Cerebral Vascular Accident (CVA),

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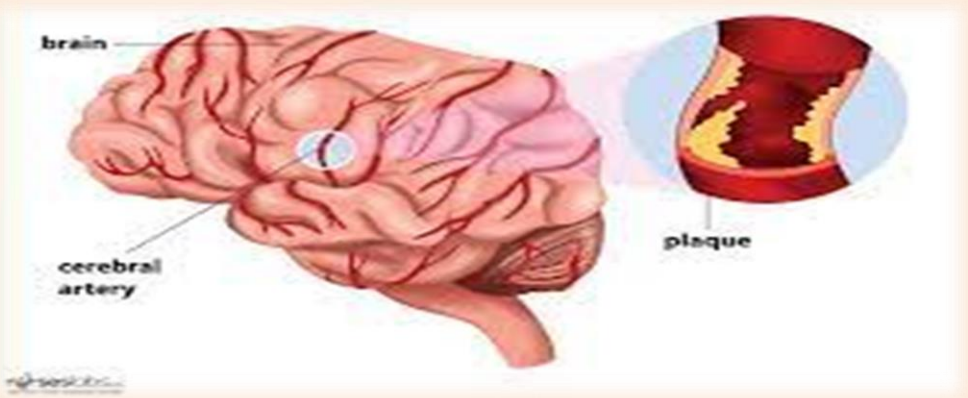
Introduction

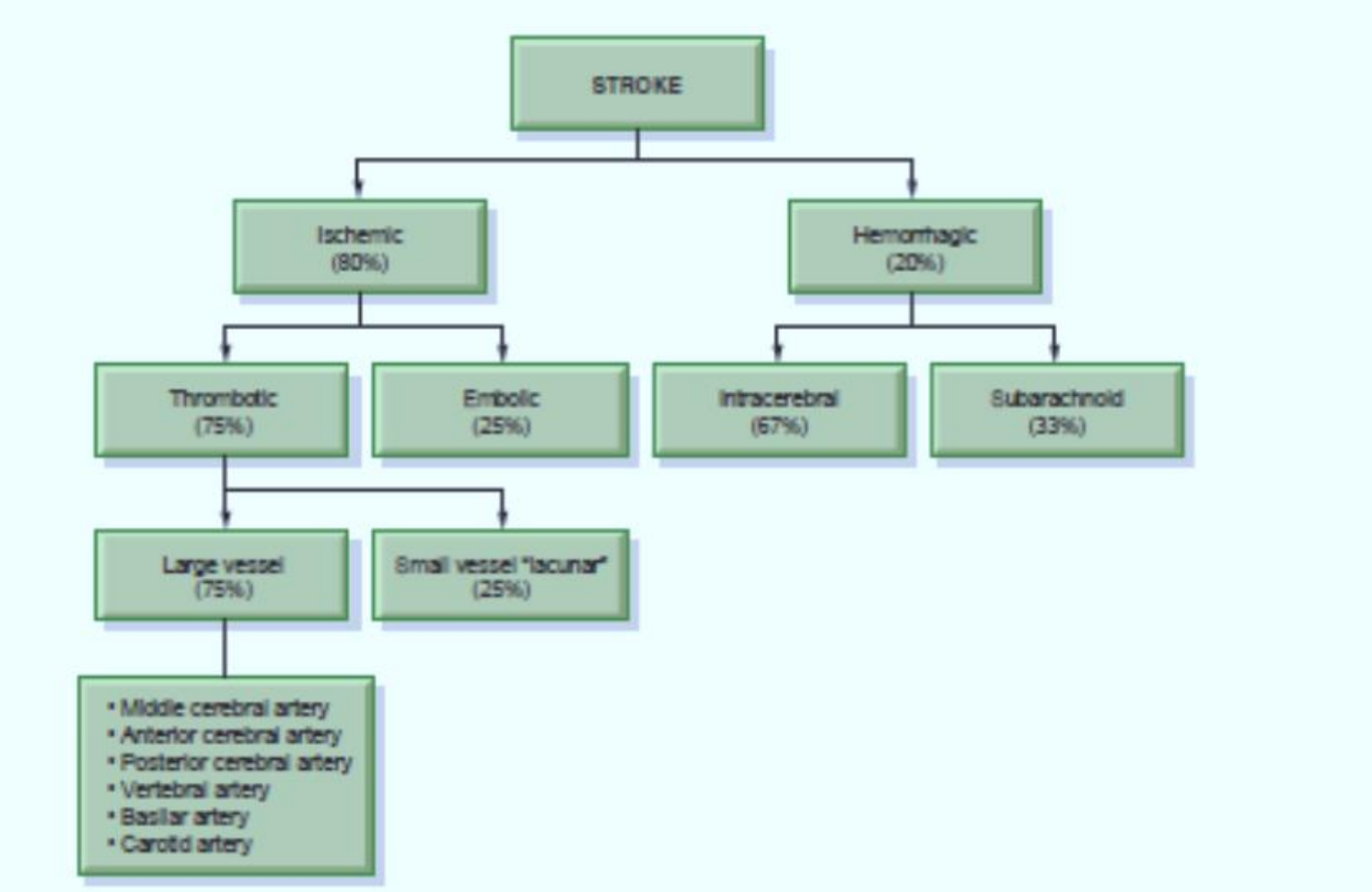
- Stroke, also referred to as cerebral vascular accident (CVA), or brain attack, is a decrease in blood flow and oxygen to brain cells with the subsequent loss of the brain due to a thrombus or embolus), which accounts for 80% of strokes; and hemorrhagic (loss of blood flow due to rupture of cerebral vessels), which accounts for 20%.

Transient ischemic attacks (TIAs)

- Defined as transient episodes of neurological dysfunction caused by focal brain, spinal cord or retinal ischemia without acute infarction. Causes are similar to those of ischemic stroke, particularly atherosclerotic thromboembolism related to the cerebral circulation and cardio embolism. Diagnosis of the cause of TIAs with appropriate management is important in order to prevent a potentially devastating stroke.

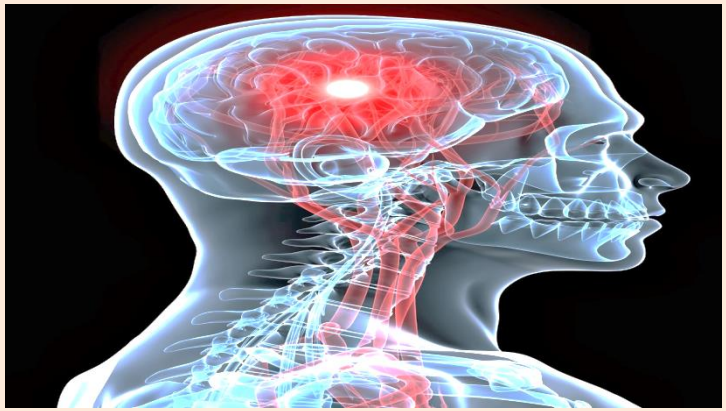


Pathophysiology



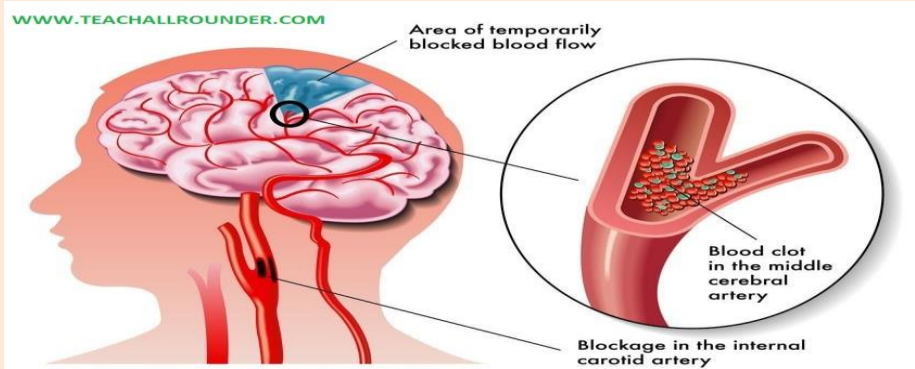
Ischemic strokes

- Ischemic strokes are subdivided into five different types based on the cause: large artery thrombotic strokes (20%), small penetrating artery thrombotic strokes (25%), cardiogenic embolic strokes (20%), cryptogenic strokes (30%), and other (5%).
- **Large artery thrombotic strokes**: are caused by atherosclerotic plaques in the large blood vessels of the brain. Thrombus formation and occlusion at the site of the atherosclerosis result in ischemia and infarction (deprivation of blood supply).



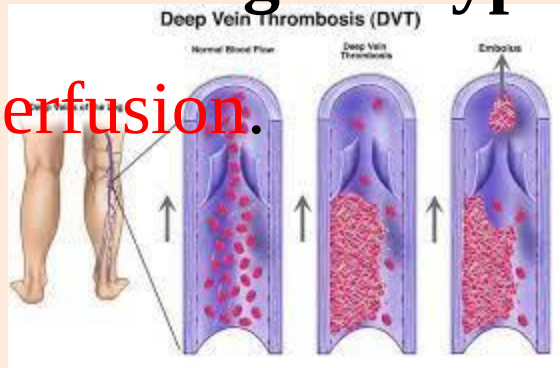
Ischemic strokes

- **Small penetrating artery thrombotic strokes** affect one or more vessels and are the most common type of ischemic stroke. Small artery thrombotic strokes are also called lacunar strokes because of the cavity that is created after the death of infarcted brain tissue.
- **Cardiogenic embolic strokes:** are associated with cardiac dysrhythmias, usually atrial fibrillation. Embolic strokes can also be associated with valvular heart disease and thrombi in the left ventricle. Emboli originate from the heart and circulate to the cerebral vasculature, most commonly the left middle cerebral artery, resulting in a stroke.

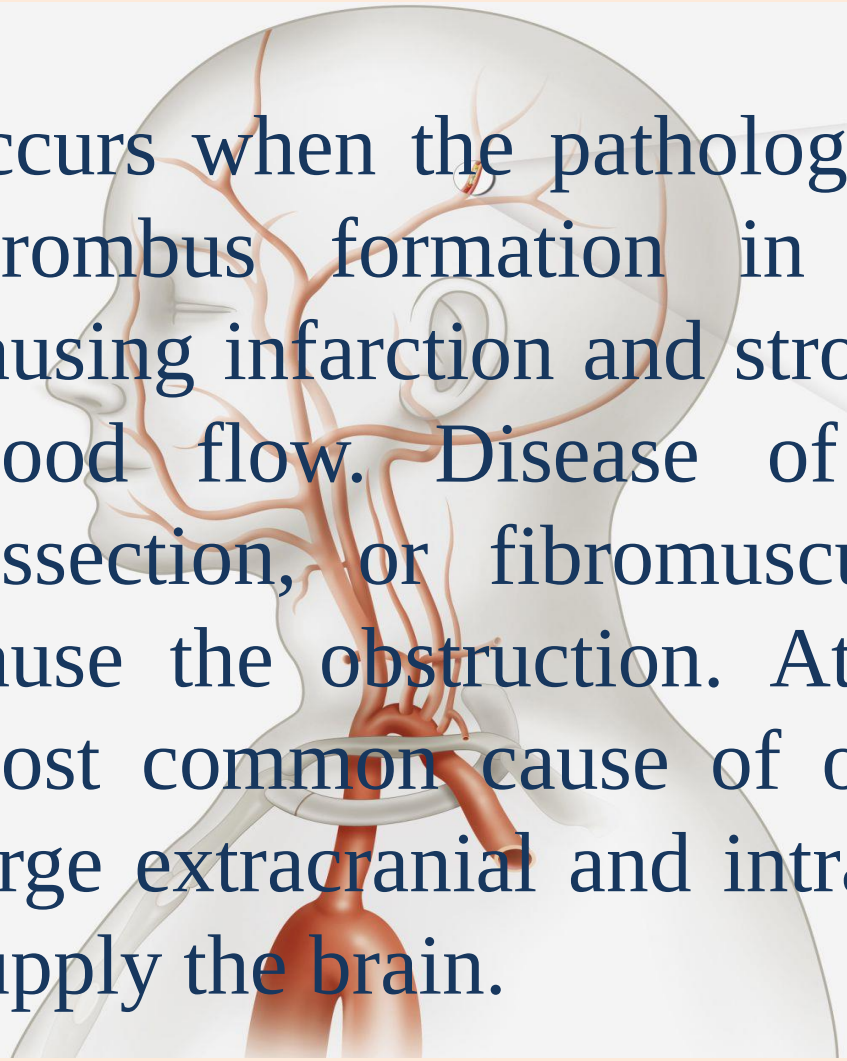


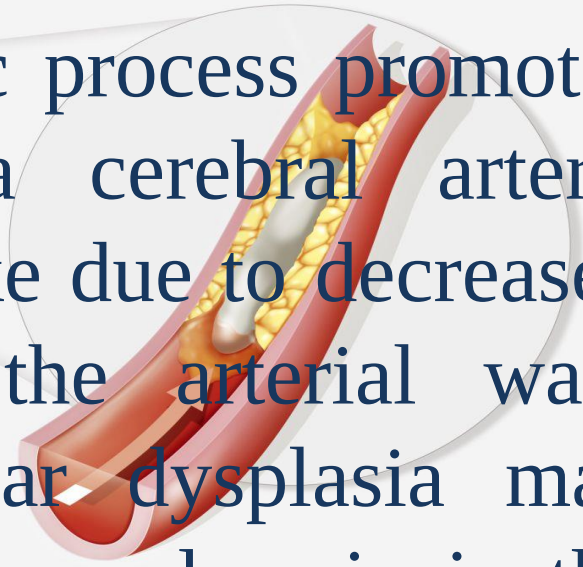
Ischemic strokes

- **The last two classifications** of ischemic strokes are cryptogenic strokes, which have no known cause, and strokes from other causes, such as illicit drug use, coagulopathies, migraine, and spontaneous dissection of the carotid or vertebral arteries.
- **Ischemic stroke includes the following subtypes**: thrombotic , embolic, and Hypoperfusion.



1.Thrombotic stroke





- occurs when the pathologic process promotes thrombus formation in a cerebral artery, causing infarction and stroke due to decreased blood flow. Disease of the arterial wall, dissection, or fibromuscular dysplasia may cause the obstruction. Atherosclerosis is the most common cause of occlusion within the large extracranial and intracranial arteries that supply the brain.

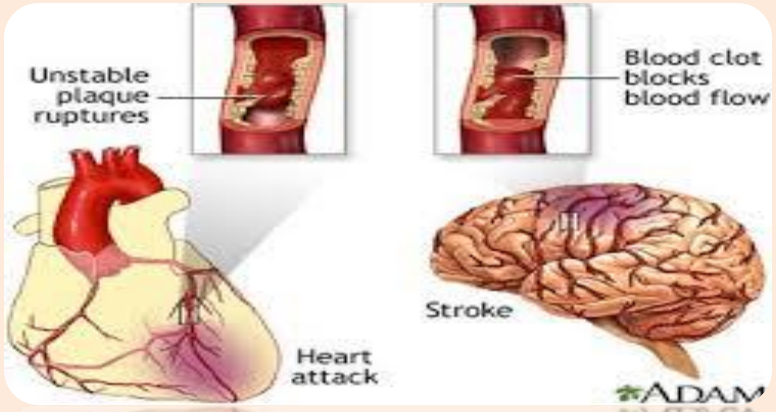
2. An embolic stroke

- An embolic stroke is caused by particles that arise from another part of the body, resulting in blockage of arterial blood flow to a particular area of the brain. Embolic strokes commonly originate from a source in the heart, aorta, or large vessels. The onset of symptoms is abrupt and maximal, because the embolus suddenly blocks the involved area of the brain.
- Embolic strokes are divided into four categories related to the cause:

- ✓ Known source is cardiac
- ✓ An arterial source
- ✓ Possible cardiac or aortic source based on transthoracic and/or transesophageal echocardiographic findings
- ✓ Unknown source in which these tests are negative or inconclusive.

3.Systemic Hypoperfusion

- **Systemic Hypoperfusion** is a general circulatory problem that can occur in the brain and possibly other organs. Decreased perfusion can be due to cardiac arrest, arrhythmia, pulmonary embolism, pericardial effusion, or bleeding. Hypoxemia may further decrease the amount of oxygen carried to the brain.



Clinical characteristics of embolic and thrombotic strokes

	Embolism	Thrombosis
Predisposing factors	Valvular heart disease	Atherosclerosis
	Endocarditis	Diabetes
	Myocardial infarction	Hypertension
	Atrial fibrillation	Arteritis
History of prior TIA	Uncommon	Common
Onset of symptoms	Rapid onset	Progression over hours

Clinical Manifestations

- An ischemic stroke can cause a wide variety of neurologic deficits, depending on the location of the lesion (which vessels are obstructed), the size of the area of inadequate perfusion, and the amount of collateral (secondary or accessory) blood flow.
- Numbness or weakness of the face, arm, or leg, especially on one side of the body.
- Confusion or change in mental status.
- Trouble speaking or understanding speech.
- Visual disturbances.
- Difficulty walking, dizziness, or loss of balance or coordination.
- Sudden severe headache.

Table 62-2 NEUROLOGIC DEFICITS OF STROKE: MANIFESTATIONS AND NURSING IMPLICATIONS

Neurologic Deficit	Manifestation	Nursing Implications/Patient Teaching Applications
Visual Field Deficits		
Homonymous hemianopsia (loss of half of the visual field)	• Unaware of persons or objects on side of visual loss • Neglect of one side of the body • Difficulty judging distances	Place objects within intact field of vision. Approach the patient from side of intact field of vision. Instruct/remind the patient to turn head in the direction of visual loss to compensate for loss of visual field. Encourage the use of eyeglasses if available. When teaching the patient, do so within patient's intact visual field.
Loss of peripheral vision	• Difficulty seeing at night • Unaware of objects or the borders of objects	Place objects in center of patient's intact visual field. Encourage the use of a cane or other object to identify objects in the periphery of the visual field. Driving ability will need to be evaluated.
Diplopia	• Double vision	Explain to the patient the location of an object when placing it near the patient. Consistently place patient care items in the same location.
Motor Deficits		
Hemiparesis	• Weakness of the face, arm, and leg on the same side (due to a lesion in the opposite hemisphere)	Place objects within the patient's reach on the nonaffected side. Instruct the patient to exercise and increase the strength on the unaffected side.
Hemiplegia	• Paralysis of the face, arm, and leg on the same side (due to a lesion in the opposite hemisphere)	Encourage the patient to provide range-of-motion exercises to the affected side. Provide immobilization as needed to the affected side. Maintain body alignment in functional position. Exercise unaffected limb to increase mobility, strength, and use.
Ataxia	• Staggering, unsteady gait • Unable to keep feet together; needs a broad base to stand	Support patient during the initial ambulation phase. Provide supportive device for ambulation (walker, cane). Instruct the patient not to walk without assistance or supportive device.
Dysarthria	• Difficulty in forming words	Provide the patient with alternative methods of communicating. Allow the patient sufficient time to respond to verbal communication. Support patient and family to alleviate frustration related to difficulty in communicating.
Dysphagia	• Difficulty in swallowing	Test the patient's pharyngeal reflexes before offering food or fluids. Assist the patient with meals. Place food on the unaffected side of the mouth. Allow ample time to eat.
Sensory Deficits		
Paresthesia (occurs on the side opposite the lesion)	• Numbness and tingling of extremity • Difficulty with proprioception	Instruct patient that sensation may be altered. Provide range of motion to affected areas and apply corrective devices as needed.
Verbal Deficits		
Expressive aphasia	• Unable to form words that are understandable; may be able to speak in single-word responses	Encourage patient to repeat sounds of the alphabet. Explore the patient's ability to write as an alternative means of communication.
Receptive aphasia	• Unable to comprehend the spoken word; can speak but may not make sense	Speak slowly and clearly to assist the patient in forming the sounds. Explore the patient's ability to read as an alternative means of communication.
Global (mixed) aphasia	• Combination of both receptive and expressive aphasia	Speak clearly and in simple sentences; use gestures or pictures when able. Establish alternative means of communication.
Cognitive Deficits		
	• Short- and long-term memory loss • Decreased attention span • Impaired ability to concentrate • Poor abstract reasoning • Altered judgment	Reorient patient to time, place, and situation frequently. Use verbal and auditory cues to orient patient. Provide familiar objects (family photographs, favorite objects). Use noncomplicated language. Match visual tasks with a verbal cue; holding a toothbrush, simulate brushing of teeth while saying, "I would like you to brush your teeth now." Minimize distracting noises and views when teaching the patient. Repeat and reinforce instructions frequently.
Emotional Deficits		
	• Loss of self-control • Emotional lability	Support patient during uncontrollable outbursts. Discuss with the patient and family that the outbursts are due to the disease process.
	• Decreased tolerance to stressful situations • Depression • Withdrawal • Fear, hostility, and anger • Feelings of isolation	Encourage patient to participate in group activity. Provide stimulation for the patient. Control stressful situations, if possible. Provide a safe environment. Encourage patient to express feelings and frustrations related to disease process.

Risk factors for transient ischemic attack/stroke

This particularly applies to cerebral ischemic events, both TIAs and strokes.

A. Non-modifiable risk factors for stroke include the following:

1. Increasing age: the stroke rate more than doubles for each 10 years above age 55 years. The risk of stroke increases by 9% every year for men and 10% for women.

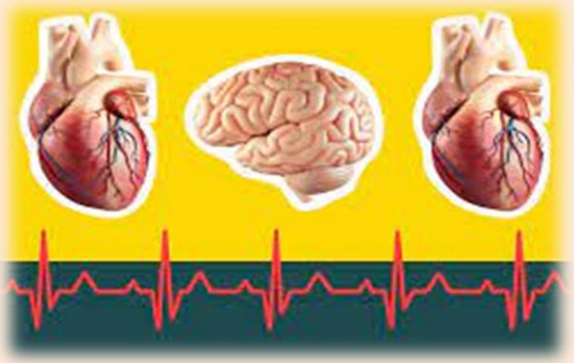
2. Gender: stroke is slightly more common in males than in females. Men are at higher risk of ischemic strokes in the young and middle-aged groups; however, women have a higher ischemic stroke risk in their lifetime and tend to have worse mortality and morbidity outcomes.

3. Ethnicity is another significant risk factor. Blacks have a higher risk of ischemic stroke risk, especially in the young middle-aged group (between 45 and 54 years of age) with a black-to-white incidence ratio of 4.02.

4. A family history of strokes.

Risk factors for transient ischemic attack/stroke

B. Modifiable risk factors for stroke include the following:



1. Hypertension
2. Physical activity
3. Obesity
4. Diet and nutrition
5. Diabetes mellitus
6. Dyslipidemia,
7. Smoking,
8. Drug use
9. Atrial fibrillation (AF)
10. Congestive heart failure
11. Valvular disease
12. Chronic obstructive pulmonary disease (COPD)
13. .Peripheral vascular disease.

Diagnosis

Patient History and Assessment

- The National Institutes of Health Stroke Scale (NIHSS) may be used in conjunction with the neurologic assessment to assign a score indicating the severity of the stroke. The NIH Stroke Scale examines visual, motor, sensory, cerebellar, inattention, language, and level of consciousness (LOC) functioning. A maximum score of 42 signifies a severe stroke, whereas a score of 0 indicates a normal exam.

Table 11-2 National Institutes of Health Stroke Scale

Category	Description	Score	
1a	Level of consciousness (LOC) **A 3 is scored only if the patient makes no movement (other than reflexive) in response to noxious stimulation.**	Alert	0
		Drowsy	1
		Stuporous	2
		Coma	3
1b	LOC questions (month, age) **The answer must be correct—there is no partial credit for being close.**	Answers both correctly	0
		Answers 1 correctly	1
		Incorrect on both	2
1c	LOC commands (open–close eyes, grip and release hand) **Substitute another one step command if the hands cannot be used.**	Obeys both correctly	0
		Obeys 1 correctly	1
		Incorrect on both	2
2	Best gaze (follow finger) **Only horizontal eye movements will be tested.**	Normal	0
		Partial gaze palsy	1
		Forced deviation	2
3	Best visual (visual fields) **Visual fields (upper and lower) quadrants) are tested by confrontation, using finger counting or visual threat.**	No visual loss	0
		Partial hemianopsia	1
		Complete hemianopsia	2
		Bilateral hemianopsia	3
4	Facial palsy (show teeth, raise brows, squeeze eyes shut) **Score symmetry of grimace in response to noxious stimuli in the poorly responsive/non-comprehending patient.**	Normal	0
		Minor	1
		Partial	2
		Complete	3
5	Motor arm left* (raise 90°, hold 10 seconds) **The limb is placed in the appropriate position; extend the arms (palms down) 90 degrees (if sitting) or 45 degrees (if supine). Each limb is tested in turn beginning with the non-paretic are.**	No drift	0
		Drift	1
		Cannot resist gravity	2
		No effort against gravity	3
		No movement	4
6	Motor leg left* (raise 30°, hold 5 seconds) **The limb is placed in the appropriate position: hold the leg at 30 degrees (always tested supine). Each leg is tested in turn beginning with the non-paretic leg.**	No drift	0
		Drift	1
		Cannot resist gravity	2
		No effort against gravity	3
		No movement	4
7	Limb ataxia (finger-nose, heel-shin) **Test with eyes open. In case of visual defect, test in intact visual field.**	Absent	0
		Present in 1 limb	1
		Present in 2 limbs	2
8	Sensory (pinprick to face, arm, leg) **Only sensory loss attributed to stroke is scored as abnormal.**	Normal	0
		Partial loss	1
		Severe loss	2
9	Best language** (name items, describe pictures) **For this scale item, the patient is asked to describe what is happening in the picture provided, to name the items on the naming sheet and read sentences.**	No aphasia	0
		Mild to moderate aphasia	1
		Severe aphasia	2
		Mute	3
10	Dysarthria (speech clarity to "mama, baseball, huckleberry, tip-top, fifty-fifty") **As adequate sample of speech must be obtained by asking patient to read or repeat words from the list provided.**	Normal articulation	0
		Mild to moderate dysarthria	1
		Near to unintelligible or worse	2
11	Extinction/neglect (double simultaneous testing) **Sufficient information to identify neglect may occur during prior testing.**	No neglect	0
		Partial neglect	1
		Complete neglect	2
	Total	—	0–42

* For limbs with amputation, joint fusion, etc., score 9 and explain.
** For intubation or other physical barriers to speech, score 9 and explain. Do not add 9 to the total score.

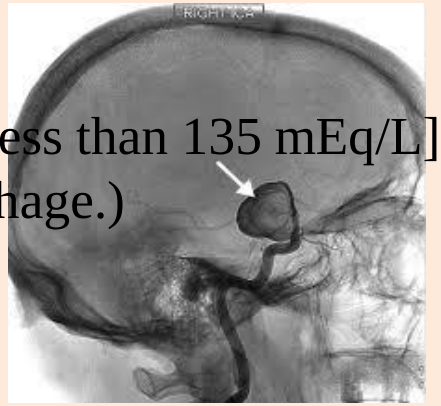
Table 62-1 COMPARISON OF MAJOR TYPES OF STROKE

Item	Ischemic	Hemorrhagic
Causes	Large artery thrombosis Small penetrating artery thrombosis Cardiogenic embolic Cryptogenic (no known cause) Other	Intracerebral hemorrhage Subarachnoid hemorrhage Cerebral aneurysm Arteriovenous malformation
Main presenting symptoms	Numbness or weakness of the face, arm, or leg, especially on one side of the body	"Exploding headache" Decreased level of consciousness
Functional recovery	Usually plateaus at 6 months	Slower, usually plateaus at about 18 months

Diagnostic Criteria

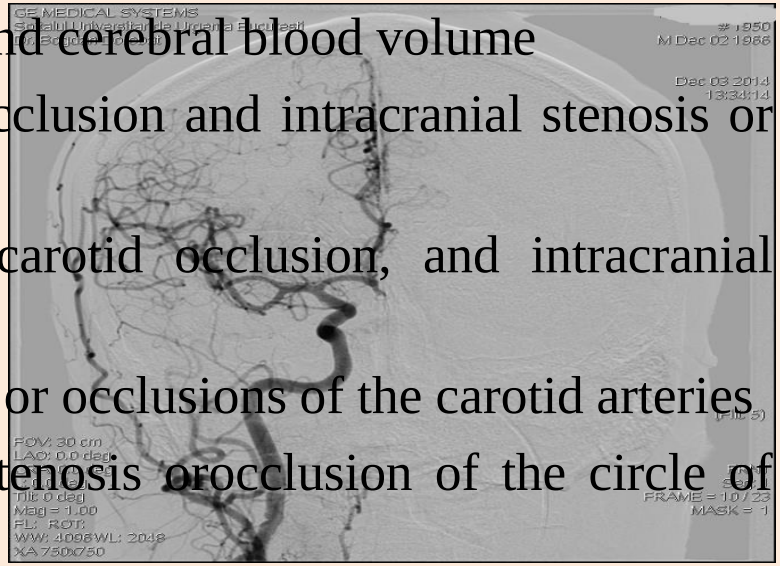
All patients with a suspected stroke should have the following tests as soon as possible following admission to the emergency department (ED):

- Non contrast brain CT or brain MRI (see neuroimaging).
- Serum glucose (Hypoglycemia can present with neurological deficits mimicking stroke, and severe hypoglycemia can cause neuronal damage. Hyperglycemia is common in patients with acute ischemic stroke and is associated with a poorer prognosis).
- Prothrombin time (PT) and international normalized ratio (INR)—anticoagulant use is a common cause of intracerebral hemorrhage.
- Electrocardiogram (ECG) used to diagnose any cardiac dysrhythmias or (MI). Complete blood count (CBC) including platelets (Platelet count is used to rule out thrombotic thrombocytopenic purpura [TPP]).
- Cardiac enzymes and troponin.
- Electrolytes, urea nitrogen, creatinine (Hyponatremia [Na less than 135 mEq/L] is found in 10% to 40% of patients with subarachnoid hemorrhage.)
- Partial thromboplastin time (PTT).
- Oxygen saturation.



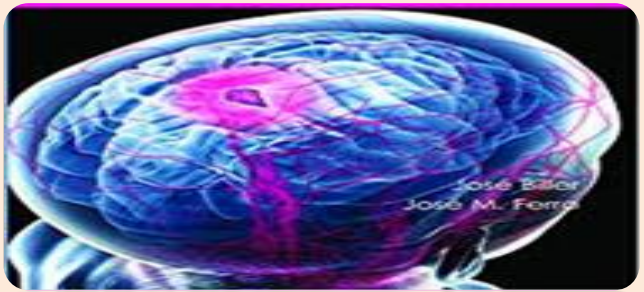
Additional Diagnostic Testing

- MRI with diffusion and perfusion images: detects ischemia, altered CBF, and cerebral blood volume
- Arteriography: detects shallow ulcerated plaques, thrombus, aneurysms, dissections, multiple lesions, AVMs, and collateral blood flow
- MRA images: detects carotid occlusion, intracranial stenosis or occlusions
- CT perfusion images: detects altered CBF and cerebral blood volume
- CT angiography images: detects carotid occlusion and intracranial stenosis or occlusions
- Digital subtraction angiography: detects carotid occlusion, and intracranial stenosis or occlusions
- Doppler carotid ultrasound: detects stenosis or occlusions of the carotid arteries
- Transcranial Doppler ultrasound: detects stenosis orocclusion of the circle of Willis, vertebral arteries, and basilar artery
- Transthoracic echocardiogram: detects cardio embolic abnormalities
- Trans esophageal echocardiogram: detects cardio embolic abnormalities; more sensitive than transthoracic echocardiogram.



Early Management

- The management of an ischemic stroke has four primary goals: restoration of CBF (reperfusion), prevention of recurrent thrombosis, neuroprotection, and supportive care. The timing of each element of clinical management should be implemented in a decisive manner. Two emergency treatments are available for stroke management: **thrombolytic therapy** and **interventional radiology.**



Early Management

1. **Thrombolytic agents** (eg, t-PA) dissolve clots and permit reperfusion of the brain tissue. A major risk of this therapy is intra cerebral hemorrhage. If the patient is a candidate for thrombolytic therapy, the systolic blood pressure is maintained at less than 185 mm Hg to the lower risk of hemorrhage. When t-PA is given, 10% of the total dose (0.9 mg/kg, not to exceed 90 mg) is administered as an IV bolus over 1 to 2 minutes, with the remainder infused over 60 minutes. No other antithrombotic or antiplatelet therapy is given for the next 24 hours. An example of a standard protocol would be to obtain vital signs every 15 minutes for the first 2 hours, every 30 minutes for the next 6 hours, then every hour until 24 hours after treatment.

Eligibility Criteria fort-PA Administration

- Age 18 years or older
- Clinical diagnosis of ischemic stroke
- Time of onset of stroke known and is 3 hours or less
- Systolic blood pressure ≤185 mm Hg; diastolic ≤110 mm Hg
- Not a minor stroke or rapidly resolving stroke
- No seizure at onset of stroke
- Not taking warfarin (Coumadin)
- Prothrombin time ≤15 seconds or INR ≤1.7
- Not receiving heparin during the past 48 hours with elevated partial thromboplastin time
- Platelet count ≥100,000/mm^3
- No prior intracranial hemorrhage, neoplasm, arteriovenous malformation, or aneurysm
- No major surgical procedures within 14 days
- No stroke, serious head injury, or intracranial surgery within 3 months
- No gastrointestinal or urinary bleeding within 21 days

Early Management

2. **Interventional radiology techniques:** include intraarterial thrombolysis (ie, the direct administration of t-PA to the site of the clot via the femoral artery) and the use of mechanical clot removal devices (eg, the mechanical embolus removal for cerebral ischemia.

- Intra-arterial thrombolysis.
- Mechanical clot removal.
- Anticoagulation therapy. Antithrombotic and antiplatelet agents (eg, warfarin) may be administered to prevent future thrombotic or embolic events.
- Control of hypertension.
- Control of ICP.
- Control of blood glucose level.

A collaborative care

1. Adequate airway is maintained. Oxygen saturation (SpO2) is maintained within normal limits.
   - Monitor breath sounds every shift.
   - Check oxygen saturation every shift.
   - Instruct to cough and deep-breathe and use incentive spirometry every 2 h while awake.
   - Assist with removal of airway secretions as needed.
2. Monitor vital signs closely. Manage blood pressure carefully; avoid sharp drops in blood pressure that could result in hypotension and cause an ischemic event secondary to hypotension.
3. Treat dysrhythmias to maintain adequate perfusion pressure and reduce chance of neurological impairment.
4. Positioning the patient on his side may help to open the airway. However, intubation may be required in some patients to reestablish adequate ventilation.
5. The nurse should monitor all stroke patients' oxygen saturations. Oxygen (O2) therapy is indicated when an arterial blood gas (ABG) or O2 saturation less than 92% (or per medical provider) suggests hypoxia. It is prudent to use the least amount of oxygen required to maintain an adequate O2 saturation.

A collaborative care

6.Careful examination of the Patient: Emphasis should be on the neurologic examination to localize the area of deficits and on other areas of the physical examination to rule in or rule out secondary causes for the ischemic syndrome.

7. Laboratory Evaluation:

8. Patients with CVA can be at risk of aspiration. Therefore, NPO order should be immediately placed, until dysphagia evaluation performed.

9. Blood Pressure Control: Therapy to maintain systemic blood pressure at approximately 150/100 mm Hg is advocated. Caution must be exercised, as severely elevated systolic blood pressure increases risk of recurrence of CVA, and reductions in blood pressure may worsen the clinical condition by producing ischemia in poorly perfused regions of the central nervous system (CNS).

10. Any catheters that are needed (e.g., urinary catheters, nasogastric tubes) are ideally placed before the administration of rt-PA to reduce the risk for bleeding. After the administration of rt-PA, invasive procedures may be performed; however, the risk of bleeding is higher.

A collaborative care

11. Anticoagulants, such as heparin or warfarin, and antiplatelet aggregates, such as aspirin, are withheld for 24 hours after administration of rt-PA to prevent bleeding complications.
12. Neurological assessment (LOC, language, motor and sensory testing, pupillary response) and vital signs are performed every15 minutes for the first 2 hours, every30 minutes for the next 6 hours, and every hour for 6 hours. Accurate intake and output are maintained.
13 .Oxygen is given to maintain the SpO2 at 95%. Pneumonia is a common complication after stroke; therefore frequent patient repositioning and nebulizer therapy may be indicated.
14. Maintaining adequate fluid balance is crucial to ensure proper hydration. Monitor intake and output.
15. Aspiration precautions are implemented including elevating the head of the bed and maintaining nothing-by-mouth status until a swallow screening or formal study rules out dysphagia.