



**Title of Activity: Stroke: Maximizing Outcomes and Minimizing Deficits (1132)**

**Total Number of Contact Hours: 2**

**Intended Level of Learner: Intermediate**

**Purpose/Goal: The course examines the different types of strokes and focuses on intervention strategies and rehabilitation options.**

<b>Objectives</b>	<b>Content (Topics)</b>	<b>Teaching/Learning Resources</b>
Discuss the incidence of stroke in the US and identify the risk factors.	Prevalence of stroke in the US Who is vulnerable? Costs and effects of stroke The incidence of stroke is rising Risk Factors & Prevention: --Non-modifiable --Modifiable risk factors	Written material online Post-test questions
Describe the pathophysiology of stroke.	Types of stroke: --Ischemic stroke --Thrombotic stroke --Embolic stroke --Hemorrhagic stroke	Written material online Visual aid Post-test questions
Discuss measures used to diagnose stroke.	Signs and Symptoms Left vs. right hemisphere stroke Diagnostic Studies	Written material online Post-test questions
Recognize important treatment interventions in the acute phase.	Treatment in the acute phase Immediate Interventions Thrombolytic Therapy Surgical Interventions	Written material online Post-test questions

<p>Discuss the rehabilitation of the stroke patient</p>	<p>The Rehabilitation Team Selecting a Rehab Facility Rehabilitation Principles Rehabilitation Interventions: --Positioning --Motor Functioning --Skin Care --Swallowing --Speech and Language --Pathology --Pain --Alterations in sensation and perception --Bowel and Bladder Incontinence --Spasticity --Patient Education</p>	<p>Written material online Post-test questions</p>
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8/31/2011

# Stroke: Maximizing Outcomes and Minimizing Deficits (1132)

By  
Dr. Adrienne E. Avillion

## Incidence

Stroke is the third leading cause of death and the most common cause of neurological disability in the United States. Every 53 seconds someone has a stroke and every 3.3 minutes someone dies as a result of a stroke (Stroke Association, 2002). Stroke affects over 500,000 Americans every year, and about half of these occurrences are fatal (Holmes, 2003). It is estimated that 25% of the 500,000 strokes that occur each year are recurrent strokes. The incidence of stroke has decreased during the past 35 years primarily as a result of increased awareness of the risk factors of stroke and efforts to modify these factors (Youngblood, 2001).

The disabling effects of stroke are significant. More than two million Americans are now disabled from the effects of stroke. The cost of providing care to these disabled individuals is about 15.6 billion dollars. Stroke survivors account for 75% of residents in long-term care facilities, 60% of those in rehabilitation centers, and 50% of all persons hospitalized due to neurological problems (Youngblood, 2001).

Most strokes occur in persons over the age of 65. Actually, "the risk of stroke doubles with each passing decade after age 55." (Holmes, 2003, p. 326). The incidence of stroke is higher in men than in women. But because women generally live longer than men, a number of studies have found a greater prevalence of stroke in women. Women are also more likely to die from a stroke than men are (Youngblood, 2001). African-Americans have a 60% greater risk for stroke than Whites or Hispanics of the same age. Additionally, African-Americans' mortality rate from stroke is twice that of Whites. The higher incidence of stroke in the African-American population is thought to be due to the higher incidence of hypertension and other risk factors for stroke present in this group (Holmes, 2003; Youngblood, 2001).



Unfortunately, the incidence of stroke is rising among younger people due to the use of cocaine. It is believed that cocaine enhances neurotransmission of serotonin and blocks its reuptake. This increases stroke risk because serotonin

is the most powerful vasoconstrictor present in cerebral circulation (Youngblood, 2001).

## Risk Factors and Prevention

There are a number of risk factors for stroke. Some of these can be modified to reduce the risk of and perhaps even prevent the occurrence of a stroke. Some risk factors cannot be modified. It is important to understand all risk factors and the most current information available to help persons control their risk for stroke as much as possible.

### Non-Modifiable Risk Factors for Stroke

- *Age.* The incidence of stroke increases exponentially with age. The deficits resulting from stroke become even more apparent as the age of the patient increases (American Heart Association, 2002a; Youngblood, 2001).
- *Gender:* Women suffer more strokes each year than men, mainly because women live longer than men and stroke occurs more often at older ages. But stroke incidence is higher in men than women at younger ages (National Stroke Association, 2011).
- *Race.* African-Americans have a significantly greater incidence of stroke than either Whites or Hispanics. They generally have a higher incidence of other risk factors for stroke such as hypertension and diabetes (Youngblood, 2001). Research is underway to determine why African-Americans are subject to increased risk factors. Possible explanations include lack of access to healthcare services, the inability to pay for such services or to pay for health insurance, and/or lifestyle factors.
- *Family History.* There is increased interest in studying the impact of heredity on stroke incidence. In addition to the possibility of genetic influence, stroke may run in families due to the lifestyle patterns that have existed for generations (Youngblood, 2001).



## Modifiable Risk Factors for Stroke

- *Smoking.* Tobacco use has been clearly identified as a significant risk factor for stroke and other types of cardiovascular disease (Youngblood, 2001). Most persons know that smoking is hazardous to health. However, it is often difficult to actually stop using tobacco. Healthcare professionals have an obligation to refer patients to groups that may be able to help. The American Heart Association, Stroke Association, senior citizens centers, and healthcare facilities are resources that frequently offer smoking cessation programs.
- *Lack of Physical Activity.* Sedentary lifestyles have been linked to increased risk for stroke and heart attacks. Regular physical exercise may help to reduce blood pressure, lower low-density cholesterol (“bad cholesterol”), raise high-density cholesterol (“good cholesterol”), and improve glucose tolerance. These factors help to decrease the risk of atherosclerosis development (Youngblood, 2001).
- *Obesity.* People who are obese generally have higher blood pressure and blood glucose and cholesterol levels than those who are not obese. Therefore, obese persons are at higher risk for stroke. Current research indicates that the location of excess weight is important. Persons with fat located primarily over the central abdomen (commonly referred to as an “apple shaped” figure) are at higher risk for atherosclerotic disease (American Heart Association, 2002a; Youngblood, 2001).
- *Elevated Cholesterol Levels.* Elevated cholesterol levels are associated with arterial plaque build-up (atherosclerosis). If carotid arteries are narrowed by plaque deposits, the possibility of decreased cerebral blood flow and carotid artery clot formation exists. If a carotid artery is blocked by a clot, the resulting complication could be a stroke (American Heart Association, 2002a).
- *Hypertension.* Next to age, hypertension is the most significant risk factor for stroke. Hypertension is widespread among Americans, with a particularly high incidence in African-Americans (Youngblood, 2001). In 1997, the National Institutes of Health revised the method of classifying hypertension. The revised categories are optimal, normal, high-normal, and three stages of hypertension. Optimal blood pressure is less than 120 mm Hg systolic, and less than 80 mm Hg diastolic. Normal blood pressure is described as less than 130 mm Hg systolic and less than 85 mm Hg diastolic. High-normal is defined as



130 to 139 mm Hg systolic or 85 to 89 mm Hg diastolic. Hypertension is classified as follows (Holmes, 2003):

Stage 1: 140 to 159 mm Hg systolic or 90 to 99 mm Hg diastolic

Stage 2: 160 to 179 mm Hg systolic or 100 to 109 mm Hg diastolic

Stage 3: 180 or greater mm Hg systolic or 110 or greater to 119 mm Hg diastolic

- *Diabetes Mellitus.* Persons who are diabetic have an increased likelihood of developing coronary, femoral, and cerebral atherosclerosis (Youngblood, 2001).
- *Oral Contraceptives.* Women, especially those over 35 years of age, who use oral contraceptives, are at increased risk for stroke (Youngblood, 2001).

**Healthcare Alert:** *Oral contraceptive users who smoke and/or suffer from hypertension are at even greater risk for stroke (Youngblood, 2001).*

- *Cardiac Disease.* There is a clear association between cardiac disease and risk of ischemic stroke. This is particularly true if atrial fibrillation, valvular heart disease, heart attack, coronary artery disease, or congestive heart failure is present (Youngblood, 2001).
- *Alcohol Intake.* Alcohol's influence on stroke risk is associated with the amount of alcohol ingested. Heavy use of alcohol is believed to be linked to incidence of stroke and stroke mortality (Youngblood, 2001).

A history of transient ischemic attacks also increases a person's risk for stroke. A TIA is a recurrent episode of neurologic deficit as a result of cerebral ischemia. Such attacks may last for a few seconds to several hours, and its effects usually resolve themselves with 12 to 24 hours. TIAs have occurred in 50% to 80% of persons who suffer a thrombotic stroke. Incidence of TIAs increases rapidly after age 50 and is highest in men and African-Americans (Holmes, 2001).

A TIA is the result of microemboli that are released from a thrombus and temporarily interrupt cerebral blood flow. The small distal branches of the brain's arterial tree are especially affected. The characteristic features of a TIA are temporary transient neurological deficits with complete return of normal function. The deficits generally cause some sensory or motor dysfunction. Examples include extremity weakness, transient dysphagia, double vision, slurred speech, dizziness, and numbness or tingling of the face and lips (Holmes, 2003).

The more risk factors a person has, the greater the likelihood of stroke. Healthcare professionals cannot wait until someone has a stroke to begin educating patients and families. Educating the general public about stroke risk factors and how to modify them will help to decrease the incidence of stroke. Stroke prevention should be a high priority of the healthcare community.

## **Pathophysiology of Stroke**

A stroke is the result of an interruption of cerebral circulation due to thrombus formation or hemorrhages (American Heart Association, 2002b). Stroke generally affects extracerebral vessels, but can occur in intracerebral vessels. The major causes of stroke are embolism, thrombosis, and hemorrhage (Holmes, 2001).

Cerebral embolism occurs when a thrombus located outside the brain (such as in the heart, aorta, or common carotid artery) travels to and lodges in an artery that supplies blood to the brain. This inhibits adequate cerebral circulation (American Heart Association, 2002b; Holmes, 2003).

Cerebral thrombosis, the most common cause of stroke in middle-aged and elderly people, occurs when a thrombus forms in and blocks blood flow in an artery that supplies nourishment to the brain (American Heart Association, 2002b).

A subarachnoid hemorrhage occurs when an intracranial artery or vein on the surface of the brain ruptures and bleeds into the space between the brain and the skull.

A cerebral hemorrhage occurs when an artery (damaged/weakened by hypertension, malformation, trauma, or hemorrhagic disorder) in the brain ruptures and floods the surrounding tissue with blood (American Heart Association, 2002b).

No matter what the specific cause of stroke happens to be, the underlying pathology involves oxygen and nutrient deprivation. Under normal conditions, if arterial blockage develops, autoregulatory mechanisms maintain adequate cerebral circulation until collateral circulation. If excessive demands are placed on these compensatory mechanisms or if cerebral blood flow is inhibited for more than several minutes, lack of oxygen will cause brain infarction (Holmes, 2001; Holmes, 2003).

It is important that healthcare professionals understand the pathophysiology of the various types of stroke. The following classifications are the most commonly seen types of stroke.

## **Ischemic Strokes**

Ischemic strokes are the result of a thrombus or embolus. Insufficient amounts of oxygen and nutrients trigger the cerebral infarction that, in turn, causes an inflammatory response and increased intracranial pressure (ICP). Surrounding cells are damaged. This damage disrupts metabolism, leads to continued cellular injury, and a continuous cycle of damage is set up (Holmes, 2003).

### **Thrombotic Stroke**

Ischemic thrombosis is the most common cause of stroke. It is generally the result of atherosclerosis and is also linked to hypertension, smoking, and diabetes. Atherosclerosis is a thickening of the intimal layer of the arterial wall by a build-up of cholesterol-based plaque that can take as long as 20 to 30 years to accumulate. Plaque causes the intima to hypertrophy and fragment and the diameter of the arterial wall narrows. Platelets attach to the blood vessel's surface, eventually forming a thrombus. This pathology continues until the blood vessel is occluded causing ischemia to the brain tissue that depends on this blood vessel for a supply of oxygen and nutrients (Holmes, 2003; Youngblood, 2001).

Thrombotic strokes can affect both intra and extracranial blood vessels. The most commonly affected extracranial vessel is the carotid artery. Commonly affected intracranial sites include bifurcation of carotid arteries, distal intracranial portion of vertebral arteries, and proximal basilar arteries. Thrombotic strokes often occur during sleep or soon after waking up, during surgery, or after a heart attack (Holmes, 2003).

### **Embolic Stroke**

An embolic stroke is caused by a thrombus that breaks loose from the wall of a distant blood vessel and travels to the blood vessels of the brain, thereby blocking blood flow to brain tissue. Lack of blood flow leads to ischemia of this brain tissue and a stroke. These types of strokes occur abruptly, often during waking activities. Embolic strokes are the second most common type of stroke and have a 20% mortality rate (Holmes, 2003; Youngblood, 2001).

### **Hemorrhagic Strokes**

Hemorrhage interferes with cerebral perfusion, leading to infarction with the blood acting as a mass that puts pressure on brain tissue. The brain attempts to maintain equilibrium by increasing blood pressure to maintain cerebral perfusion pressure. Increased ICP forces cerebrospinal fluid out and balance is restored. This regulatory process may keep the patient alive with only slight neurological deficits if the hemorrhage is small. However, a massive hemorrhage can lead to extremely rapid increases in ICP and perfusion stops. This can lead to the death

of many brain cells. Hemorrhagic strokes are the third most common type of stroke (Holmes, 2001; Holmes, 2003).

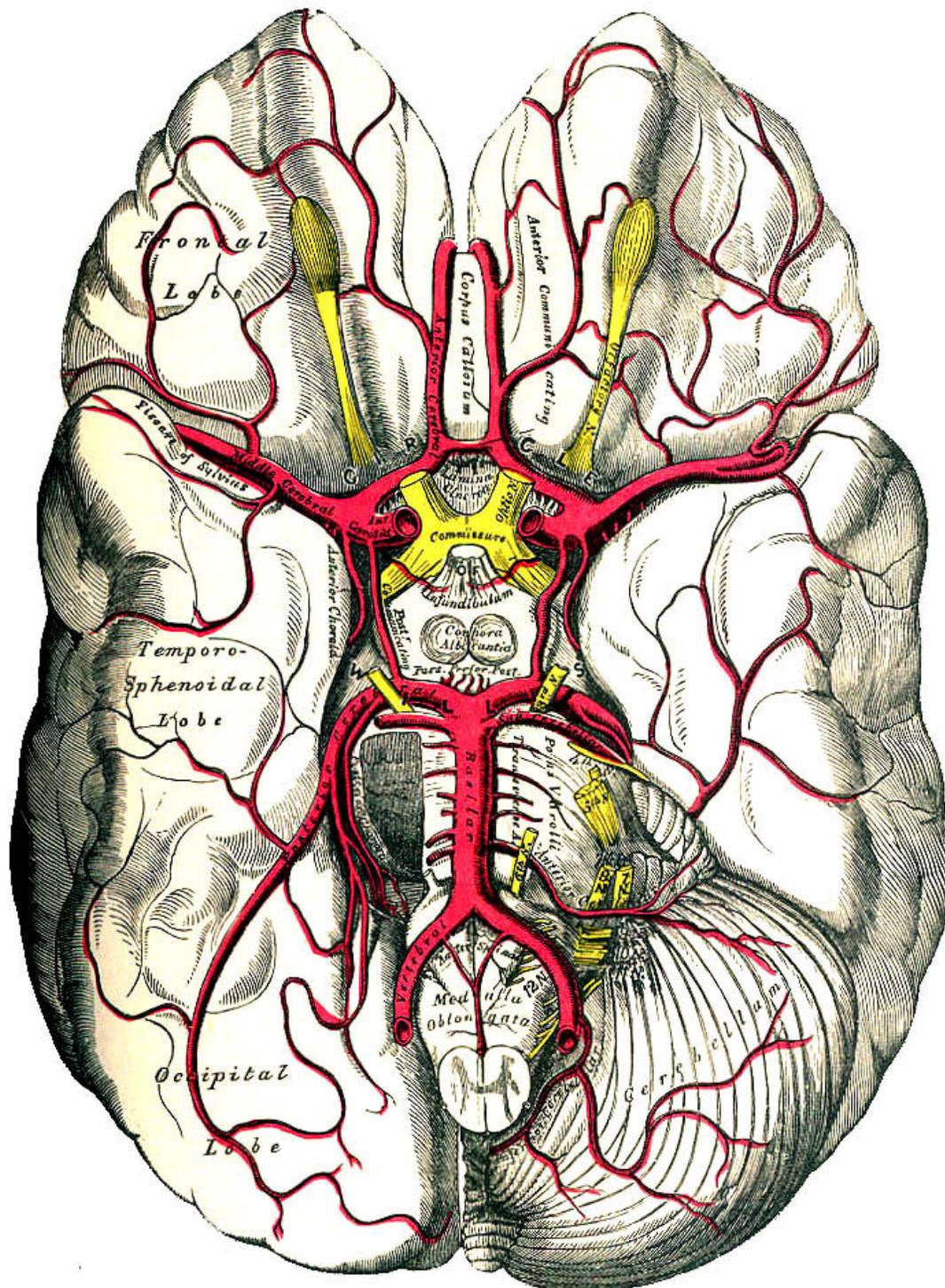
### **Intracerebral Stroke**

Intracerebral hemorrhagic stroke is the result of a ruptured blood vessel that causes blood to enter brain tissue. These vessels are usually deep and small and penetrate deep inside brain tissue. The blood tissue compresses brain tissue by forming a hematoma, and cerebral perfusion is compromised. A massive hemorrhage has a sudden onset, with headache and steady development of neurological deficits that progress to coma. If the patient survives the stroke, his/her neurological condition will persist until the clot is resolved (Youngblood, 2001).

**Healthcare Alert:** *Despite the severity of intracerebral hemorrhagic stroke symptoms, prognosis may be better than might be anticipated. This is because the brain tissue is dysfunctional due to compression by the hematoma not because it is infarcted (Youngblood, 2001).*

### **Subarachnoid Hemorrhagic Stroke**

Bleeding into the subarachnoid space causes a subarachnoid hemorrhagic stroke. Such a stroke is most often the result of a ruptured aneurysm or arteriovenous malformation. The resulting pressure caused by the bleeding into this space causes the neurologic effects experienced by patients (Youngblood, 2001).



## Review

There are various processes that cause strokes. Ischemic attacks may progress slowly, but hemorrhagic strokes are generally abrupt, with a dramatic onset and can be quickly fatal. Regardless of the cause, the affected brain tissue responds similarly. A lesion (whether formed by a clot or by hemorrhage) causes an

increase in intracranial pressure. This increase causes neurologic signs and symptoms. Deficits may be temporary or permanent depending on the location of brain injury and the length of time the brain has been deficient in oxygen (Holmes, 2001; Holmes, 2003; Youngblood, 2001).

## Diagnosis: Signs and Symptoms

The presenting clinical features of a stroke depend on the affected blood vessel, its location, the extent of the damage, and the effectiveness of any collateral circulation (Holmes, 2001; Holmes, 2003).

**Healthcare Alert:** *A stroke occurring in one hemisphere of the brain causes signs and symptoms on the opposite sides of the body. A stroke that affects cranial nerves damages structures on the same side as the infarction (Holmes, 2003).*

Signs and symptoms can be categorized as general and as those associated with the specific area of involvement. General signs and symptoms include unilateral extremity weakness, numbness on one side of the body, headache, speech problems, dizziness, and anxiety. Vision disturbances such as ptosis, diplopia, and hemianopsia may be present as well as an altered level of consciousness (LOC) (Holmes, 2003).

Middle cerebral artery syndrome is the most common cerebral occlusion. Main stem middle cerebral artery occlusion can cause a huge infarction that damages most of the hemisphere. The patient experiences vomiting at onset and a rapid deterioration into coma that can last several weeks. The anterior cervical artery is the one least often occluded. Occlusion of the distal portion of the artery or if the communicating artery is not functional an infarction of the medial aspect of one frontal lobe occurs. If one anterior cervical artery is occluded and the other artery is small and relies on its blood flow, a bilateral medial frontal lobe infarction occurs with extensive cerebral edema (Youngblood, 2001, p.315).

Signs and symptoms associated with middle cerebral arterial infarction include the following (Holmes, 2001; Holmes, 2003, p.328):

- Hemiparesis of the affected side that is more severe in the arm and face than in the leg
- Dysphasia
- Aphasia
- Visual field deficits

Presenting signs and symptoms of an anterior cerebral artery infarction include the following (Holmes, 2003, p.328):

- Weakness and confusion

- Incontinence
- Numbness (particularly in the legs on the affected side)
- Loss of coordination and impaired motor and sensory functions
- Changes in personality

Involvement of the carotid artery produces the following signs and symptoms (Holmes, 2001, p.642; Holmes, 2003, p.328):

- Aphasia
- Weakness
- Paralysis
- Numbness
- Sensory changes
- Visual disturbances on the affected side
- Altered LOC
- Bruits
- Headaches
- Ptosis

Involvement of the vertebrobasilar system affects the brainstem and cerebellum (Youngblood, 2001). Signs and symptoms include (Holmes, 2001, p.642; Holmes, 2003, p.328):

- Weakness on the affected side
- Diplopia
- Numbness around the mouth and lips
- Dysphagia
- Slurred speech
- Dizziness
- Nystagmus
- Amnesia
- Ataxia
- Lack of coordination
- Visual field deficits

The posterior cerebral artery is infrequently affected by stroke. The patient experiencing such an infarction would experience the following signs and symptoms (Holmes, 2003, p.328):

- Homonymous hemianopsia
- Dyslexia
- Coma
- Sensory impairment
- Perseveration
- Cortical blindness

**Healthcare Alert:** *Posterior cerebral artery infarction does not usually cause paralysis (Holmes, 2003).*

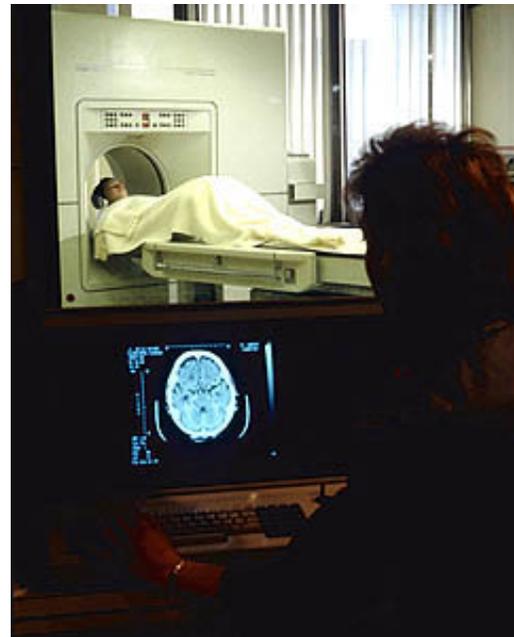
There are also some common signs and symptoms associated with the side of the brain affected by stroke. These are identified in Table 1 (Youngblood, 2001).

**Table 1: Left Versus Right Stroke**

Right Hemisphere Stroke	Left Hemisphere Stroke
<ul style="list-style-type: none"> <li>• Visual deficits</li> <li>• Impulsive behavior</li> <li>• Weakness of the left side</li> <li>• Spatial impairment</li> <li>• Decreased insight about deficits</li> <li>• Sensory loss</li> </ul>	<ul style="list-style-type: none"> <li>• Speech and language deficits</li> <li>• Slow, cautious behavior</li> <li>• Weakness of the right side</li> <li>• Sensory loss</li> <li>• Motor planning difficulties</li> </ul>

## Diagnostic Studies

Cranial computed tomography (CT) can identify an ischemic stroke within the first 72 hours of the onset of symptoms and hemorrhagic stroke (if lesions are larger than 1 cm) immediately (Holmes, 2003; Youngblood, 2001). The CT of the brain provides a view of the patient's head as if one were looking down through the top of the head. Results are in the form of a computerized analysis of multiple tomographic x-ray films taken of brain tissue. These provide a three-dimensional view of cranial contents (Pagana & Pagana, 2003).



**Healthcare Alert:** *CT scans are not as precise in determining the location and severity of damage in ischemic strokes as they are in hemorrhagic strokes (Youngblood, 2003).*

Magnetic resonance imaging (MRI) visualizes areas of ischemia or infarction, cerebral swelling, and the extent of ischemic damage not visualized on a CT scan (Youngblood, 2003). The MRI has some additional advantages over CT scanning. These include the following (Pagana & Pagana, 2003):

- MRI provides a better contrast between normal and abnormal tissue.
- Bone artifacts that interfere with CT scanning do not occur with an MRI.
- Rapidly flowing blood helps to provide a natural contrast from other tissues to blood vessels during MRI.
- The MRI can provide images of transverse, sagittal, and coronal planes.

Single photon emission (SPECT) computed tomography and positron emission tomography (PET) scans identify how different areas of the brain metabolize oxygen and glucose after a stroke (Holmes, 2003; Youngblood, 2001). Cerebral angiography shows disrupted or displaced cerebral circulation due to occlusion (Holmes, 2003). Digital subtraction angiography can indicate occlusion of cerebral vessels, lesions, or vascular abnormalities (Holmes, 2003).

Other tests that are used in the diagnosis of stroke include (Holmes, 2003):

- Brain scan shows ischemic damage but may not be conclusive for up to two weeks after the stroke.
- Lumbar puncture reveals bloody CSF in hemorrhagic stroke.
- EEG can help to identify damaged areas of the brain.
- Ophthalmoscopy may show signs of hypertension and atherosclerotic changes in retinal arteries.

## Treatment in the Acute Phase

### Immediate Interventions

During the acute phase of treatment, emphasis is on patient survival and the prevention and/or minimization of further cerebral damage. It is essential to maintain a patent airway. An unconscious patient should be kept in a lateral position to avoid aspiration of secretions and supplemental oxygen or mechanical ventilation should be initiated as needed (Holmes, 2001).

**Healthcare Alert:** Observe for “ballooning of the cheek with respirations. The side that “balloons” is the side that the stroke affected (Holmes, 2001).

Vital signs and neurologic status must be observed frequently. If a stroke (or an additional stroke) is impending, there is an abrupt increase in blood pressure with

a rapid and bounding pulse. The patient may also complain of a headache. Blood gasses and fluid and electrolyte balance must also be frequently evaluated. Meticulous mouth and eye care is important. The patient should be turned and properly positioned every two hours and adequate nutritional intake must be ensured (Holmes, 2001; Youngblood, 2001).

### Thrombolytic Therapy

If the stroke is an ischemic event, thrombolytic therapy is the current accepted medical treatment. In 1996 the Food and Drug Administration (FDA) approved the first thrombolytic drug for specific use in stroke treatment. Recombinant tissue plasminogen activator (r-TPA) has been shown to improve stroke outcome if given within three hours of symptom onset. r-TPA is not recommended if the time of stroke symptom onset cannot be identified. This includes strokes that occur upon awakening (Holmes, 2001; Youngblood, 2001).

**Healthcare Alert:** *The benefit of administering r-TPA more than three hours after symptom onset has not been established. If there is evidence of cerebral edema or hemorrhage thrombolytic therapy is contraindicated (Youngblood, 2001).*

Thrombolytic drugs reduce an arterial occlusion by causing the conversion of plasminogen to plasmin. Plasmin is the enzyme that breaks down clots by causing lysis of fibrin and the release of fibrin degradation products. Such products inhibit the formation of clots (Youngblood, 2001).

At this time, thrombolytic therapy is only recommended if (Youngblood, 2001):

- A physician with expertise in diagnosing stroke has made a diagnosis of ischemic stroke.
- A CT of the brain confirms the diagnosis of ischemic stroke.
- The time of stroke symptom onset can be identified.

The primary complication of thrombolytic therapy is the possibility of hemorrhage. For example, if a clot forms in response to the rupture of an artery as a way to prevent further blood loss, a thrombolytic drug may dissolve the clot. After the clot has been dissolved, it no longer prevents bleeding and the patient may hemorrhage (Youngblood, 2001).

### Surgical Interventions

Surgery is actually a preventive measure instead of an actual treatment after a stroke. The decision to have surgery is made based on the patient's general health and a careful analysis of the risks compared to potential beneficial

outcomes. Surgical interventions for stroke are generally carotid endarterectomy (CEA) and extracranial-intracranial (EC-IC) bypass.

### Carotid Endarterectomy

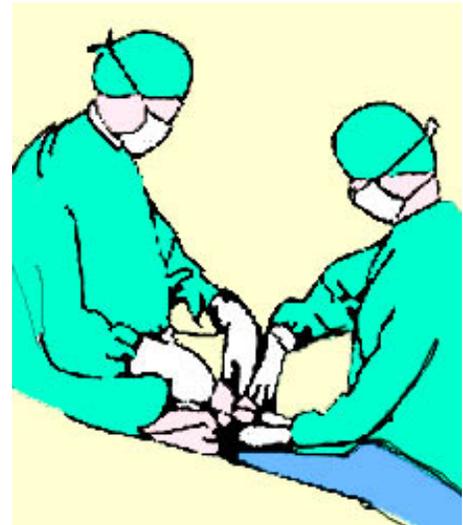
Carotid endarterectomy (CEA) is a surgical excision of atherosclerotic segments of the endothelium and tunica media of the carotid artery. The purpose is to leave a smooth tissue lining of the artery and enhancing blood flow through the affected vessel (Anderson, 2002).

The long-term benefits of CEA are not easy to predict. Because each patient experiences differences in the severity of neurological deficits and has a unique medical history, it is difficult to evaluate the significance of CEA in actual neurological recovery. CEA is believed to lower recurrent stroke incidence and to help relieve the symptoms of TIAs. There are no definitive data on the impact of CEA on survival rates of surgical patients compared with control groups. Healthcare experts believe, however, that CEA does help to prevent stroke and improve the quality of life in carefully selected patients (Youngblood, 2001).

### Extracranial-Intracranial Bypass

Extracranial-intracranial (EC-IC) bypass surgery can add collateral blood flow and may be able to return reduced cerebral blood flow and defective cerebral oxidative metabolism to normal or near normal. But definitive indications for EC-IC bypass have yet to be determined.

ED-IC is most likely indicated for certain cases of vascular trauma or surgically planned vascular occlusion (Youngblood, 2001). This type of surgery has been used successfully as part of the treatment of “giant aneurysms at the base of the skull and arteriovenous malformations” (Youngblood, 2001, p.321). It has been used, cautiously, in the management of TIAs and other types of cerebral symptoms (Youngblood, 2001).



**Healthcare Alert:** *The patient who has undergone EC-IC is generally treated as any other craniotomy patient and is maintained on anticoagulants for about three to six months after surgery (Youngblood, 2001).*

## Rehabilitation of the Stroke Patient

Rehabilitation principles should be initiated as soon as possible after stroke onset. As soon as medically approved, the patient should help to participate in such activities as turning, positioning, and performing activities of daily living. The sooner rehabilitation is initiated, the more beneficial its impact will be on patient outcomes.

The primary goal of rehabilitation is to assist the stroke survivor to achieve his/her maximal level of independence and wellness. The extent to which successful rehabilitation is achieved depends on the severity of brain damage, the expertise of the rehabilitation team, the participation of family and friends, the motivation of the patient, and how soon rehabilitation is initiated (National Institute of Neurological Disorders and Stroke, 2002b).

There are millions of Americans living with the effects of stroke. According to the National Stroke Association “10% of stroke survivors recover almost completely, 25% recover with minor impairments, 40% experience moderate to severe impairments that require special care, and 10% require care in a nursing home or other long-term facility” (National Institute of Neurological Disorders and Stroke, 2002b, p.1). Additional statistics show that 15% die shortly after experiencing a stroke, and about 14% of stroke patients experience a second stroke in the first year after a stroke (National Institute of Neurological Disorders and Stroke, 2002b).



To maximize the number of patients who live productive, happy lives after a stroke it is necessary to understand the basics of a good rehabilitation program.

### The Rehabilitation Team

A number of professionals work with patients and families to successfully rehabilitate stroke survivors.

- *Physiatrists.* Physiatrists are physicians who specialize in the practice of physical medicine and rehabilitation. When choosing a rehabilitation program it is important to ascertain whether or not qualified physiatrists are members of the rehabilitation team (Youngblood, 2001).

- *Other Physicians.* There are a number of physicians who may be part of the stroke survivor's team depending on individual needs. These include neurologists, urologists, psychiatrists, cardiologists, and neurosurgeons.
- *Rehabilitation Nurses.* Nurses who specialize in assisting with patients who are in need of physical medicine and rehabilitation are essential members of the rehabilitation team. Patient/family education is a critical responsibility of rehabilitation nurses. They work to help patients learn to manage activities of daily living and medication administration and to recognize threats to safety and wellness (National Institute of Neurological Disorders and Stroke, 2002a).
- *Physical Therapists.* Physical therapists specialize in treating deficits resulting from motor and/or sensory impairments. They work to increase strength, endurance, and range of motion and to decrease gait abnormalities and sensory deficits (National Institute of Neurological Disorders and Stroke, 2002a).
- *Occupational Therapists.* Occupational therapists specialize in helping patients to improve motor abilities. They help stroke patients to relearn specific motor skills needed for the performance of activities of daily living, including job-related activities. They teach patients to divide complex activities into manageable components to help overcome cognitive as well as motor deficits (National Institute of Neurological Disorders and Stroke, 2002a).
- *Speech/Language Pathologists.* Speech/language pathologists help stroke survivors who have aphasia learn/relearn how to use language, or, if necessary, to develop alternate means of communication. These specialists also help patients enhance their ability to swallow (National Institute of Neurological Disorders and Stroke, 2002a).
- *Vocational Therapists.* About 25% of all strokes occur in people between the ages of 45 and 65. Therefore, the ability to return to work is a matter of concern to many stroke patients and their families. Vocational therapists help persons to identify their strengths, develop



resumes, assist in job searches, and refer patients to stroke vocational rehabilitation agencies as needed (National Institute of Neurological Disorders and Stroke, 2002a).

- *Clergy.* Clergy help to support stroke patients in their religious beliefs as they go through the recovery process.
- *Recreational Therapists.* “Recreational therapists contribute to the improved functioning and independence of the client through pleasant and rewarding avocational activities in a safe, controlled environment” (Youngblood, 2001, p.40).
- *Psychologist.* Psychologists help the patient and family to adjust emotionally to the impact of a serious/life-threatening event and to resulting deficits. Psychologists help to maximize rehabilitation efforts and teach skills to ease psychosocial adjustment. Psychologists also help to recognize stress in the rehabilitation team members and help them to deal with the tensions that arise when caring for seriously ill/physically challenged patients (Youngblood, 2001).
- *Social Workers.* Social workers help to deal with psychosocial issues of patients and families. They work to facilitate interactions among patients, families, and their communities (Youngblood, 2001).
- *Case Manager.* Case managers, relatively new members of the rehabilitation team, may be employed in an institutional setting or in the insurance industry. The case manager helps patients, families and the team to coordinate and optimize services in a cost-efficient manner (Youngblood, 2001).

## Selecting a Rehabilitation Facility

Rehabilitation facilities vary in both the quality of care and patient outcomes. When evaluating rehabilitation services patients and families should ask the following questions:

- Is 24-hour, seven-day-a-week rehabilitation nursing provided?
- Is a qualified physiatrist a member of the rehabilitation team?
- How many stroke patients does the facility rehabilitate annually?
- How successful are the patient outcomes of stroke survivors?
- What professional disciplines are represented on the rehabilitation team?

- Is there a case manager assigned to all patients?
- Does the rehabilitation team visit the patient's home (or other discharge destination) prior to discharge to assess for any necessary environmental modifications?
- What types of patient education are provided?
- What types of education are provided for the patient's loved ones?
- Are there stroke support groups available for patients and loved ones?
- Is there a social worker available to help with discharge planning?



## Rehabilitation Principles

Many of the rehabilitation interventions are initiated, to some extent, as soon as medically possible during the acute phase of treatment. These interventions are more vigorous and detailed during the rehabilitation phase of treatment. Youngblood (2001) identifies the following rehabilitation principles that govern the rehabilitation of the stroke patient:

- Start rehabilitation as soon as medical stability is achieved, usually 24 to 36 hours after admission to acute care. Initial rehabilitation efforts should include positioning, turning, and getting out of bed when medically authorized.
- Provide encouragement and emotional support since a positive mental outlook is critical.
- A clinical pathway should be in place so that care is consistent.
- The patient should be both physically and mentally active for as much of the day as possible. Long periods of inactivity and social isolation contribute to impaired intellectual functioning.

- Consistency of care should be reflected in the actions of all members of the rehabilitation team.
- Motivation is an essential component of any rehabilitation program and is necessary for the recovery of the patient. The rehabilitation treatment plan should include motivational strategies.

## Rehabilitation Interventions for the Stroke Patient

### Positioning

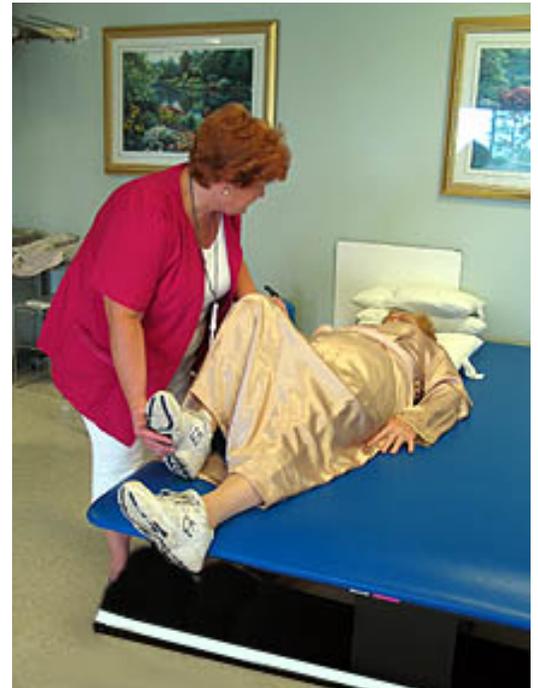
Proper positioning, including turning, from stroke onset is a priority and should be started as soon as the patient's condition allows. Extremities should be aligned properly whether the patient is standing, sitting, or lying down. High-topped sneakers, as appropriate, should be worn to prevent footdrop and contracture.

Position should be changed and/or the patient turned every two hours to prevent pneumonia and avoid excess pressure on bony prominences. Affected extremities should be elevated to control dependent edema. The use of convoluted foam, flotation, or pulsating mattresses or sheepskins can be used as needed to help prevent pressure ulcers (Holmes, 2001; Holmes, 2003; Youngblood, 2001).

The patients, as soon as they are safely able, should participate in and be taught to position themselves. Family and friends should also learn how to properly help patients to achieve and maintain proper body alignment.

Passive and active range-of-motion exercises are also critical to positioning. Such exercises help to achieve and/or maintain the flexibility to properly position and align the human body.

Each joint should be moved regularly and gently through its full range of motion in a smooth, careful, slow, and steady manner. The patient and family should also be taught how to perform regular range of motion exercises (Holmes, 2003; Youngblood, 2001).



**Healthcare Alert:** Avoid rapid, “jerky” movements because they trigger spasms and spasticity (Youngblood, 2001).

Affected limbs are easily dislocated. When moving these limbs, the elbow and ankle should be supported below the joints to prevent shoulder and/or hip

traction and to avoid friction burns if the patient is being moved in bed. No type of temporary pressure should be applied to the palm of the hand because it causes a spastic grip reflex, increases hand tone, and eventually results in a contracted fist. It may be helpful to keep the patient's affected hand and wrist in extension and to abduct the thumb by splinting. This will help to reduce spasticity (Youngblood, 2001).

**Healthcare Alert:** *The rehabilitation team should help the patient (and the family) to focus on the affected side and not to concentrate solely on the unaffected side. By promoting awareness and use of the affected side, the patient stands a much better chance of being able to become a bilaterally functioning person again (Youngblood, 2001).*

The purpose of proper positioning is to achieve and maintain as much normal functioning of the affected extremities as possible. This is accomplished by: normalizing muscle tone, facilitating normal movements, and providing experiences that stimulate sensory awareness and functioning.

If the patient is in bed his/her spine must be aligned, the hips straight without rotation, and the upper extremities away from the body. The superior extremities should be supported when the patient is in a side-lying position. Knee joint should be flexed 15 degrees when the patient is in a supine position (Youngblood, 2001).

If the patient is in a sitting position he/she must learn to evenly distribute weight on both buttocks, to keep both feet flat on the floor and close together, and to maintain spinal alignment.

When the patient is standing the feet should be a few inches apart, the hips in front of the ankles and the shoulders over the hips, the head balanced, and the spine in proper alignment (Youngblood, 2001).

## Motor Functioning

Physical therapists assess the stroke patient's strength, endurance, range of motion, gait, and sensory deficits for the purpose of helping the patient to regain and maintain motor functions. The entire rehabilitation team will follow the strategies identified by physical therapy and approved by the physiatrist.

There are a number of ways to encourage stroke survivors to use impaired extremities. These include selective sensory stimulation (such as tapping or stroking), regular active and passive range of motion exercises, and practicing motor tasks using the affected limbs.

Sometimes transcutaneous electrical nerve stimulation (TENS) is used to encourage brain reorganization and regain function. A TENS unit uses a small probe that generates an electrical current to stimulate nerve activity in affected extremities (National Institute of Neurological Disorders and Stroke, 2002a).

Stroke patients practice complex movements that require coordination and balance. These include ambulation, walking up and down stairs, and moving around obstacles in the environment (Neurological Disorders and Stroke, 2002a). Patients learn to use assistive devices, if needed to, achieve mobility. Such devices include canes, walkers, and wheelchairs.



**Healthcare Alert:** *Stroke patients tend to avoid using or even to ignore their affected extremities. This is commonly referred to as “learned non-use” or neglect. Continued, repetitive use of affected extremities helps the brain to “relearn” how to use impaired extremities and to reduce deficits (National Institute of Neurological Disorders and Stroke, 2002a; Youngblood, 2001).*

Occupational therapists also identify strategies to improve motor functioning. They concentrate on helping stroke survivors to “relearn” motor skills for the performance of activities of daily living (ADL). These activities include, but are not limited to, bathing, dressing, housekeeping, and eating. In some cases patients will be taught to drive a car again and receive on-road training.

A big part of relearning motor strategies is the development of compensatory strategies. This involves learning how to compensate for deficits and to adapt patients’ environments to facilitate achievement of goals. Learning to use assistive devices such as splints, canes, walkers, and wheelchairs are also part of enhancing motor functioning.

Family members are taught how to make changes in their homes and/or the homes of the patients to remove barriers, enhance functioning, and increase safety (Neurological Disorders and Stroke, 2002a).

Therapeutic recreation specialists identify strategies to improve motor ability through the practice of appropriate leisure activities and ADLs. As with any patient strategy, all members of the rehabilitation team must reinforce techniques to improve motor functioning. It is imperative that consistency of approach is implemented at all times.

## Skin Care

The stroke survivor is at risk for skin breakdown due to changes in mobility and nutritional status. Additionally, the older adult's skin is more fragile and bruises and tears more easily. Rehabilitation nurses generally take the lead in identifying appropriate skin care measures to prevent a breakdown of skin integrity.

In addition to turning and changing position every two hours the stroke patient must learn to avoid putting pressure on bony prominences for any length of time. Whether sitting in a chair or wheelchair or lying in bed, the patient must learn to distribute his/her weight evenly. The patient must also learn to change position independently whenever possible. Family members must also be aware of the need to avoid pressure on the skin and how to intervene effectively.

Bony prominences should be massaged regularly. Particular attention should be paid to the sacral area but other sites such as elbows, knees, and ankles should not be ignored. Patients and family members should be able to massage bony prominences.

Lotions are sometimes used to massage bony prominences and to moisturize dry skin. However, patients should be cautioned not to attempt transfers if their hands are slippery from lotion.

Nutrition plays a major role in maintaining skin integrity. Proper intake of vitamins and minerals helps to keep cells healthy and continually regenerate. Adequate hydration helps to enhance skin integrity. However, it can be difficult for a stroke patient to maintain adequate nutrition and fluid intake if he/she is experiencing problems with swallowing and cognition. Additionally, some patients, fearful of being incontinent of feces and/or urine, deliberately decrease the amount of food they eat and fluid they drink. The rehabilitation team must work to help patients achieve and maintain adequate nutritional status. A consultation with a registered dietician is generally part of the rehabilitation process.



While hospitalized, rehabilitation team members should assess the patient's skin integrity on a daily basis. Any reddened areas must immediately receive appropriate attention. Patients and families should be taught to perform skin assessment as well. Long-handled mirrors are available to help the patient examine all areas of his/her skin independently.

## Swallowing

There are several causes of swallowing impairment in the stroke survivor. These include delayed swallowing reflex, problems manipulating food with the tongue, or difficulty detecting food remaining in the cheeks after swallowing (Neurological Disorders and Stroke, 2002a).

In order to promote successful, safe swallowing the patient must be positioned appropriately when eating. When the patient eats he/she should be sitting in a chair or sitting straight up in bed. The head and neck are flexed and positioned slightly forward to protect the airway and to prevent aspiration. Stroke survivors are usually able to tolerate soft or semi-soft foods and fluids better than thin liquids or regular table food (Youngblood, 2001).

Speech-language pathologists often lead the rehabilitation team in efforts to overcome swallowing problems. All members of the team reinforce these efforts. The following interventions are some of the ways swallowing can be improved (Neurological Disorders and Stroke, 2002a; Youngblood, 2001):

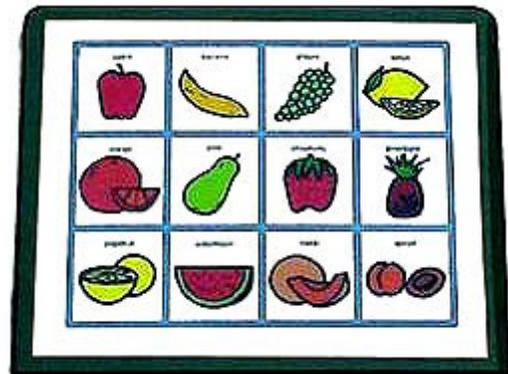
- Modify food textures to facilitate swallowing. For example, thicken thin liquids.
- Teach patients to take small bites and chew slowly
- Teach patients to place food in the back of the mouth on the unaffected side. This will help to avoid trapping food in the affected cheek.
- Teach the patient to sweep the affected cheek with the tongue to prevent pocketing food in the affected cheek.
- Monitor the patient for fatigue. Fatigue will interfere with the patient's ability to focus on what must be done to eat safely. It will also interfere with the patient's desire for and enjoyment of food.

Even though some patients may be able to swallow safely and without difficulty, they may also be impulsive and easily distracted. This puts them at high risk for aspiration. Such patients should be in a quiet environment that is as distraction-free as possible when they are eating. The patient needs to concentrate on eating (Youngblood, 2001).

## Speech and Language Pathology

Impaired speech and language is generally due to a stroke that involves the dominant hemisphere. In most people, the speech center is located in the left cerebral hemisphere. Language difficulties can be the result of aphasia, an inability to use or understand language, or dysarthria, poorly articulated speech as a result of motor function loss to the tongue or speech muscles (Youngblood, 2001).

Expressive aphasia (difficulty speaking) is also referred to as motor or Broca's aphasia because of damage to Broca's area of the frontal lobe. The patient is not able to coordinate speech muscles. Training to strengthen and relearn how to use these muscles is generally under the supervision of the speech-language pathologist. Picture or communication boards can be used to help patients. They can point to a picture or activity (there is usually a printed description below each picture) that they want or need (Youngblood, 2001).



**Healthcare Alert:** *The patient who experiences expressive aphasia still possesses the ability to understand what is said to him/her (Youngblood, 2001).*

Persons experiencing receptive aphasia cannot comprehend either the spoken or written language. Directions must be given slowly and carefully. Activities must be broken down into short components and given to the patient one step at a time. Members of the rehabilitation team should face the patient and speak slowly and clearly. The patient must be given an opportunity to understand and to respond (Youngblood, 2001). Staff members should not show impatience, amusement, or disgust when working with patients who have difficulty communicating.

Patients frequently experience global or mixed aphasia. This means that they exhibit impairment of both expression and reception. This is a very challenging situation for the patient and family. The speech/language pathologist identifies strategies to help enhance reception and communication considering the massive impact that global aphasia has on patients (Youngblood, 2001).

## Pain

Stroke patients can experience a variety of chronic pain in syndromes due to the damage the stroke causes to the nervous system. This type of pain is commonly

referred to as neuropathic pain. Some stroke patients experience transmission of false signals from damaged sensation pathways. These signals cause pain sensations in the side of the body that has the sensory deficit.

One of the most common pain syndromes is referred to as thalamic pain syndrome. This syndrome is hard to treat effectively, even with the use of medications. Most often, pain results from joint immobilization. Because of decreased movement, the tendons and ligaments around the affected joint become fixed or “frozen” in one position (Neurological Disorders and Stroke, 2002a).

**Healthcare Alert:** *The prevention of a “frozen” joint is essential. The possibility of this complication highlights the importance of passive and, if possible, active exercise of the affected limbs.*

Painful shoulder syndrome is quite a common problem for stroke survivors. It is due to decreased motor activity around the shoulder. Even under normal circumstances this area is not particularly stable. Loss of motor function can result in total joint instability. Instability leads to a soft tissue injury and pain, stiffness, and subluxation.

Factors that can cause and exacerbate pain can occur during normal activities such as helping the patient to turn, bathe, dress, or position him/herself. The problem basically results from “pulling” on the arm during these activities, or because the affected arm is allowed to hang down without support (Youngblood, 2001).

**Healthcare Alert:** *All staff must know how to support the affected arm and to avoid dangerous “pulling” on the extremity. Patients and families must also be taught to support the affected arm appropriately.*

Another common syndrome is the shoulder-hand syndrome of the affected arm. About 41% of stroke survivors experience this syndrome. Characteristics of this syndrome include pain in the shoulder (especially with movement) and swollen, red, and shiny forearm and hand. If the syndrome reaches its most severe form, reflex sympathetic dystrophy results. This is indicated by erythema and sweating as well as the pain, swelling, and redness. The skin, hair, and nails may even atrophy.

Measures must be taken to enhance movement, move fluids back into circulation, and decrease syndrome progression (Youngblood, 2001). Again, the best treatment for this syndrome is prevention. All staff members and patients and families must institute appropriate handling, exercises, and positioning.

## Alterations in Sensation and Perception

Alterations depend on which part of the brain sustained damage. Table 2 outlines common problems and appropriate interventions. This table is developed from information provided by Youngblood (2001).

**Table 2: Alterations in Sensation and Perception**

<b>Hemisphere Damaged</b>	<b>Presenting Signs and Symptoms</b>	<b>Interventions</b>
Right-hemisphere damage	Problems with visual-perceptual or spatial-perceptual tasks. Patients have difficulty with depth and distance perception and discriminating left from right or up from down. Visual field deficits may exist.	Approach the patient from the non-affected side. Provide frequent verbal and tactile cues. Tasks should be broken down into small components. Place objects with the patient's field of vision. Teach the patient to turn his/her head from side to side and scan the environment. Patients suffering from diplopia may need to wear a patch over the affected eye.
Left-hemisphere damage	Memory deficits are common. Patients have difficulty carrying out simple tasks.	Orient the patient to date, time, and place frequently. Consistency of routine is important. The routine should be structured and repetitious and supported by all members of the rehabilitation team. Families and friends should bring in familiar objects and pictures of events to help orient the patient. This patient is generally slow, cautious, and

		hesitant to perform tasks. Additionally he/she may neglect affected extremities. They may fail to recognize that their affected extremities are part of their bodies. This increases the possibility of injury to the affected side.
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### **Bowel and Bladder Incontinence**

One of the most difficult problems for stroke patients to deal with is incontinence. Patients are often ashamed and embarrassed because of their incontinence. Family members may be reluctant to have patients return home because they cannot deal with the possibility of incontinence. Rehabilitation nurses generally take the lead in helping patients to retrain bowel and bladder functioning.

About 75% of stroke patients experience urinary incontinence. However, most of these people are able to regain continence within three to six months. Incontinence is an accurate predictor of outcome because it mirrors damage to frontal lobes, cerebellum, basal ganglia, thalamus, hypothalamus, and limbic system (Youngblood

**Healthcare Alert:** *Patients who have cognitive deficits in memory, problem solving, and orientation require the most time to regain continence (Youngblood, 2001).*

Before bladder training can begin, it is important to determine the cause of incontinence. For instance, is the problem one of alterations in consciousness, muscle weakness, and/or inability to communicate the need to go to the bathroom? A timed voiding program is often initiated as soon as the patient is able. He/she is assisted (if medically approved) to the bathroom or bedside commode every two hours to void. The patient needs to have privacy and be in a normal position to relearn continent voiding. Bedpans do not facilitate the “normal” pattern that is needed to help the patient learn what it takes to be continent. However, if the patient is unable to get out of bed a bedpan may be the only alternative at the beginning of the bladder-training program.

The patient needs to learn to recognize the sensation to void and to work to control voiding. As the patient progresses, the time between attempts to void should be increased. Adequate fluid intake is important for adequate functioning of the urinary system. Total fluid intake should be 2000 mL or more a day (Youngblood, 2001). Patients are often reluctant to drink fluids for fear of

becoming incontinent. They must be helped to understand the importance of an adequate fluid intake.

If there is doubt about the patient's ability to empty his/her bladder a residual catheterization may be necessary. Patients should be observed for (and taught to recognize) signs of urinary tract infections.

If patients are incontinent, clothes and sheets should be changed promptly and the patients' skin dried. Wet skin and the friction of wet clothes or sheets can lead to skin breakdown. Meticulous skin care is imperative.

The first step in establishing a bowel-training program is to identify the patient's normal time for bowel evacuation and any measures that the patient usually employs to facilitate bowel elimination (such as prunes for breakfast). These routines should be followed as much as possible (Youngblood, 2001). At the normal time the patient should be assisted to the bathroom or bedside commode. As tolerated, the diet should have adequate amounts of bulk, fiber, and fluids. To avoid straining at stool, stool softeners may be prescribed.

## Spasticity

Stroke survivors may experience hypotonia and/or spasticity. To avoid or decrease such problems, appropriate positioning and range of motion exercises are imperative. Splinting is also a common intervention. For severe spasticity, medications such as valium and baclofen may be needed to control spasticity (Youngblood, 2001).

Deep vein thrombosis can be a serious complication of mobility loss and spasticity. Patients should be monitored for signs and symptoms of thrombosis. Patients' thighs and calves should be measured weekly and they should be checked for Homan's sign (Youngblood, 2001).

## Patient Education

Patient and family education are critical to the successful rehabilitation of the stroke patient. In addition to transfer techniques, positioning and exercises, skin care, bowel and bladder retraining, and adaptations for the performance of activities of daily living, patients and families need information about several other issues.

Recognition of stroke risk factors and how to modify them deserves a great deal of attention. No one wants to experience, or to see a loved one experience,



another stroke. However, there is no guarantee that the patient will be able to avoid future strokes. Patients and families must be able to recognize the signs and symptoms of impending stroke and the importance of accessing medical care immediately.

Patients and families also need to understand the patients' medication schedule. The name of the medication, when and how it is to be administered, desired effects, and adverse reactions are all part of the teaching plan.

Safety awareness is of critical importance. Most rehabilitation facilities offer home visits to help adapt the environment to the needs of the stroke survivor. Family members also need to understand particular safety risks that affect their loved ones.

## Resources

The following organizations may be helpful for patients, families, and healthcare professionals.

National Aphasia Association  
29 John Street  
Suite 1103  
New York, NY 10038  
(212) 267-2814  
<http://www.aphasia.org>



National Family Caregivers Association  
10400 Connecticut Ave.  
Suite 500  
Kensington, MD 20895-3944  
1-800-896-3650  
<http://www.nfcacares.org>

The following resources may be helpful as healthcare professionals design or update their clinical pathways for stroke.

The Royal College of Physicians, London  
<http://www.rcplondon.ac.uk/pubs/books/stroke>

The American Academy of Physical Medicine and Rehabilitation  
<http://www.aapmr.org/hpl/clinpath.htm>

The Rusk Institute of Rehabilitation  
[http://www.rusk institute.org/ri/rusk/rusk\\_stroke\\_home.jsp](http://www.rusk institute.org/ri/rusk/rusk_stroke_home.jsp)

## Conclusion

A stroke can have a devastating effect on both the patient and his/her family. Early intervention helps to decrease mortality and resulting deficits. A rehabilitation program carried out by qualified, experienced professionals greatly influences the success, or lack thereof, of patient outcomes. Patients and families need a great deal of education to continue the recovery process after discharge. Follow-up care should not only assess the health and well-being of the stroke survivor but of those family members and loved ones who help to care for him/her after discharge.

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## Biography

### Dr. Adrienne E. Avillion

Adrienne E. Avillion, D.Ed., RN, owns and operates a consulting business specializing in freelance medical writing, work redesign, and continuing education and staff development for health care professionals. Among her clients have been PraxisPress, KidsGrowth, Audionet International, CoMed, Good News Consulting, Noah's Place, Oncology Education Services, PDCfor nurses.com, Nursce.com, and The National Nursing Staff Development Organization.

Dr. Avillion holds a master's degree in nursing and a doctorate in adult education from Penn State University. Her professional experience includes positions as Vice President of Education Services for the Hospital and Healthsystem Association of Pennsylvania; Administrator for Nursing Education Programs of the Pennsylvania Nurses Association; Director of Educational Resources of the Rehab Hospital of York, in York, Pennsylvania; Manager of Training and Development at Kernan Hospital, Baltimore, Maryland.

Author and editor of articles and books for various health care publications and web sites, Dr. Avillion has over 20 years of experience writing on medicine and continuing education. Her work has been extensively published. She was editor-in-chief for the first and second editions of *Core Curriculum for Staff Development*. She has served on the editorial board of *Rehabilitation Nursing* and on the review board of the *Journal of Continuing Education in Nursing*. She is currently a member of the board of directors of The National Nursing Staff Development Organization.

Dr. Avillion is a frequent speaker at staff development conferences and conventions, and is a member of various professional organizations in the fields of training and continuing education.

## Stroke: Maximizing Outcomes and Minimizing Deficits (1132) Post Test

1. Of the 500,00 strokes that occur every year in the United States, what percentage reflects recurrent strokes?
  - A. 50%
  - B. 25%
  - C. 10%
  - D. 70%
2. Which of the following represents a member of the population most commonly affected by strokes in the United States?
  - A. A 60-year old African-American man
  - B. A 60-year old White man
  - C. A 50 year old Hispanic with hypertension
  - D. A 50 year old White woman
3. Which of the following obese persons are probably at most risk for stroke?
  - A. A woman whose excess weight is located over her hips
  - B. A women whose excess weight is over the hips and thighs
  - C. A man whose excess weight is located over the central abdomen
  - D. A man whose excess weight is distributed evenly over the body
4. Based on the current guidelines for hypertension, which of the following is considered to be a high-normal reading?
  - A. 142/86
  - B. 138/96
  - C. 120/70
  - D. 134/86
5. The most common cause of stroke in middle-aged and elderly people is:
  - A. A thrombosis that blocks cerebral arterial blood flow
  - B. Rupture of an intracranial artery or vein on the brain's surface
  - C. Bleeding into the subarachnoid space
  - D. A thrombus that travels from the heart to the brain

6. Which extracranial vessel is most commonly affected by thrombotic strokes?

- A. Cerebral arteries
- B. Carotid artery
- C. Jugular vein
- D. Aortic artery

7. Infarction of which artery does not usually cause paralysis?

- A. Middle cerebral artery
- B. Anterior cerebral artery
- C. Vertebrobasilar system
- D. Posterior cerebral artery

8. A patient with damage to the left hemisphere of the brain will generally exhibit:

- A. Impulsive behavior
- B. Speech/language impairments
- C. Left-sided weakness
- D. Spatial impairment

9. The diagnostic test that provides images of transverse, sagittal, and coronal planes is:

- A. CT scan
- B. PET scan
- C. MRI
- D. SPECT

10. Ballooning of the cheek with respirations indicates:

- A. The side affected by the stroke
- B. Respiratory distress
- C. Increased blood pressure
- D. Elevated ICP

11. Thrombolytic therapy is recommended if:

- A. The stroke is noticed upon awakening
- B. The diagnosis of hemorrhagic stroke is confirmed
- C. It can be administered within three hours of symptom onset
- D. Evidence of arterial rupture is present

12. When performing range of motion or positioning the patient, spasms may be triggered by:

- A. Applying pressure to the palm of the hand
- B. Keeping the patient's affected hand in extension
- C. Abducting the thumb
- D. Using smooth, slow movements

13. Measures to help the patient to swallow safely include all of the following EXCEPT:

- A. Encourage the intake of fluids such as water
- B. Teach patients to place food in the back of the mouth on the unaffected side
- C. The patient should sweep the affect cheek with his/her tongue
- D. Monitor for fatigue

14. A swollen, red, and shiny forearm indicates:

- A. Neglect
- B. Shoulder-hand syndrome
- C. Phantom pain
- D. Damage to Broca's area

15. All of the following are true concerning bowel and bladder incontinence EXCEPT:

- A. Most patients regain continence within 3 to 6 weeks
- B. A timed voiding program is usually initiated for urinary incontinence
- C. Adequate fluid intake is important for both bowel and bladder training
- D. Patients should be assisted to use the bathroom or bedside commode rather than a bedpan