

CEREBROVASCULAR ACCIDENT

1. Introduction

A stroke is also known as a cerebrovascular accident (CVA) or a brain attack. Blood supply is interrupted to part of the brain, causing brain cells to die. This results in the patient losing brain function in the affected area. Interruption is usually caused by an obstruction of arterial blood flow (ischemic stroke), such as formation of a blood clot, but can also be caused by a leaking or ruptured blood vessel (hemorrhagic stroke).

2. Definition

Stroke occurs when there is ischemia to a part of the brain or hemorrhage into the brain that results in death of brain cells leading to impairment or loss of functions.

3. Incidence and Risk factors

Stroke is the third most leading cause of death in the world next to heart disease and cancer.

3.1 Modifiable factors

- Diabetes mellitus
- Hypertension
- Hyperlipidemia
- Obesity
- Coronary artery disease and cardiac disorders, such as congenital heart disease, valvular conditions, endocarditis, atrial fibrillation
- Prior history of TIA or stroke
- Rare: Endothelial damage (inflammation or infection, drug-induced, fibromuscular dysplasia, carotid or vertebral artery dissections)

3.2 Behaviors

- Cigarette smoking (50% risk reduction in 1 year; return to baseline in 5 years)

- Alcohol abuse
- Physical inactivity
- Cocaine use (hemorrhagic stroke)

3.3 Nonmodifiable factors

- Increasing age—risk doubles for each decade over age 50
- Gender—men and women are equally affected but women die more often than men as women tend to live longer and have more opportunity to suffer a stroke.
- Heredity—increased risk with family history of stroke.
- Ethnic background—Blacks and Hispanics at higher risk than Whites due to higher incidence of hypertension, obesity, and diabetes mellitus in African Americas.

Others

There have been reports in the literature of increased risk due to childbirth, hormone replacement therapy or contraceptive use, and migraine headaches. Chiropractic manipulation and the way in which a person is positioned (when getting hair shampooed) in a hair salon have been associated with ischemic stroke related to dissection.

4. Etiology

- Occlusion(50%)
- Embolisation (25%)
- Hemorrhage (20%)

4.1 Occlusion

a) Atheromatous / thrombotic

- ✓ Large vessel occlusion eg, carotid artery.
- ✓ Branch vessel occlusion eg, middle cerebral artery
- ✓ Perforating vessel occlusion eg, lacunar infarction

b) Non-atheromatous diseases of the vessel wall

- ✓ Collagen disease eg, rheumatoid arthritis
- ✓ Vasculitis
- ✓ Miscellaneous eg, syphilis, trauma.

Occlusion due to atherosclerosis

4.2 Embolisation

Atheromatous plaque in the intracranial and extracranial arteries.

Embolisation in the heart like valvular diseases of the heart.

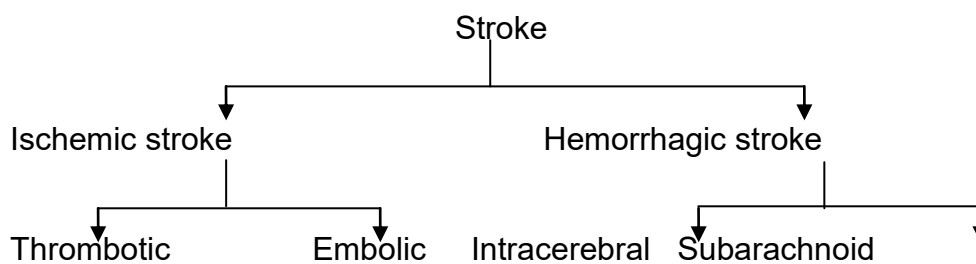
Miscellaneous eg, fat emboli, tumor emboli, air emboli.

4.3 Hemorrhage

- Parenchymal
- Subarachnoid
- Aneurysm
- Coagulation disorder
- Drug abuse
- Trauma

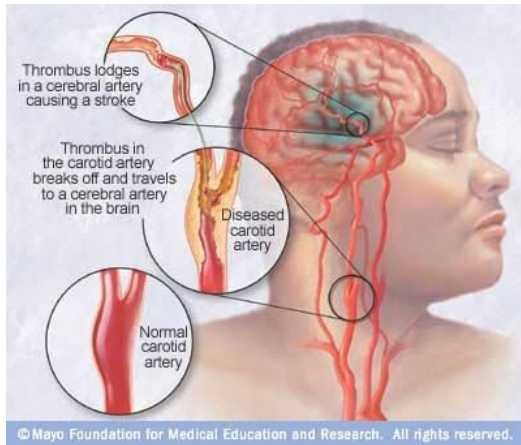
5. Types

Stroke is classified based on the underlining pathological finding as;



5.1 Ischemic stroke

It results from inadequate blood supply to the brain from partial to complete occlusion of an artery and accounts for 85% of all strokes. They are further divided into thrombotic stroke and embolic stroke.



5.1.1 Thrombotic stroke

It occurs when there is an injury to the blood vessel and there a formation of a clot. The lumen of the blood vessel becomes narrowed, and if it becomes occluded, infarction occurs. Thrombosis develops readily where atherosclerotic plaques have already narrowed blood vessel. It is the most common cause of stroke(61%) and is associated with hypertension and diabetes mellitus.

The extent of the stroke depends on the rapidity of onset, the size of the lesion, and the presence of collateral circulation. Most patients with ischemic stroke do not have decreased level of conscious in the first 24 hours and the symptoms progress as infarction and cerebral edema increases.

Lacunar stroke refers to a stroke from occlusion of a small penetrating artery with development of a cavity in the place of the infarcted brain tissue. Mostly these strokes are asymptomatic but sometimes produce neurological deficits

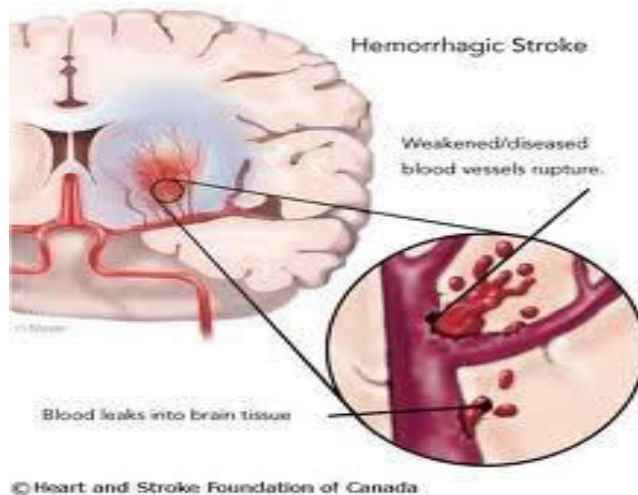
5.1.2 Embolic stroke

It occurs when an embolus lodges in and occludes a cerebral artery, resulting in infarction and edema of the area supplied by the involved vessel. The emboli originate in the endocardial layer of the heart, with plaque breaking off from the endocardium and entering into the circulation. It travels up to the cerebral circulation and lodges where a vessel narrows or bifurcates.

The patient with such stroke develops severe symptoms rapidly and it is of sudden onset. Hence there is no time for the brain to form collateral circulation for accommodation.

5.2 Hemorrhagic stroke

This type of stroke accounts for 15% of all the strokes and results from bleeding into the brain tissue itself or into the subarachnoid space or ventricles.



5.2.1 Intracerebral Hemorrhage

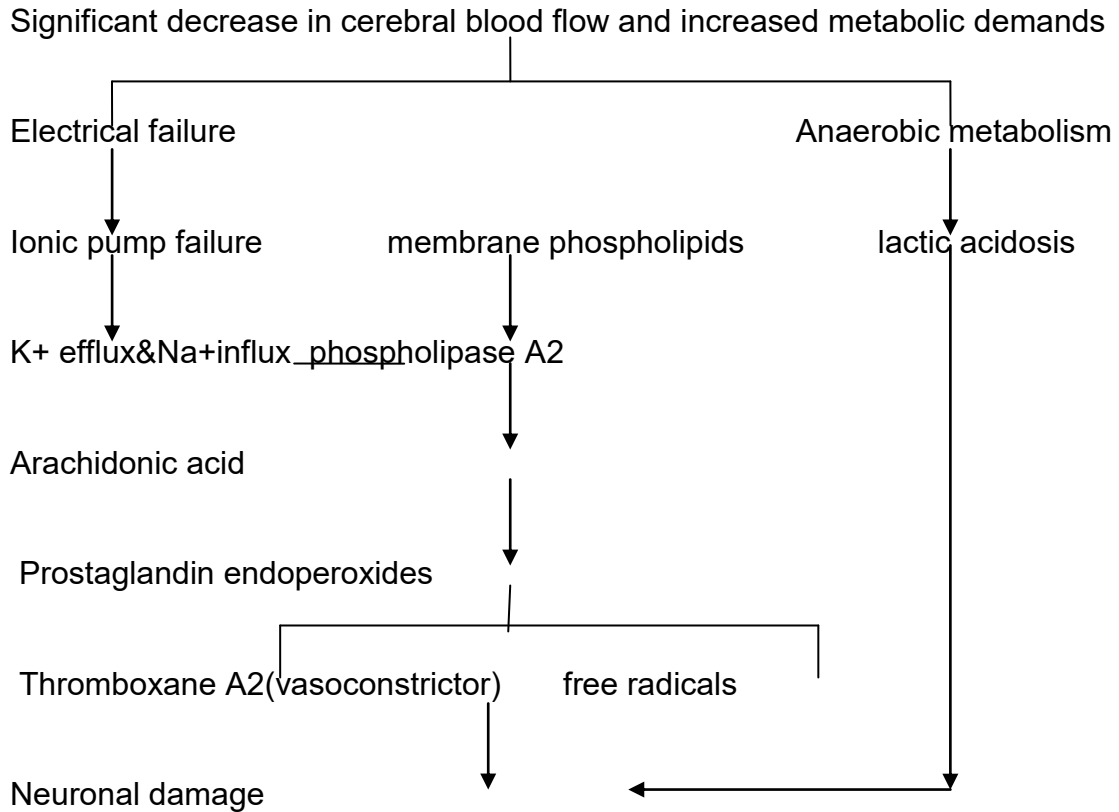
It is bleeding within the brain caused by a rupture of the vessel. Hypertension is the most common cause of intracerebral hemorrhage. Hemorrhage occurs during the period of activity, sudden in onset and progresses with bleeding. The clinical manifestations depend on the amount of bleeding and the duration of bleeding. A blood clot within the skull can result in a mass and cause on the brain, displace the tissues and decrease the cerebral blood flow, leading to ischemia and infarction.

5.2.2 Subarachnoid Hemorrhage

It occurs when there is intracranial bleeding into the cerebrospinal fluid filled space between the arachnoid and the piamater membranes on the surface of the brain. It is commonly caused by the rupture of a cerebral aneurysm (congenital or acquired weakness and ballooning of the vessels). It can also be caused by arteriovenous malformations, trauma, and drug usage. Warning symptoms are present and sudden

onset of severe headache is present. Loss of consciousness may occur.

6. Pathophysiology



7. Clinical manifestations

The clinical manifestations are directly related to the artery involved and the area of brain it supplies.

Middle cerebral artery

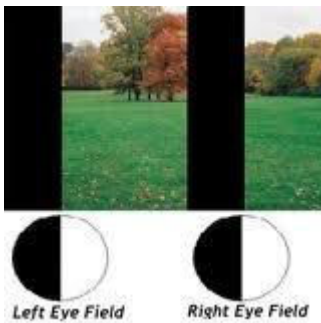
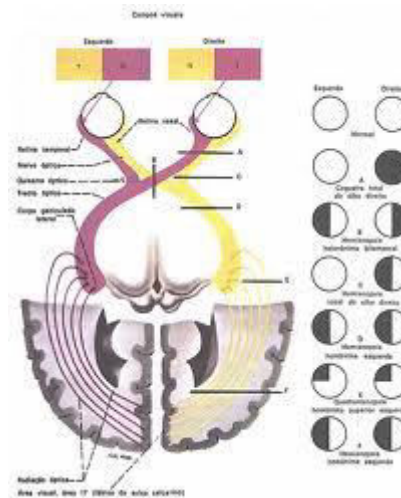
- Contralateral weakness(hemiparesis)
- Contralateral paralysis(hemiplegia)
- Contralateral hemianesthesia
- Aphasia

- Homonymous hemianopia

Hemiplegia



hemianopia



Anterior cerebral artery

- Contralateral sensory and motor deficits of foot and legs
- Contralateral weakness of proximal upper extremity
- Urinary incontinence
- Apraxia
- Personality changes like slowness in responding
- Possible cognitive impairment

Posterior cerebral artery and vertebrobasilar artery

- Unilateral or bilateral sensory loss
- Contralateral or bilateral weakness
- Dysarthria
- Dysphagia
- Ataxia

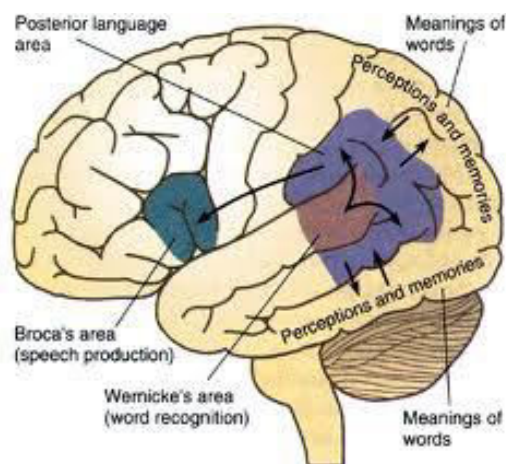
- Hoarseness
- Vertigo
- Nausea and vomiting
- Unilateral hearing loss
- Visual disturbances

Motor function

- Impairment of mobility, respiration, swallowing and speech, gag reflex, self-care abilities.
- Akinesia-loss of skilled voluntary movement.
- Alteration of muscle tone
- The arms and legs of the affected side is weakened or paralysed

Communication

- Aphasia- total loss of comprehension and use of language
- *Global aphasia*-loss of all communication and receptive function.
- *Receptive aphasia*- the patient cannot understand neither the sounds of speech or nor its meaning. It occurs due to damage to Wernicke's area.
- *Expressive aphasia*-difficulty in speaking and writing occurs due to damage to Broca's area of the brain.
- Dysphasia –difficulty related to language and comprehension or use of language.
- Nonfluent dysphasia
- Fluent dysphasia
- Dysarthria-impairment in articulation, pronunciation, and phonation.

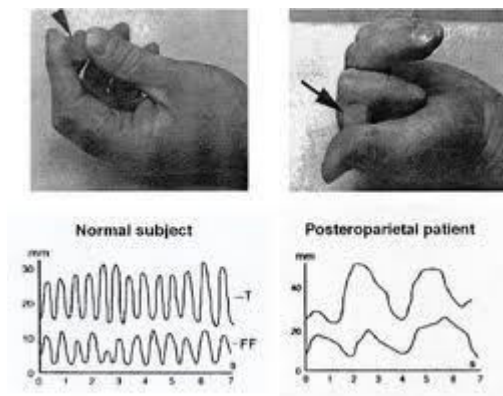


Affect

- Depression
- Exaggerated emotional response

Intellectual function

- Impaired memory and judgement
- Spatial-perceptual alterations
- It occurs in right sided brain damage. It is divided into four categories
- Patient's incorrect perception of self and illness
- Patient neglects all inputs from affected side.
- Agnosia-the inability to recognize objects by sight, touch, or hearing.
- Apraxia-the inability to carry out learned sequential movements on command.



Elimination

Constipation due to immobility, dehydration, weak abdominal muscles, and diminished response to defecation reflex.

8. Diagnostic evaluation

- History collection
- Physical examination
- X-ray of skull
- Computerized tomography-indicates the size and location of lesion.
- CT Angiography
- Magnetic Resonance Imaging

- Electroencephalogram
- Cerebral angiography
- CSF analysis
- Positron emission tomography
- Single photon emission computed tomography
- Transcranial Doppler- to measure the velocity of blood flow in the cerebral arteries.
- **Blood tests**
- Complete blood count
- Platelets, PT,APTT
- Serum electrolytes
- Lipid profile
- Arterial blood gas analysis.

9. Management

Management focuses on healthy diet, weight control, regular exercises, routine health assessments, quitting alcohol and smoking.

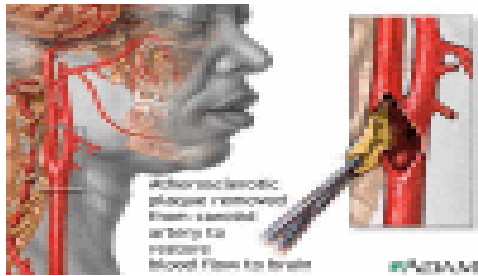
Medical management

- Oxygen administration
- Artificial Airway insertion
- Intubation
- Mechanical ventilation
- Fluid replacement of 1500-2000ml per day
- Anti-platelet drugs-Aspirin,50-325 mg/day
- Oral anticoagulants-warfarin
- Thrombolytic therapy
- Tissue plasminogen activator is administered to digest fibrin and fibrinogen and thus lyse the clot. It should be administered within 3 hours of the onset of symptoms to reduce disability. During infusion of the drug monitoring the vital signs is most important to assess for improvement or deterioration of the client.
- Osmotic diuretics- mannitol

- Calcium channel blockers to decrease the effects of vasospasm and minimize cerebral damage. Ex;Nifedipine.
- Anti-seizure drug-phenytoin.

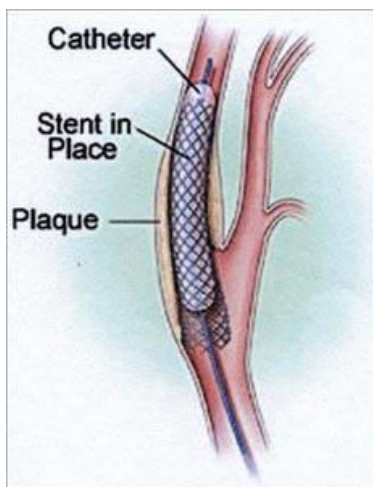
Surgical management

1. Carotid endarterectomy-removal of atheromatous lesion from the carotid artery to improve blood flow.

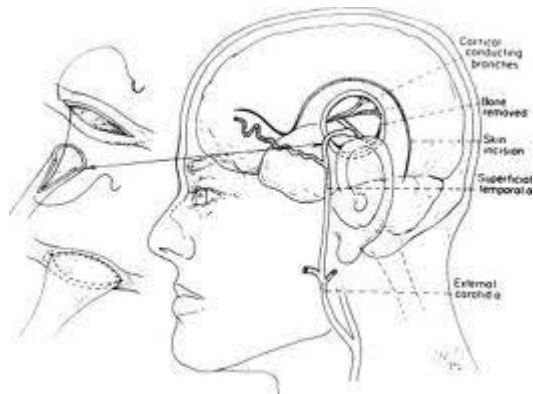


2. Transluminal angioplasty-insertion of a balloon to open a stenosed artery and improve blood flow.

3. Stenting-intravascular placement of a stent to maintain patency of the artery.

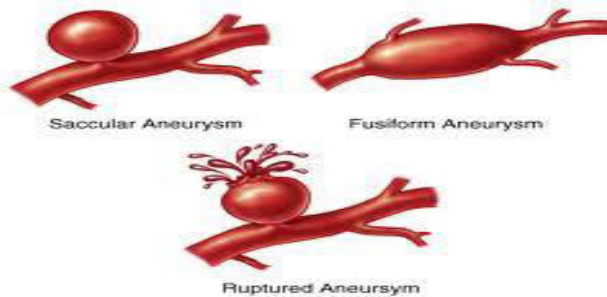


4. Extracranial-intracranial bypass-anastomosing a branch of extracranial artery to an intracranial artery (temporal artery to mid-cerebral artery) beyond an area of obstruction to increase cerebral perfusion.



5. Removal of bone flap to manage increased ICP. The flap is frozen and preserved which can be replaced later.

6. Treating aneurysm by clipping, wrapping, coiling, of aneurysm to prevent rebleeding.



7. Resection of A-V malformation.

Nursing management

1. Ineffective tissue perfusion related to decreased cerebral blood flow as manifested by decreased Glasgow Coma Scale.

- Establish and maintain airway, breathing, and circulation.
 - Assess the neurologic status atleast every hourly initially to detect changes indicative of worsening or improving condition.
 - Administer mannitol (Osmitol), an osmotic diuretic
- Maintain balanced fluids and electrolytes. Watch for increased or decreased serum sodium due to the following conditions that may occur with increased ICP.
- Maintain normothermia and treat fever aggressively. Fever increases cerebral blood flow and cerebral blood volume; acute increases in ICP occur with fever spikes.

- Avoid positions or activities that may increase ICP. Keep head in alignment with shoulders; neck flexion or rotation increases ICP by impeding venous return. Keep head of bed elevated 30 degrees to reduce jugular venous pressure and decrease ICP.
- Record ICP readings every hour, and correlate with significant clinical events or treatments (suctioning, turning).
- Minimize suctioning, keep procedure less than 15 seconds, and, if ordered, instill lidocaine via endotracheal (ET) tube before suctioning. Coughing and suctioning are associated with increased intrathoracic pressure, which is associated with ICP spikes. Inject 5 to 10 mL of lidocaine into ET tube before suctioning to dampen the cough response.

2. Ineffective airway clearance related to inability to raise secretions as manifested by diminished breath sounds

- Position patient to prevent tongue from obstructing the airway, encourage drainage of respiratory secretions, and promote adequate exchange of oxygen and carbon dioxide.
- Keep the airway free from secretions with suctioning. In the absence of cough and swallowing reflexes, secretions rapidly accumulate in the posterior pharynx and upper trachea and can lead to respiratory complications (eg, aspiration).
 - Insert oral airway if tongue is paralyzed or is obstructing the airway. An obstructed airway increases ICP. This is considered a short-term measure.
 - Prepare for insertion of cuffed endotracheal tube to protect the airway from aspiration and to allow efficient removal of tracheobronchial secretions.
 - See page 234 for technique of tracheal suctioning.
 - Use oxygen therapy as prescribed to deliver oxygenated blood to the CNS.
 - Before suctioning, pretreat with sedative, opioid, or endotracheal lidocaine, if indicated.

3. Impaired physical mobility related to generalized weakness as manifested by limited range of motion.

- Maintain functional position of all extremities.
 - a) Apply a trochanter roll from the crest of the ilium to the midthigh to prevent external rotation of the hip.

- b) Place a pillow in the axilla of the affected side when there is limited external rotation to keep arm away from chest and prevent adduction of the affected shoulder.
- c) Place the affected upper extremity slightly flexed on pillow supports with each joint positioned higher than the preceding one to prevent edema and resultant fibrosis; alternate elbow extension
- Apply splints and braces, as indicated, to support flaccid extremities or on spastic extremities to decrease stretch stimulation and reduce spasticity.
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- Assist with ambulation, as needed, with help of physical therapy as indicated.

4. Impaired verbal communication related to residual aphasia as manifested by inability to speak.

- Speak slowly, using visual cues and gestures; be consistent, and repeat as necessary.
- Speak directly to the patient while facing him.
- Give plenty of time for response, and reinforce attempts as well as correct responses.
- Minimize distractions.
- Use alternative methods of communication other than verbal, such as written words, gestures, or pictures.

5. Impaired bowel elimination related to impaired defecation reflex as manifested by constipation.

- Auscultate for bowel sounds; palpate lower abdomen for distention.
- Observe for constipation due to immobility and lack of dietary fiber. Stool softener or laxative, scheduled or as needed, may be prescribed to promote bowel elimination.
- Monitor for diarrhea resulting from infection, antibiotics, enteric feedings, hyperosmolar fluids, and fecal impaction.
 - Perform a rectal examination if fecal impaction is suspected.
 - Use fecal collection bags, and provide meticulous skin care if patient has fecal incontinence

6. Risk for Impaired Skin Integrity related to immobility or restlessness

- Keep the skin clean, dry, well-lubricated, and free from pressure because comatose patients are susceptible to the formation of pressure ulcers.
- Turn the patient from side to side on a regular schedule to relieve pressure areas and help clear lungs by mobilizing secretions; turning also provides kinesthetic (sensation of movement), proprioceptive (awareness of position), and vestibular (equilibrium) stimulation.
- Reposition carefully after turning to prevent ischemia and shearing over pressure areas.
- Position extremities in functional position, and monitor skin underneath splints/orthoses to prevent skin breakdown and pressure neuropathies.
- Perform range-of-motion (ROM) exercises of extremities at least four times daily; contracture deformities develop early in unconscious patients.

10. Patient Education and Health Maintenance

- Teach the patient and family to adapt home environment for safety and ease of use.
- Instruct the patient of the need for rest periods throughout day.
- Reassure the family that it is common for poststroke patients to experience emotional lability and depression; treatment can be given.
- Encourage consistency in the environment without distraction.
- Assist the family to obtain self-help aids for the patient.
- Instruct the family in management of aphasia.
- Educate those at risk for stroke about lifestyle modifications and medication therapy that can lower risk.
- Refer the patient and family for more information and support to such agencies as The National Stroke Association,

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