisposition may play significant parts in its development. Studies of the pathophysiology of the disease show that a dopamine deficiency inhibits the affected brain cells from functioning normally.23 There are no definitive diagnostic tests. Diagnosis depends on age, history and presenting signs and symptoms.4,9 Nursing assessment may be critical to the diagnosis of this and other diseases that occur in the elderly adult.

There is no cure for Parkinson’s disease. Treatment focuses on symptom relief and maximizing function for as long as possible. Drug therapy generally includes levodopa, a dopamine replacement; physical therapy; and in very severe cases, stereotactic neurosurgery or the controversial treatment of fetal cell transplantation.24

**Assessment tip:** Dosages of anti-Parkinson drugs may need to be decreased in elderly patients because of inability to tolerate higher doses of such medications. Patients must be taught to recognize medication side effects, such as orthostatic hypotension, irregular heartbeats, anxiety or confusion.24

**Transient ischemic attack (TIA) or “mini-stroke”**
Mrs. Stephens is 80 years old, She lives with her husband, who is 81 and dealing with prostate cancer. During an appointment with his oncologist, Mr. Stephens tells the nurse practitioner that he is worried about his wife. He says, “I think there might be something wrong with my wife. Sometimes she acts like she doesn’t know what’s going on. Her speech gets really funny, and she can hardly walk. It only lasts for a few minutes, and then she is OK. But I don’t think this is good.”

There is no permanent damage from TIsA, but their occurrence is considered to be a warning sign of impending stroke. Incidence increases significantly after the age of 50 and is greatest among men and African-Americans.4,9

The occurrence of TIAs indicates a need for meticulous assessment and actions to prevent the occurrence of stroke.

**Cerebrovascular accident (stroke)**
Stroke is an abrupt impairment of cerebral circulation. This impairment interrupts the flow of oxygen to the brain, which can cause serious damage to brain tissue. Depending on the location and extent of damage, the patient can be left with serious disabilities that may affect all aspects of daily living.24

There are three major types of stroke.9,24

- **Thrombosis:** The most common cause in middle-aged and elderly adults, thrombosis causes ischemia in brain tissue affected by diminished circulation.
- **Embolism:** The second most common cause of stroke, embolism is due to the occlusion of a blood vessel by a fragmented clot, tumor, fat, or air.
- **Hemorrhage:** The third most common cause of stroke, hemorrhage is due to a sudden rupture of a cerebral artery.

Signs and symptoms depend on the location of the stroke and may include speech impediments, paralysis or weakness of the extremities, disorientation, vision disturbances, headaches, vomiting and coma.24

The sooner the patient receives emergency medical intervention, the better the chances for survival. Emergency administration of medications includes:24

- Tissue plasminogen activator to dissolve clots in non-hemorrhagic stroke. It must be administered within three hours of symptom onset.
- The antiplatelet drug ticlopidine may be effective in preventing stroke and in reducing the risk for future strokes in patients who have already suffered one.
- Corticosteroids may be administered to reduce cerebral edema and anticonvulsants given to prevent seizures.

Patients will need long-term follow-up and rehabilitation.

**Measures to reduce the risk for stroke include:**

- Participate in a regular exercise program.
- Stop smoking.
- Monitor blood pressure and take anti-hypertensives as ordered.
Reduce salt intake.
Reduce the intake of saturated fats.
Eat at least two servings of fish per week.
Eat five or more servings of fruit and vegetables every day.
Eat six or more servings of grain products every day.

**Seizures disorders**
Seizures occur when there is an acute, abnormal release of electrical activity in the brain. Seizures may be partial or focal or generalized. Focal seizures include a brief change in level of consciousness characterized by a blank stare, rolling of the eyes and/or a brief change in level of consciousness. Generalized seizures can include muscular jerks of the extremities or entire body, incontinence, difficulty breathing, apnea and loss of consciousness.9,24

The nurse should assess when and how often seizures occur and what occurs during seizures. Some adults may have had seizures for many years due to problems such as epilepsy. They may also develop epilepsy in old age. Adults over 75 are twice as likely to develop new-onset epilepsy than all adult age groups less than 65 years of age.24

Nurses should find out what, if anything, triggers seizures and what treatment measures are in place to control the occurrence of seizures. Patient education should stress the importance of adherence to treatment regimens and how to avoid injury in the event of seizures. Family members and caregivers must be involved in patient education as well.

**The gastrointestinal system**
The gastrointestinal system undergoes quite a few changes with aging. These changes can have significant impact on a person’s nutritional status and general health and well-being. The gastrointestinal (GI) system is responsible for digestion, absorption, secretion and motility.9

Normal age-related changes in the GI system include:9
- Decrease in salivary secretion and the number of taste buds.
- Decreased esophageal mobility.
- Decreased size and weight of the liver.
- Decreased rate of fat, mineral and vitamin absorption.
- Tooth enamel and dentin erode.
- Increased incidence of gastroesophageal reflux.
- Increased incidence of constipation.
- Delay in gastric mobility and emptying.

**Assessment tip:** Many medications can add to the age-related changes in the GI system. These include antidepressants, antihistamines, antihypertensives, calcium channel blockers, diuretics and laxatives.9,14

These changes contribute to a number of common age-related disorders in the geriatric patient.

**Dysphagia**
Dysphagia is the most common esophageal problem in older adults.9 It is characterized by trouble with any part of the mechanism of swallowing foods or liquids. This problem inhibits adequate nutritional intake and can adversely affect the older adult’s health and well-being.

When assessing swallowing, the nurse should be aware of factors that increase the risk of dysphagia:9,24
- Reports of dysphagia from patients, families, or caregivers.
- Observation of drooling or dribbling.
- Observation that patient has trouble controlling food or liquids in the mouth.
- Facial drooping or facial paralysis.
- Changes in mental acuity that affect eating.
- Slurred speech.
- Coughing.
- Pocking food in mouth.
- Changes in voice quality (e.g. weak voice, hoarse voice) when eating.
- Existence of neurologic problems and/or muscle disorders.

Underlying causes, such as tumors, dementia, neurologic diseases and so on, should be identified and corrected or treated. Here are some tips to help reduce dysphagia:9,24
- Be sure that the patient is seated comfortably in an upright position.
- Encourage a calm, pleasant atmosphere during meals.
- Avoid extensive conversation. Allow patient to concentrate on eating and swallowing.
- Plan meals with patient’s food preferences in mind.

**Constipation**
Constipation affects up to 20 percent of older adults in the community and between 50 percent and 75 percent of those living in long-term care facilities.9 Factors that contribute to constipation in the elderly include lack of adequate fluid intake, lack of adequate fiber in the diet, and side effects of medications.

Here are some tips to reduce constipation:9,24
- If constipation is due to medications, consult with physician or nurse practitioner about possible changes in medication regimen.
- Increase fluid intake unless contraindicated.
- Increase fiber intake.
- Increase whole grain, fruits and vegetables intake.
- Participate in exercise as tolerated.
- Add stool softeners or laxatives under medical supervision.

**Assessment tip:** Patients need to be evaluated for possible serious cause of constipation, such as impaction or bowel obstruction. Be alert to additional symptoms, such as severe abdominal pain, nausea and vomiting, which may indicate bowel obstruction, or a lump or thickening in the lower abdomen, indicating a growth or tumor.

**Fecal incontinence and diarrhea**
When evaluating diarrhea, determine the quality of diarrhea. For example, are the stools loose but formed, or watery? Is the diarrhea accompanied by cramps, frequency and/or urgency? How many times a day does diarrhea occur?

Diarrhea may be due to viral, bacterial or parasitic infection; medications; tumors; or stress. Treatment measures include identifying and correcting underlying causes and medications to relieve symptoms.

Fecal incontinence may accompany diarrhea or exist with normal quality bowel movements. It may be due to cognitive impairment, tumors or muscle weakness. Correction of underlying causes is necessary, and a bowel-training program is often indicated.

**Assessment tip:** Bloody stools or passage of blood is a medical emergency and requires immediate evaluation and intervention!

**Gastroesophageal reflux disease**
Gastroesophageal reflux disease (GERD) is the backflow of gastric and/or duodenal contents into the esophagus. GERD is due to problems with deficient pressure of the lower esophagus. Symptoms range from none at all to heartburn of varying degrees of severity, and pain that radiates to the neck, jaws and arms. The patient may awaken during the night with coughing and a mouthful of saliva.24

Many patients, and even health care professionals, may believe that these symptoms are trivial and unlikely to indicate a serious health problem. In reality, GERD may be responsible for 1,700 deaths annually in the United States.9 Complications include esophageal ulcer, hemorrhage, esophageal stricture, hoarseness, esophagitis and inflammation of the esophagus that can predispose the patient to the development of adenocarcinoma.9

Certain medications and substances can increase the risk of GERD. These include anticholinergics, caffeine and alcohol, nicotine, beta blockers, potassium supplements, and non-steroidal anti-inflammatory agents.9,14

Treatment of GERD focuses on relief and control of symptoms and promotion of esophageal healing.9 Lifestyle changes are the first line of treatment and include the following:9,24
- **Diet:** Avoid caffeine, chocolate, spicy foods, carbonated beverages, orange juice, tomato juice, alcohol and other beverages that stimulate the production of gastric acid. Reduce fat content in diet.
- **Positioning:** Avoid lying down for at least two hours after eating. Sleep with the head of the bed elevated six to eight inches. Avoid lying on right side, which encourages reflux.
- **Weight:** Achieve or maintain normal weight.
- **Tobacco products:** Avoid use of tobacco products.
- **Stress:** Participate in stress reduction efforts.
- **Alcohol:** Reduce or avoid the intake of alcohol.
- **Medications:** Ask about possible alterations in medical regimen.
- **Clothing:** Avoid clothing that fits tightly.
- **Exercise:** Do not exercise within one hour after meals.
- **Hydration:** Drink six to eight ounces of water with medications.

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If lifestyle changes do not control GERD, medications may be necessary. These include:14,24
- Prokinetic agents that improve lower esophageal sphincter tone and stimulate upper GI motility,
- Proton pump inhibitors and histamine receptor antagonists to reduce gastric acidity,
- Over-the-counter antacids, which may reduce symptoms but may cause side effects such as diarrhea, constipation and acid-base disturbances.

In severe cases, surgery may be necessary to control symptoms, prevent complications and stop hemorrhage.

**Assessment tip:** Stress the importance of lifestyle changes as the first line of treatment for GERD. Such changes are also helpful to promote overall health and, if effective, can reduce or eliminate the need for medications and/or surgery.

**Peptic ulcers**

It is estimated that 10 percent of adults in the United States have peptic ulcer disease. Hospitalization, morbidity and mortality rates for peptic ulcer disease are higher in older adults as compared to younger persons.9

Peptic ulcers are defined as circumscribed lesions in the mucus membrane and can be located in the lower esophagus, stomach, pylorus, duodenum, or jejunum. Most peptic ulcers (about 80 percent) are located in the duodenum. Gastric ulcers are most common in middle-aged and elderly men. Risk factors for peptic ulcer development include chronic use of nonsteroidal anti-inflammatory drugs, alcohol and tobacco products.24

Ulcer development is caused by infection with Helicobacter pylori and pathologic hypersecretory disorders. Gastric acid is believed to contribute to the development of infection.24

**Assessment tip:** Blood type seems to influence peptic ulcer development. Gastric ulcers are more common in people with type A blood, and duodenal ulcers are more common in people with type O blood.24

Signs and symptoms include heartburn and indigestion, bloating, abdominal distention, and nausea. Specific symptoms are as follows. Duodenal ulcers cause heartburn, localized mid-epigastric pain that is relieved with eating, weight gain because patients eat to relieve pain, and an unusual sensation of hot water bubbling at the back of the throat. Gastric ulcers cause heartburn and indigestion, pain with eating since food causes the gastric wall to stretch, thus causing pain, and feelings of fullness and bloating.24

Treatment includes antibiotic therapy, analgesics and drugs to reduce gastric acid production.24

**Colorectal cancer**

Colorectal cancer is the most common cancer that develops after the age of 65.9 Early diagnosis and treatment is associated with improvement in survival. Routine colonoscopies are the best diagnostic tool for early diagnosis.

Signs and symptoms may not appear until the disease is advanced. They include overt or covert bleeding; change in quality and/or quantity of bowel movements; black, tarry stools; cramps; urgent need to defecate when first getting up in the morning; feelings of fullness or incomplete evacuation of stool; and blood or mucus in the stool.9,24

Treatment depends on the extent of the tumor and the stage of the disease. It can include simple removal of the tumor, removal of part of the intestine, radiation and/or chemotherapy. A colostomy may be needed. This could be temporary or permanent.24

**Assessment tip:** Elderly adults may assume that symptoms of colorectal cancer are due to aging changes and not report them. Educate patients, families and caregivers about the signs and symptoms of this type of cancer and the importance of appropriate preventive screening.

**The genitourinary system**

The genitourinary system is composed of the kidneys, ureters, bladder, and urethra, and the reproductive organs. Since this system is so broad in scope, this section concentrates on those issues most closely associated with the aging process. Age-related changes associated with kidneys, ureters, bladder and urethra include the following:4,9

- Nighttime production of urine increases and ability to concentrate urine decreases.
- Blood flow to the kidneys decreases.
- Glomerular filtration rate decreases.
- Bladder capacity is decreased.
- Bladder contractility increases.
- Risk of overflow incontinence and urinary retention increases in men.
- Detrusor becomes unstable in women, causing an increased potential for incontinence.
- Prostate increases in size in men.
- Half-life of drugs is prolonged due to a reduction in renal function.

**Assessment tip:** Assess for signs of drug toxicity due to changes in excretion ability of the kidneys.9

Common age-related problems of the kidneys and related structures include the following:5,24

**Urinary incontinence**

Urinary incontinence affects over 13 million adults.9 It is of considerable concern to older adults, who are often ashamed and embarrassed by the problem. They may not seek help for this problem because they assume it is a normal part of the aging process. Be sure to assess the older patient for urinary incontinence, because this is a problem that can be treated, reduced, and sometimes eliminated.

There are several types of urinary incontinence.9

- **Stress incontinence** occurs when urine is involuntarily expelled when a person laughs or coughs. The muscles of the pelvic floor or urethral sphincter are not strong enough to control the loss of urine.
- **Overflow incontinence** occurs when the bladder muscles stretch beyond their ability to contract or when the urethra is blocked.
- **Urgre incontinence** occurs when there are strong, unexpected contractions of the bladder muscles and the internal sphincter cannot hold the urine in the bladder.
- **Functional incontinence** is due to a cause not associated with the urinary system. For example, the older adult may not be able to get to a bathroom in time to avoid incontinence or he may be physically unable to reach a bathroom by himself. Another example is that of the adult whose cognition is impaired and who does not recognize the need to void.

Treatment interventions include bladder training. Bladder training involves training the bladder to hold gradually increasing amounts of urine by extending the time between trips to the bathroom. Pelvic floor exercises, also referred to as Kegel exercises, may also be helpful. These exercises involve tightening the bladder muscles and releasing them in patterns of 15. A general exercise program may also help to strengthen appropriate muscles. Bladder irritants such as spicy foods, carbonated beverages, caffeine, and alcohol, may be avoided.9 There are also a number of protective undergarments that can be worn to protect clothing, stop odor and decrease embarrassment.

**Urinary tract infections**

Older adults are especially vulnerable to urinary tract infections (UTI). UTIs in older adults are often asymptomatic. Antibiotic therapy may be prescribed, although, in some asymptomatic cases, no treatment may be initiated.9

**Assessment tip:** In elderly adults, the most common symptoms of UTI are often lethargy and changes in mental status.24

Tips to prevent UTIs include:24

- Maintain adequate hydration. Cranberry juice may have some properties that fight infections.
- Void promptly when the urge to urinate occurs. Don’t wait a long time between voiding.
- Wipe from front to back after going to the bathroom.
- Avoid using products such as douches and perfumes and scented powders over the genital areas as these can irritate the urethra.

**Benign prostatic hyperplasia**

Benign prostatic hyperplasia (BPH) affects about half of men between 51 and 60 years of age and 90 percent of men over 80.9 Signs and symptoms include decreased urinary stream and force, feeling of incomplete bladder emptying, frequency and urgency, dribbling, incontinence, difficulty initiating voiding, and, at times, hematuria.24

The only effective treatment is surgical removal of the prostate tissue. Such tissue is always biopsied to rule out malignancy.
Malignancies
Bladder cancer is fairly common in older adults, with men nearly four times as likely as women to develop this malignancy. Symptoms are similar to UTI. The first symptom is often painless hematuria. As with other cancers, treatment depends on the stage of the disease and its exact location. Chemotherapy, surgery and radiation may be part of treatment plan.

The incidence of prostate cancer in men is even higher than that of bladder cancer. Symptoms are usually not evident until the disease is advanced. That is why it is so important to have a prostate examination as part of the annual physical exam. Symptoms include lower back pain, difficulty initiating urination, dribbling, retention of urine, and hematuria. Radiation is used to treat locally invasive lesions. Surgery and hormone therapy also may be used in conjunction with radiation therapy.

Issues related to reproductive organs
Age-related changes in the reproductive system include:
- Decreased libido.
- Breast tissue atrophies.
- Diminished ejaculation in men and the need for more time and stimulation to reach arousal.
- Increased incidence of erectile dysfunction in men.
- Drastically decreased estrogen levels in women, which leads to vaginal dryness and possibly painful sexual intercourse.
- Increase in facial hair in women.
- Increase in length of time for arousal in women.

These changes do not prevent older adults from having a satisfying sex life. It is important to assess sexuality as part of physical assessment. For more detailed information about sexual assessment and interventions see the section on Sexual assessment presented earlier in this education program.

Common gynecological malignancies in older women
Uterine, breast and ovarian malignancies are more common in older women than in younger women. Uterine cancer is the most common gynecological cancer in older women. The most common symptom is bleeding from the vagina after menopause. Other signs and symptoms include weight loss and pain, but these do not appear until the disease is advanced.

Treatment includes surgery, which is generally a total abdominal hysterectomy. Hormonal therapy, radiation therapy and chemotherapy in various combinations are generally part of the treatment regimen. Seventy-five percent of ovarian cancer cases occur in women over 55. Unfortunately, prognosis is often poor, especially in older women. There is no screening test at this time. However, the CA-125 blood test for tumor markers does exist. It is not recommended as a screening tool because there are no data to support the hope that such screening would decrease mortality.

Ovarian cancer is the leading cause of gynecological deaths in the United States. Symptoms are generally vague and include abdominal discomfort, dyspepsia, feeling of being bloated, urinary frequency, abdominal distention and weight loss.

Treatment includes removal of the uterus, ovaries, fallopian tubes and omentum. Aggressive therapy is usually indicated, including chemotherapy and sometimes radiation.

According to the American Cancer Society, breast cancer affects approximately one in every 14 women over 60 years old. Risk factors include: age, family history of breast cancer, early menarche and late menopause, ingestion of hormonal contraceptives, use of hormonal replacement therapy for more than five years, never having been pregnant, had first pregnancy after the age of 30, personal history of breast cancer, regular use of alcohol, history of ovarian cancer and exposure to low-level ionizing radiation.

Recent controversy over screening recommendations from various health care groups has led to some confusion about the value of screening. In general, recommendations include yearly mammograms for women over the age of 40, monthly self-breast examination, and yearly breast examination by a health care professional. There is some question about the value of mammography for the very old woman. Screening techniques and their value should be discussed with the woman’s health care provider.

Treatment of breast cancer includes a variety of options based on the stage of the disease. For localized tumors without metastasis, lumpectomy and radiation are often the treatments of choice. However, a growing number of women are choosing to have mastectomies to avoid the need for adjunct therapy and to decrease the chances of recurrence. Some women with unilateral breast cancer and some with a strong family history or the presence of genetic markers are choosing to have bilateral mastectomies to reduce their risk for developing the disease in the unaffected breast or to prevent the occurrence of the disease at all. Radiation and/or chemotherapy may also be part of the treatment regimen. Treatment options should be discussed at length with the woman’s health care team. Ultimately, she must make the choice (e.g. lumpectomy, mastectomy or even refusal to have surgery) herself. It is important that health care providers maintain an objective attitude. Breast cancer triggers not only fear of death but also the fear of disfigurement. Some older adults may understand the need for calcium supplements but fail to realize the need for vitamin D. Patient education should include an explanation of the need for adequate amounts of calcium as well as vitamin D on a daily basis.

The musculoskeletal system
The musculoskeletal system includes the bones, muscles, ligaments, bursae and joints. The bones or skeleton provides the form and support of the body. Muscles move the various body parts. Joints, the areas where two bones are attached, provide stability and facilitate mobility.

Changes in the musculoskeletal system may have adverse effects on mobility and decrease the independence of older adults. Normal age-related changes include:
- Decreased range of motion of some joints.
- Loss of bone mass.
- Loss of height.
- Joint degeneration.
- Arthritic changes of the joints.
- Problems maintaining balance.
- Problems with the feet, such as corns, bunions and calluses.
- Muscles atrophy.
- Bones become stiffer and brittle.

These changes increase the risk of the following problems.

Osteoporosis
Osteoporosis is a metabolic bone disorder and is the most common metabolic disease, affecting half of all women during their lifetimes. Although its occurrence is higher in women, men are also affected by the disease.

Osteoporosis occurs when the rate of bone resorption increases while the rate of bone formation decreases, leading to a loss of bone mass. The exact cause is unknown, but prolonged negative calcium imbalance is probably a contributing factor. The most common presenting symptom is back pain. A loss of height is common, and the risk of fractures and falls is high.

There is no cure for osteoporosis. The goals of treatment are to slow or prevent loss of bone, avoid fractures and reduce pain. Calcium and vitamin D supplements may also be recommended.

Assistive devices such as walkers or canes may be used to provide stability when walking. Patients should be taught safety precautions and measures to avoid falls.

There are steps that can be taken to reduce the risk of osteoporosis. These steps may also be part of the treatment regimen for the disease. These steps include:
- Ingest adequate amounts of calcium and vitamin D. Postmenopausal women and all women and men over the age of 65 should ingest 1,500 mg of calcium and at least 800 international units of vitamin D on a daily basis. Vitamin D is necessary for the absorption of calcium and enhances muscle strength. Some older adults may understand the need for calcium supplements but fail to realize the need for vitamin D. Patient education should include an explanation of the need for adequate amounts of calcium as well as vitamin D on a daily basis.

Assessment tip: Lymphedema is a potential complication of lymph node removal. The patient must be taught to exercise her arm(s) and hand(s) to avoid the development of this potentially debilitating complication.
Alcohol intake should be limited. Having more than two alcoholic drinks per day may decrease the formation of bone. Alcohol may also adversely affect the body’s ability to absorb calcium.

Limit the intake of caffeine. No more than two to three cups of beverages containing caffeine should be consumed per day. Some patients may assume that caffeinated beverages means “coffee.” They should be taught that chocolate, colas and teas also contain caffeine.

Participate in an appropriate exercise program. Exercise helps to slow the rate of bone loss and improve bone strength. Weight-bearing exercises are important to help increase bone strength. Exercise programs should be designed and implemented under the supervision of the geriatric patient’s health care provider.

Osteoarthritis

Osteoarthritis is the most common form of arthritis. It is a chronic disease that causes deterioration of the cartilage of the joints and development of new bone at the joints. Symptoms often begin after the age of 40 and progress with age.24

Signs and symptoms include a deep, aching joint pain, morning stiffness, weather-related aching pain, joint instability and poor posture.24

Treatment is aimed at symptom relief and minimizing disability. Joint replacement surgery may be necessary. Assistive mobility devices and anti-inflammatory medications are also used.24

Falls

Falls are certainly not a disease condition. But they are a significant health problem of older adults. In fact, falls are the leading cause of death in persons over the age of 65.24 As age increases, so does the risk of falls and the death rate from falls.

Fall prevention is a key goal of gerontological nursing. Some tips to prevent falls include:

- Make sure patients wear glasses as needed.
- Assess the home environment for adequate lighting.
- Assess the home for safety. Remove small area and “scatter” rugs, which may cause the older adult to trip.
- Are there stairs in the older person’s home? If so, are there safety rails to support the older adult as he ascends and descends the stairs?
- Does the patient use assistive devices for mobility? If so, are they appropriate to the older adult’s needs? If he does not use such devices, does he need them?
- Is the older adult alert and oriented? If not, is there someone in the home to help him with safety issues?
- Does the adult get adequate amounts of sleep? Does he seem to be tired or fatigued? Lack of rest and/or fatigue or weakness increase the risk of falls.

Assessment tip: More than 95 percent of hip fractures are the result of falls. Hip fractures are associated with complications such as permanently decreased mobility and death.3

The immune system

The immune system is responsible for defending the body against infection. The immune system must recognize the normal components of the body and differentiate between these components and foreign substances that are potentially harmful. There are three types of immunity.

Natural immunity is “natural” to the body and not produced by an immune response (e.g., an immune response triggered by a vaccine). A human is born with natural immunity. Examples of natural immunity include immunity to diseases that affect animals but not humans. Natural passive immunity is natural immunity that comes as a mother’s antibodies cross the placental barrier to the fetus. This type of immunity is only temporary and generally lasts for the first three to six months of the infant’s life.4,9

Acquired active immunity occurs as a result of the body’s response to a foreign substance. For example, if a person has the mumps, his body responds by developing protection against future infections of the virus that causes mumps. Vaccines also cause the body to develop acquired active immunity. Booster vaccines may be necessary to maintain immunity.4,5

Acquired passive immunity is acquired when a serum that contains specific antibodies is given to a person who is vulnerable to a particular disease. For example, gamma globulin may be administered to prevent the development of hepatitis A.9

The components of the immune system include organs and tissues rich in lymphocytes. The two primary lymphocytes are B cells and T cells. These cells are found throughout the body, but are predominant in the lymph nodes and spleen. They possess receptors that respond to specific antigens.26 Antigens are substances (usually proteins) that are recognized by the body as foreign and can produce an immune response. This response involves producing antibodies to attack the foreign substance. Antibodies are specific to the antigens that trigger them.20

The older person’s immune system is not as effective as that of a younger person. However, exercise, diet and emotional well-being all contribute to boosting the immune system and enhancing health and wellness. Specific age-related immune system changes include:4,9

- Reduction in the rate and strength of the immune response.
- The number of available B cells decreases.
- The manufacture of antibodies that fail to differentiate between the person’s own body and foreign substances increases. This makes the older adult more vulnerable to autoimmune disease development.
- There is an overall decrease in cellular immunity.

As part of the assessment of the immune system, the nurse must recognize those factors that can have an impact on the immune system.

Hypersensitivity problems

Mrs. Slater is 68 years old. She recently retired from her job and is looking forward to spending more time with her family and friends. Mrs. Slater lives in Florida, where the climate allows her to spend time gardening year round. Mrs. Slater has a lengthy history of coughing and becoming slightly short of breath when working in her garden, especially in the spring, when her garden is in full bloom. She also sneezes and her eyes water. These symptoms, especially the cough and shortness of breath, have slowly, insidiously become worse with age.
Type II hypersensitivity disorders

Mr. St. John is a 75-year-old retired construction worker who is infected with the human immunodeficiency virus (HIV). His infection has been traced to a blood transfusion Mr. St. John received many years ago. He has difficulty dealing with the disorder and says he is “ashamed.” He is doing well on his treatment regimen, and his wife of 50 years is supportive. But Mr. St. John needs help dealing not only with the physical components of HIV infection but with its emotional consequences as well.

Infection with HIV is often underreported and under-diagnosed in the elderly population. Although the average age of patients who are first identified as HIV positive is progressively increasing, both older adults and some health care workers seem to lack knowledge about the potential for HIV infection in the elderly population. Older persons who have had multiple sexual partners in their youth continue to have multiple partners as they age. Unfortunately, many older adults have unprotected sex, believing that since the risk of pregnancy is no longer an issue among older couples, there is no need for protection.

The rates of sexually transmitted disease are increasing among persons who live in retirement communities. This also includes an increase in the incidence of HIV infection in this population.

When HIV was first recognized as a serious health problem, the primary means of transmission of the virus in older adults was via blood transfusion. But today, the risk of infection seems to be primarily due to intravenous drug use and sexual activities. As a result of the increasing incidence of HIV infection, the Centers for Disease Control (CDC) recommends that routine HIV testing should be initiated in all health care settings for persons between the ages of 13 to 64.

Assessment tip: When assessing the health status of an older adult, the nurse should provide patient education regarding sexually transmitted diseases, including HIV. Such education is often automatic when working with younger patients. Age should not preclude the nurse from offering this type of education to her geriatric patients.

Vulnerability to infections in the older adult

As the immune system undergoes age-related changes that reduce its effectiveness, nurses need to be aware that older patients are at increased risk of infection. This risk includes viral infections such as influenza; bacterial infections, such as pneumonia; and infections following surgery or other open wounds. Even a slight laceration may result in a serious infection.

Because of its prevalence, it is appropriate to discuss pneumonia as a problem of particular concern among the elderly. The prognosis is generally good for persons with normal respiratory function and intact immune systems. However, among the elderly, who may have a compromised immune system or are dealing with chronic disease or disorders, pneumonia is a leading cause of death in people over the age of 65. Not only is it the most common hospital-acquired infection (nosocomial infection), but it also has the highest mortality rate of such infections.

To add to the problem of pneumonia among older adults, the signs and symptoms of the disease in this population are often atypical. The cardinal signs of fever, chest pain, chills and shortness of breath may be subtle and not obviously apparent. Persons over the age of 65 are urged to receive pneumococcal vaccine.

Assessment tip: Older adults who live alone in the community seem to be at particular risk for not being diagnosed until pneumonia has reached an advanced stage. This could be that the symptoms are so subtle that the patient may assume he has a cold or simple viral infection. Teach older patients to be aware of the prevalence of pneumonia and to recognize the signs and symptoms as they appear in the older population. When possible, teach family members, friends and caregivers about the signs and symptoms that indicate pneumonia. The earlier the disease is recognized, the more prompt and effective the treatment.

Summary

Nurses working with geriatric patients have unique opportunities to promote health and wellness throughout a long and hopefully productive life span. Although basic assessment techniques of interview, observation, auscultation, percussion, and palpation are similar for all age groups, the unique aspects of geriatric assessment require that the nurse have an in-depth understanding of how the body ages and a respect for older patients and their wealth of life experiences.

Nurses also have unique opportunities to teach their colleagues about the older population and to dispel myths about this age group. All health care professionals should understand that “old” does not equate with “sick.” Most older adults live independently and enjoy their lives. Too many people believe that older adults are inactive physically, mentally and sexually. Nothing could be further from the truth.

The people in this age group deserve the respect and support of the health care profession. They also deserve the opportunity to access health care services provided by professionals who understand how the body ages and want to serve as advocates for older adults. Work with your older patients to not only promote their health and well-being, but to also promote community awareness of the contributions older adults have made, and can continue to make, to their families, friends and communities.

References

Immunodeficiency disorders

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References

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### GERIATRIC ASSESSMENT Self Evaluation Exercises

<table>
<thead>
<tr>
<th>Question</th>
<th>True</th>
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<tr>
<td>1. According to the World Health Organization, the fastest-growing segment of people over 65 are those 80 years of age and older.</td>
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<td>False</td>
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<tr>
<td>2. Members of the traditional generation prefer a more informal environment and prefer that young health care providers automatically address them by their first names.</td>
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<td>False</td>
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<tr>
<td>3. A frequent complication of dry mouth in the older adult is the fungal infection oral candidiasis, more commonly known as thrush.</td>
<td>True</td>
<td>False</td>
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<td>4. As the body ages, there is as much as a 15 percent decrease in water content and an increase in body fat. The extra fat means that the effects of fat-soluble drugs may be increased.</td>
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<td>False</td>
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<td>5. When assessing the sleep patterns of older adults it is important to know what medications they are taking. Advise them to take antidepressants such as Zoloft that have a sedating effect in the evening.</td>
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<td>False</td>
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<td>6. Your first clue to depression in older adults may be the reporting of somatic complaints.</td>
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<td>False</td>
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<td>7. Persons who commit sex abuse are more likely to be women.</td>
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<td>8. A normal finding when assessing the skin of an older adult is the presence of a multicolored lesion with nodules and irregular black outline.</td>
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