

# **Nervous System: Disorders and Therapeutic Management**

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# Increased ICP

- ◆ Nursing interventions
- ◆ Adequate oxygenation and ventilation
- ◆ Management of CO<sub>2</sub>
- ◆ Diuretics
- ◆ Fluid administration
- ◆ Blood pressure management
- ◆ Reducing metabolic demand
- ◆ Surgical interventions

# TBI (traumatic brain injury )

- ◆ Leading cause of trauma –related deaths
- ◆ Closed brain injury or Open brain injury
- ◆ Tissue damage ,Bleeding and Swelling
- ◆ Severity depends on ;Duration of loss of consciousness ,Initial score on Glasgow Coma Scale (GSC) and Length of post-traumatic amnesia

# Scalp lacerations

- ◆ There are a lot of blood vessels in the scalp. Because of this, a lot of bleeding is common with scalp cuts
- ◆ Closure of the laceration is preferred in most cases



# Skull fractures

- ◆ A skull fracture is a break in the skull bone.
- ◆ There are 3 major types of skull fractures
  - 1- Linear skull fractures
  - 2-Depressed skull fractures
  - 3-Basilar skull fracture.

# Linear skull fractures

- ◆ This is the most common type of skull fracture.
- ◆ There is a break in the bone, but it does not move the bone.
- ◆ These patients may be observed in the hospital for a brief amount of time, and can usually resume normal activities in a few days.
- ◆ Usually, no interventions are necessary.

# Depressed skull fractures

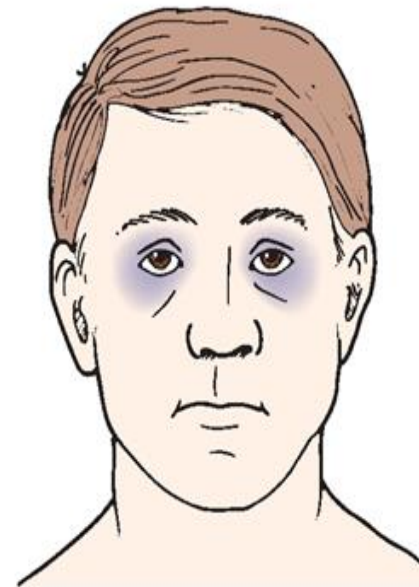
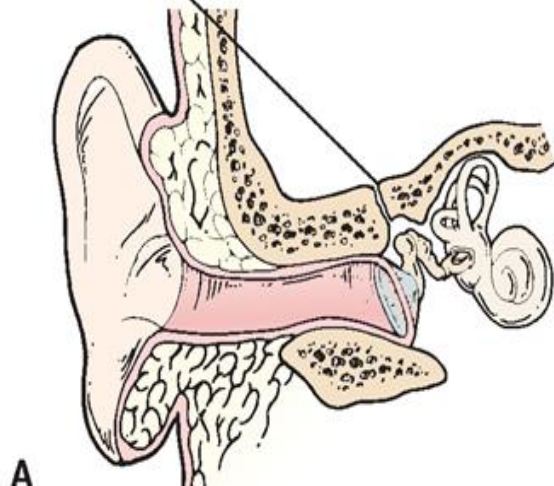
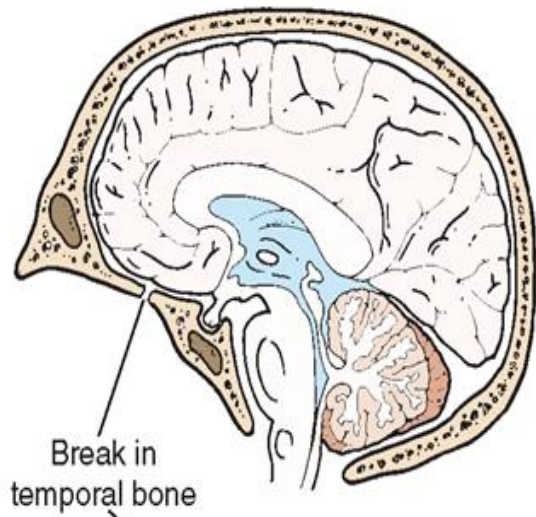
- ◆ This type of fracture may be seen with or without a cut in the scalp.
- ◆ In this fracture, part of the skull is actually sunken in from the trauma.
- ◆ This type of skull fracture may require surgical intervention, depending on the severity, to help correct the deformity.

# Basilar skull fracture

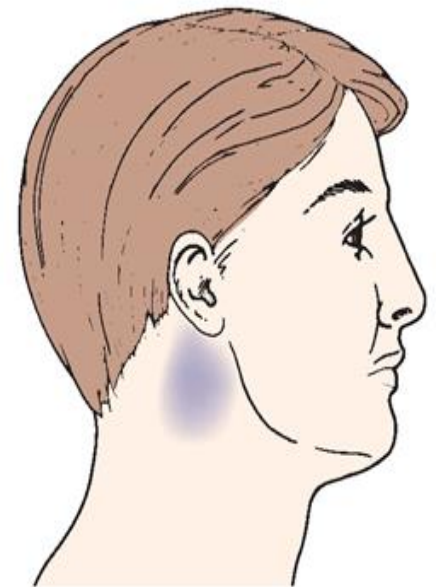
- ◆ This is the most serious type of skull fracture, and involves a break in the bone at the base of the skull.
- ◆ Patients with this type of fracture frequently have bruises around their eyes and a bruise behind their ear.
- ◆ They may also have clear fluid draining from their nose or ears due to a tear in part of the covering of the brain.



# Basilar skull fracture



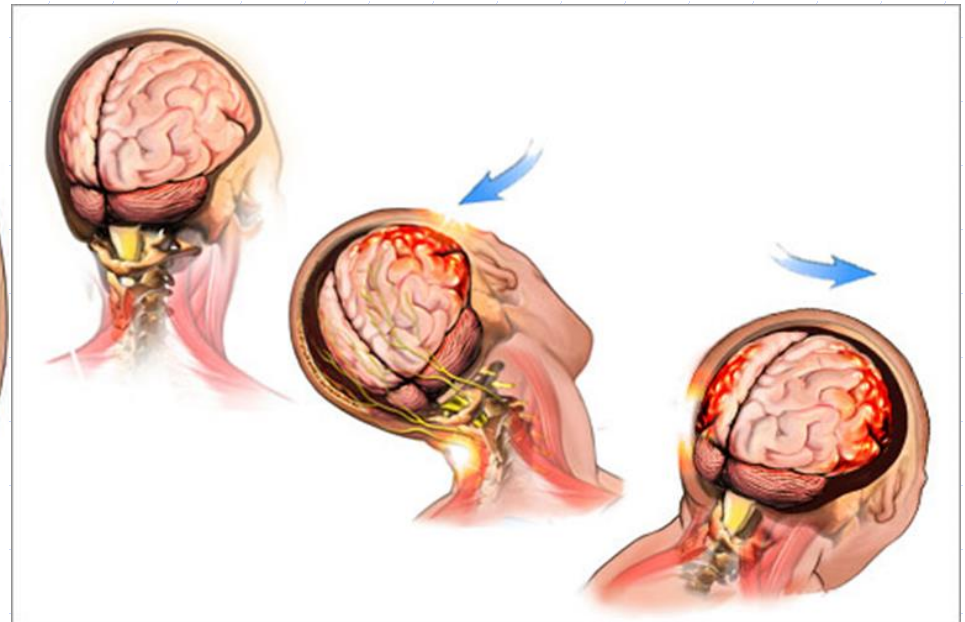
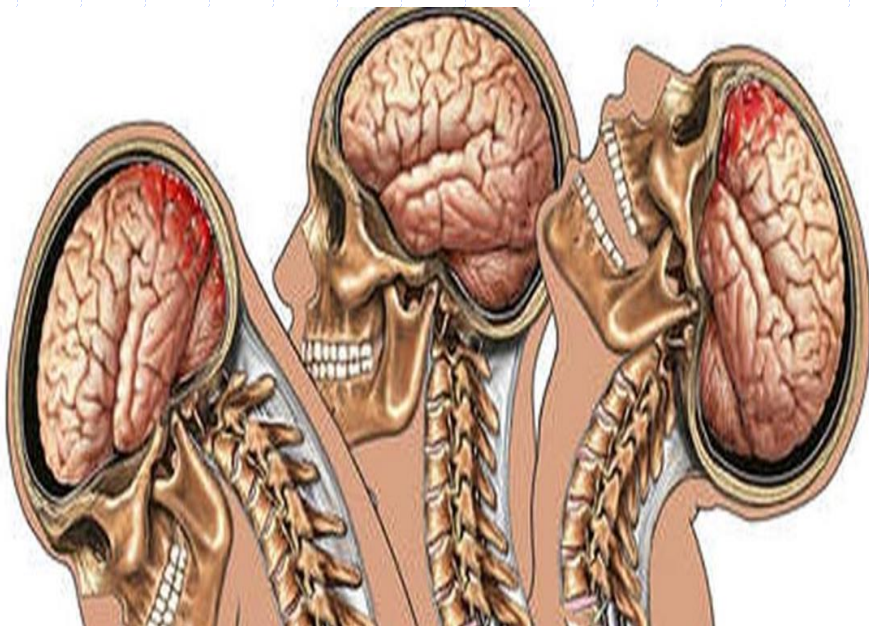
**B** Raccoon's eyes



**C** Battle's sign

# Concussion and contusion

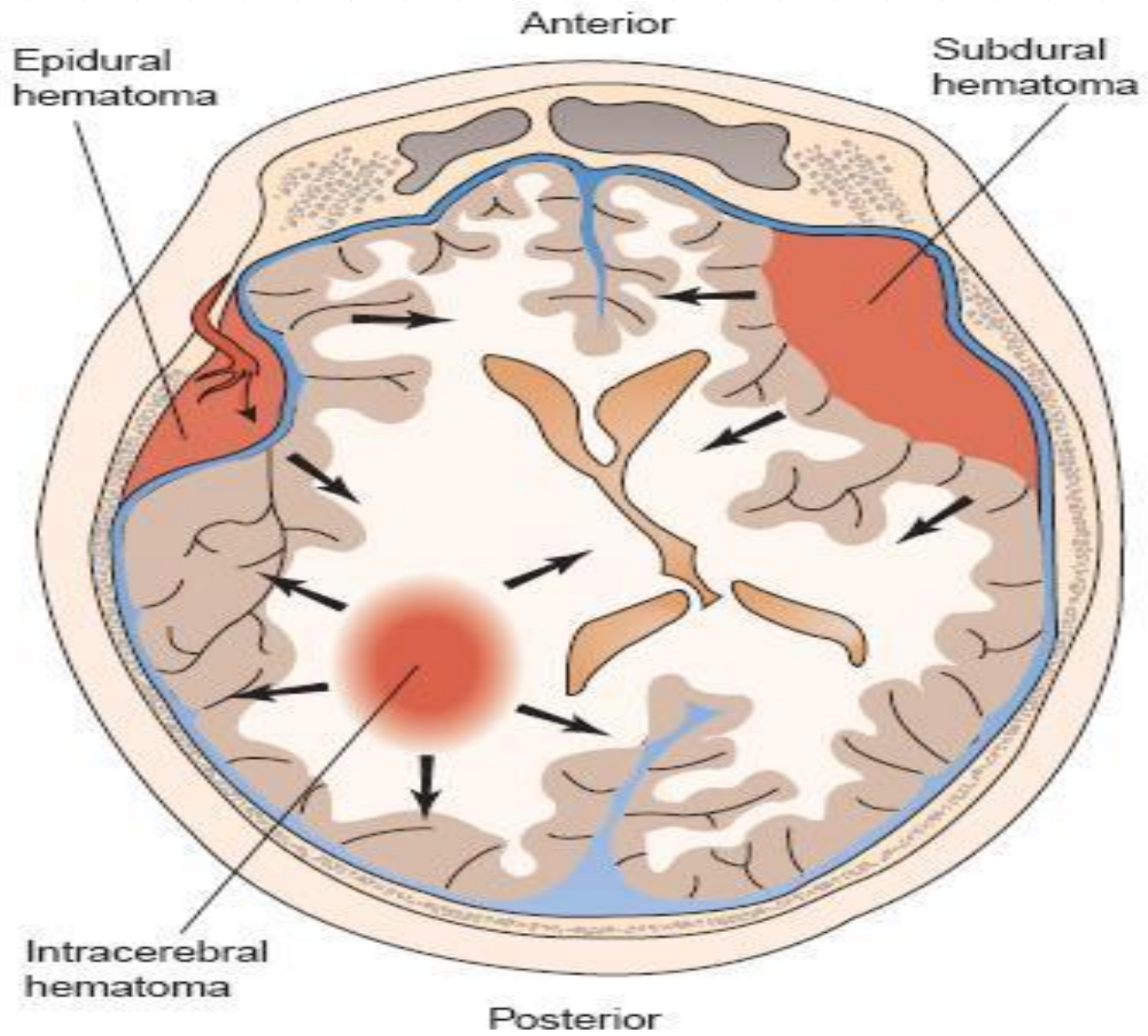
- ◆ A contusion is often caused by a strong impact to the head
- ◆ Concussion there is no physical damage to the brain.



# Intracranial Hematoma

- ◆ Collection of blood within the skull. It's most commonly caused by the rupture of a blood vessel within the brain or from trauma such as a car accident or fall
- ◆ There are three categories of hematoma subdural hematoma, epidural hematoma and intracerebral (intraparenchymal) hematoma.





The three types of subdural hematomas are:

- ◆ **Acute.** This most dangerous type is generally caused by a severe head injury, and signs and symptoms usually appear immediately.
- ◆ **Subacute.** Signs and symptoms take time to develop, sometimes days or weeks after your injury.
- ◆ **Chronic.** The result of less severe head injuries, this type of hematoma can cause slow bleeding, and symptoms can take weeks and even months to appear. You might not recall injuring your head.

# Coma

- ◆ Coma is the deepest state of unconsciousness whereby a patient cannot react with the surrounding environment.
- ◆ The patient cannot be wakened with outside physical or auditory stimulation.
- ◆ Coma is a symptom rather than a disease

# Acute Coma

- Levels of consciousness diminish in stages:
  - Confusion: can't think rapidly and clearly
  - Disorientation: begin to lose consciousness  
Time, place, person
  - Lethargy: spontaneous speech and movement limited
  - Obtundation: arousal (awakeness) is reduced
  - Stupor: deep sleep or unresponsiveness  
Open eyes to vigorous or repeated stimuli
  - Coma: respond to noxious stimuli only  
Light (purposeful), full coma (non-purposeful), deep coma (no response)

# Causes of coma

- ◆ The two main causes of coma are **structural** (ischemic stroke ,ICH ,trauma ,brain tumors ) and **metabolic** (medical ) drug over dose ,infectious disease ,endocrine disorders ,poisoning )
- ◆ Assessment and diagnosis ( LOC ,medical history ,neurological examination ...etc )



# Treatment

Coma is a medical emergency, and attention must first be directed to:

- maintaining the patient's respiration and circulation, using intubation and ventilation
- administration of intravenous fluids blood and other supportive care as needed.
- Eye care is important for comatose pt. to prevent corneal ulceration by instilling saline drops every 2 hours and polyethylene film ( eye cover ) is taped over the eye to keep the eye moist

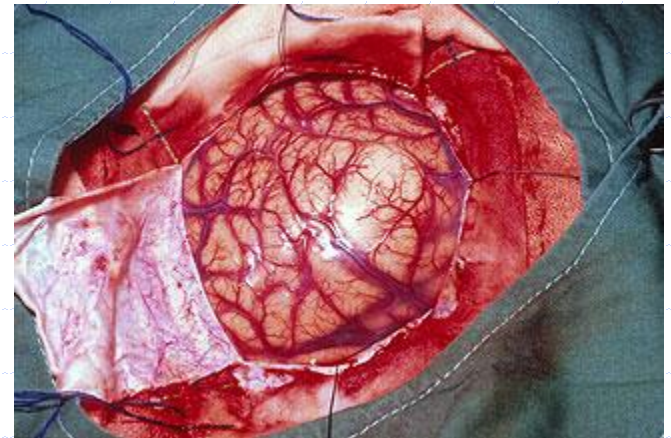
- ◆ preventing infections such as pneumonias, bed sores (decubitus ulcers and providing a balanced nutrition).
- ◆ The nursing staff will move the patient every 2 hrs
- ◆ The goal is to move the patient as much as possible to try to avoid bedsores, atelectasis and pneumonia

- ◆ Pneumonia can occur from the persons inability to swallow leading to aspiration, lack of gag reflex or from feeding tube, (aspiration pneumonia).
- ◆ Physical therapy may also be used to prevent contractures and orthopedic deformities that would limit recovery for those patients who emerge from coma.
- ◆ A person in a coma may become restless and need special care to prevent them from hurting themselves.
- ◆ Patients who are restless may also try to pull on tubes or dressings so soft cloth wrist restraints may be put on.
- ◆ Side rails on the bed should be kept up to prevent patient from falling

# Intracranial surgery

## ◆ Craniotomy:

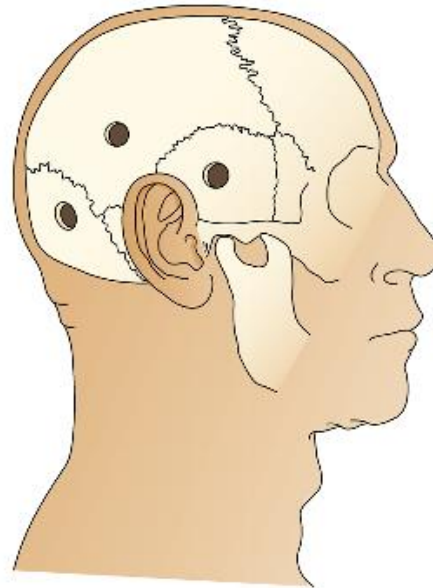
- Opening the skull surgically to gain access to intracranial structures



# Intracranial surgery

## ◆ Burr hole

- Circular opening made in the skull by a drill



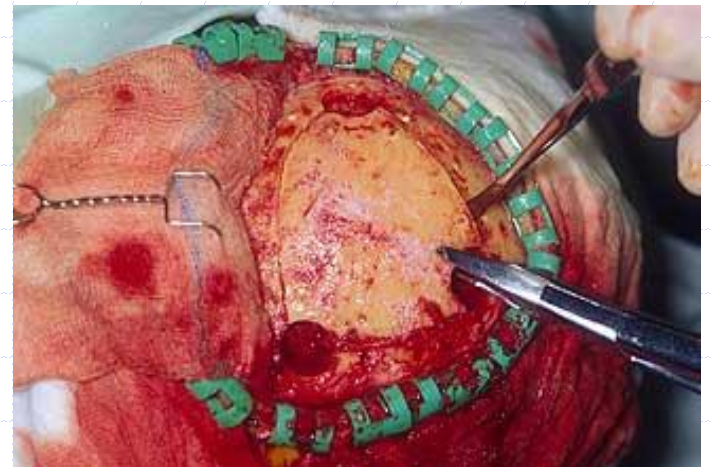
# Intracranial surgery

## ◆ Craniectomy

- An excision of a portion of the skull

## ◆ Cranioplasty

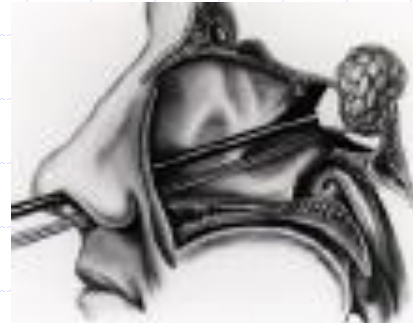
- Repair of a cranial defect by means of a plastic or metal plate



# Intracranial surgery

## ◆ Transsphenoidal

- Through the nasal sinuses to gain access to the pituitary gland



# Post OP. NSG management (Craniotomy)

- 1- Preserve adequate Cerebral perfusion (positioning , fluid management ,vomiting and fever )
- 2-prevented complication ( I.C Hypertension ,hemorrhage ,fluid imbalance ,CSF Leak ,DVT )
- 3- Promote arterial oxygenation
- 4-providing comfort ( analgesic ,stool softeners ,eye cover and saline drops ,infection ,prevent injury )



# Stroke

- ◆ The third leading cause of death in US
- ◆ Neurologic deficits lasting 24 hours or longer
- ◆ Ischemic: embolic or thrombotic
  - blocked blood flow to the brain
- ◆ Hemorrhagic: ICH, SAH, ruptured cerebral aneurysm
- ◆ TIA: This is a stroke, although symptoms resolve within 24 hrs

# Signs and Symptoms of Stroke

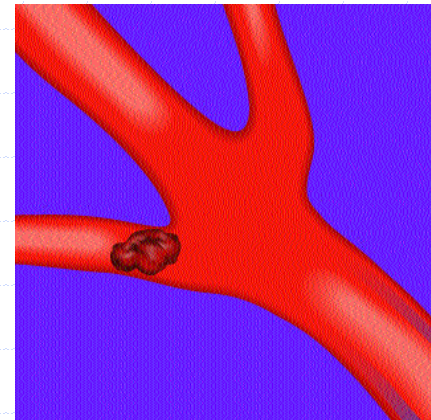
- ◆ Sudden numbness or weakness of the face, arm or leg, especially on one side of the body
- ◆ Sudden confusion, trouble speaking or understanding
- ◆ Sudden trouble seeing in one or both eyes
- ◆ Sudden dizziness, loss of balance or coordination or trouble walking
- ◆ Sudden severe headache with no known cause

# Risk Factors

- ◆ High blood pressure
- ◆ Carotid artery disease
- ◆ Physical inactivity
- ◆ Excess alcohol intake
- ◆ Atrial fibrillation
- ◆ Diabetes
- ◆ Heart disease
- ◆ Smoking
- ◆ Family history
- ◆ Prior stroke/TIA
- ◆ High cholesterol
- ◆ Obesity

# Treatment for Ischemic Stroke

- tPA=Thrombolytic agent
- Document time of symptom onset.
- Immediate head CT (check for blood)
- Evaluate for tPA administration

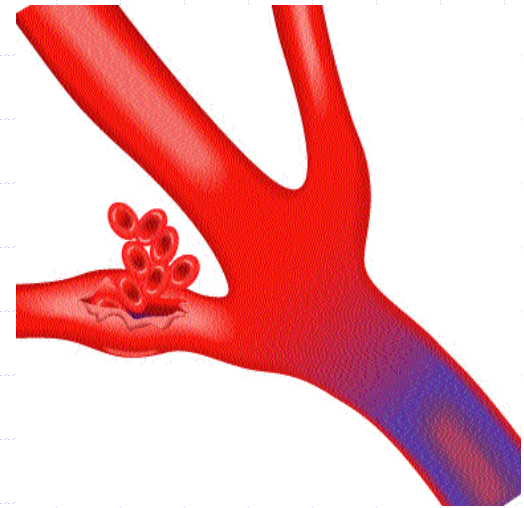


# Treatment Cont...

- Keep NPO
- Admit as Inpatient and perform diagnostic testing: Carotid US, Echo, TEE, ECG monitoring for a-fib, MRI, fasting Lipid, Clotting disorder blood
- Rehabilitation

# Hemorrhagic Stroke Treatment

- ◆ Do not give antithrombotics or anticoagulants
- ◆ Monitor and treat blood pressure greater than 150/105
- ◆ NPO
- ◆ Anticipate Neurosurgical consult
- ◆ Possible administration of blood products



- ◆ Good functional outcome is reported when patients with acute ischemic stroke receive tPA **within 3 hours** of stroke symptom onset
- ◆ Facial droop, arm weakness, and speech abnormalities ,If any 1 of these 3 signs is abnormal, the probability of a stroke is 72%
- The neurological deficit persisting for more than **24 hrs** (stroke )

SAH caused by rupture of a cerebral aneurysm or AVM , ICH bleeding directly into cerebral tissue ,caused by rupture of small artery in the brain resulting from hypertension

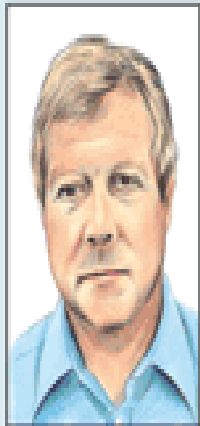


# Pre-hospital Stroke Scale

## FAST

### Cincinnati Pre-hospital Stroke Scale

**1. FACIAL DROOP:** Have patient show teeth or smile.

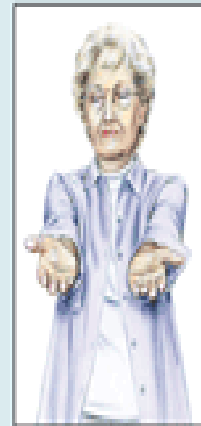


**Normal:**  
both sides  
of the face  
move equally

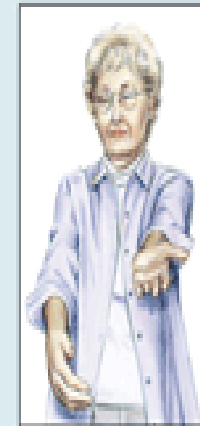


**Abnormal:**  
one side of  
face does not  
move as well  
as the other  
side

**2. ARM DRIFT:** Patient closes eyes & holds both arms out for 10 sec.



**Normal:**  
both arms  
move the  
same or both  
arms do not  
move at all



**Abnormal:**  
one arm does  
not move or  
drifts down  
compared to  
the other

**3. ABNORMAL SPEECH:** Have the patient say "you can't teach an old dog new tricks."

**Normal:** patient uses correct words with no slurring      **Abnormal:** patient slurs words, uses the wrong words, or is unable to speak

**INTERPRETATION:** If any 1 of these 3 signs is abnormal, the probability of a stroke is 72%.

## NATIONAL INSTITUTES OF HEALTH STROKE SCALE (NIHSS)

| ITEM   | SCORE    |  | SCORE    |
|--|----------|--|----------|
| <b>Level of consciousness</b>                        |          | <b>Upper-extremity motor function (right and left scored independently 0 – 8 points)</b> |          |
| Alert  | 0 points | Normal movement  | 0 points |
| Drowsy   | 1 point  | Drift of upper extremity   | 1 point  |
| Stupor   | 2 points | Some effort against gravity  | 2 points |
| Coma   | 3 points | No effort against gravity but moves  | 3 points |
| <b>Response to 2 questions (orientation)</b>         |          | No movement  | 4 points |
| Know age and current month                           | 0 points | <b>Lower-extremity motor function (right and left scored independently 0 – 8 points)</b> |          |
| Answers 1 question correctly                         | 1 point  | Normal movement  | 0 points |
| Cannot answer either question correctly              | 2 points | Drift of lower extremity   | 1 point  |
| <b>Response to 2 commands</b>                        |          | Some effort against gravity  | 2 points |
| Follows 2 commands correctly                         | 0 points | No effort against gravity but moves  | 3 points |
| Follows 1 command                                    | 1 point  | No movement  | 4 points |
| Cannot follow either command                         | 2 points | <b>Limb ataxia (cannot be tested in presence of paresis)</b>                             |          |
| <b>Best gaze (movement of eyes to left or right)</b> |          | No limb ataxia   | 0 points |
| Normal eye movements                                 | 0 points | Ataxia present in 1 limb   | 1 point  |
| Partial gaze paresis to one side                     | 1 point  | Ataxia present in 2 limbs  | 2 points |
| Forced gaze palsy to one side                        | 2 points | <b>Sensory function</b>  |          |
| <b>Visual fields</b>                                 |          | No sensory loss  | 0 points |
| No visual loss                                       | 0 points | Mild-to-moderate sensory loss  | 1 point  |
| Partial homonymous hemianopia                        | 1 point  | Severe-to-total sensory loss   | 2 points |
| Complete homonymous hemianopia                       | 2 points | <b>Language</b>  |          |
| Bilateral visual loss                                | 3 points | Normal language  | 0 points |
| <b>Facial motor function</b>                         |          | Mild-to-moderate aphasia   | 1 point  |
| No facial weakness                                   | 0 points | Severe aphasia   | 2 points |
| Minor unilateral facial weakness                     | 1 point  | Mute   | 3 points |
| Partial unilateral facial weakness                   | 2 points | <b>Articulation</b>  |          |
| Complete paralysis of 1 or both sides                | 3 points | Normal articulation  | 0 points |
|  |          | Mild-to-moderate dysarthria  | 1 point  |
|  |          | Severe dysarthria  | 2 points |
|  |          | <b>Extinction or inattention (neglect)</b>   |          |
|  |          | No neglect or extinction   | 0 points |
|  |          | Visual or sensory inattention or extinction  | 1 point  |
|  |          | Profound inattention to visual and sensation   | 2 points |

# Stroke severity may be stratified on the basis of NIHSS scores as follows

- ◆ Very Severe:  $>25$
- ◆ Severe: 15 – 24
- ◆ Mild to Moderately Severe: 5 – 14
- ◆ Mild: 1 – 5

# Fibrinolytic Therapy Contraindications

- ◆ Current intracranial hemorrhage
- ◆ Subarachnoid hemorrhage
- ◆ Active internal bleeding
- ◆ Recent (within 3 months) intracranial or intraspinal surgery
- ◆ conditions that may increase the risk of bleeding (e.g., some neoplasms, arteriovenous malformations, or aneurysms)
- ◆ Bleeding diathesis
- ◆ Current severe uncontrolled hypertension

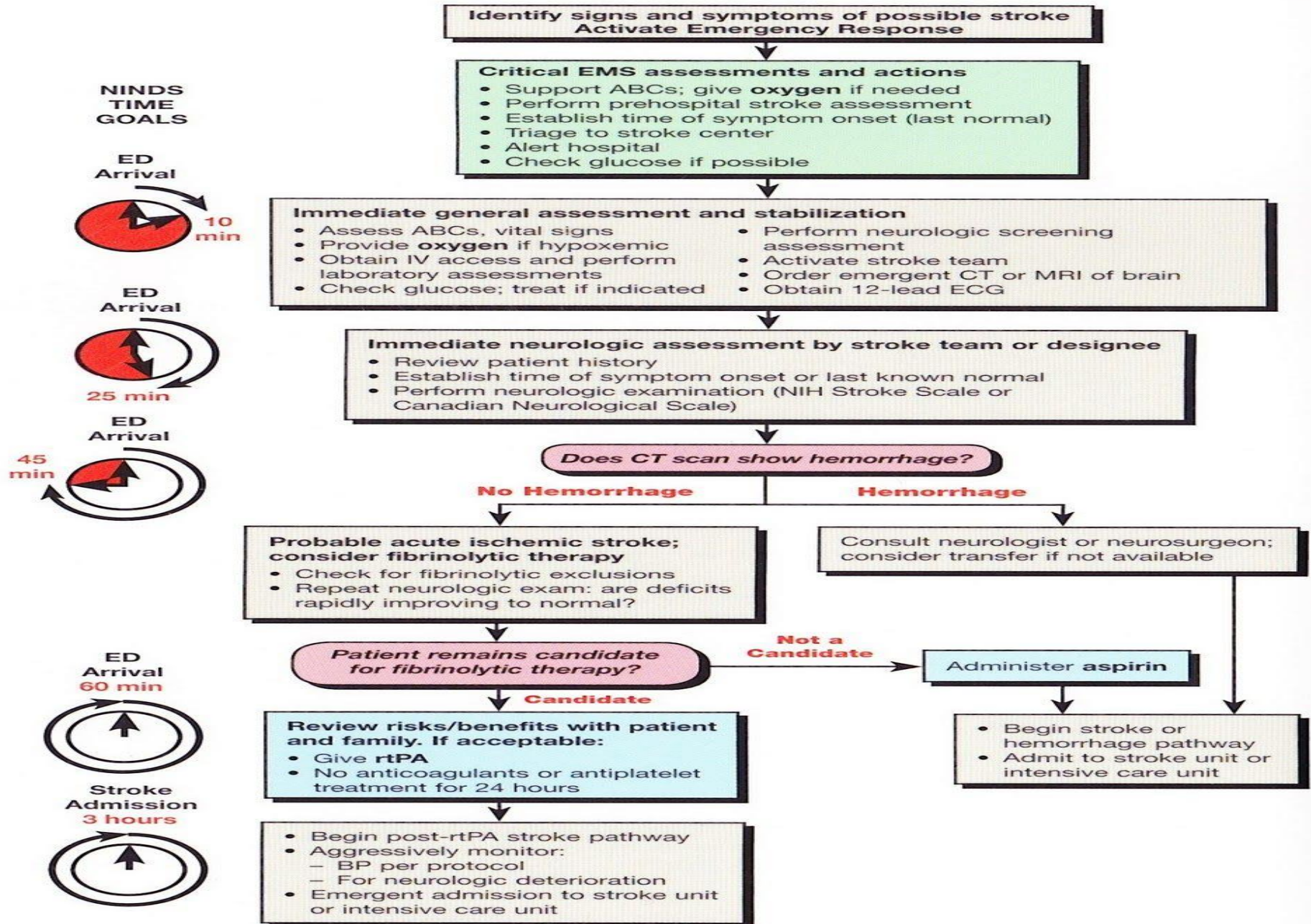
# Additional exclusion criteria

## Between 3 and 4.5 hours:

- ◆ Age >80 years
- ◆ Severe stroke (NIHSS > 25)
- ◆ History of diabetes and prior stroke
- ◆ Taking an oral anticoagulant regardless of INR



# Suspected Stroke Algorithm: Goals for Management of Stroke



# Endovascular treatment of stroke

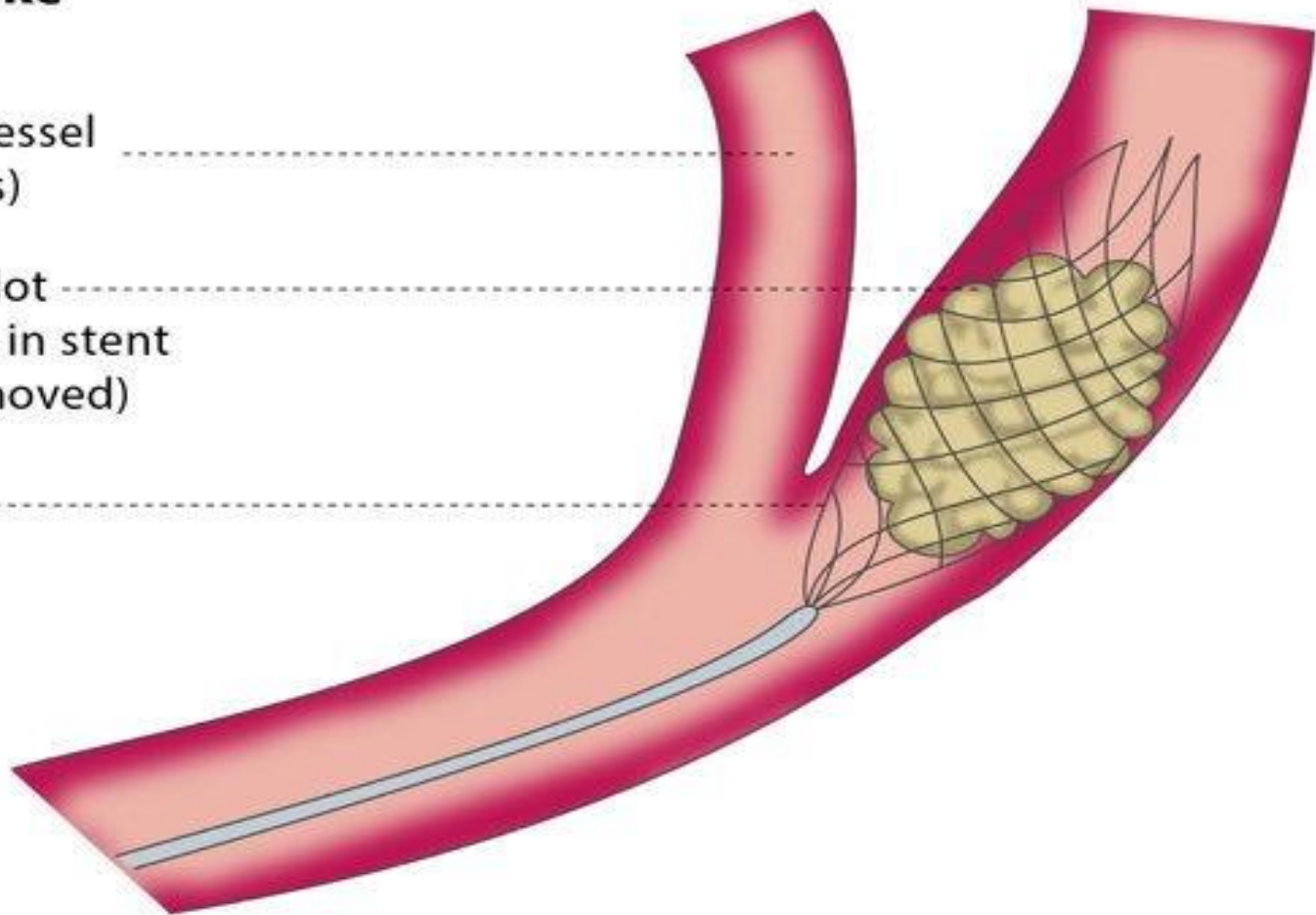
- ◆ The treatment involves placing a catheter into the brain and removing the clot that's causing the stroke.
- ◆ Endovascular therapy must be done within six to eight hours of the onset of a stroke
- ◆ Studies show that patients who receive endovascular rescue therapy after intravenous tissue plasminogen activator (IV tPA) have better outcomes than patients treated with medical therapy alone.

## Endovascular treatment of stroke

Blood vessel  
(arteries)

Blood clot  
(caught in stent  
and removed)

Stent





# SEIZURES AND STATUS EPILEPTICUS

- ◆ A seizure is an abnormal electrical discharge in the brain caused by a variety of neurological disorders, systemic diseases, and metabolic disorders.
- ◆ Seizures consist of repetitive depolarization of hyperactive, hypersensitive cells that cause an altered state of brain function

**First line treatment in adult status epilepticus: Benzodiazepines**

# Bacterial Meningitis

- ◆ Bacterial meningitis is very serious and can be deadly.
- ◆ Death can occur in as little as a few hours. Most people recover from meningitis. However, permanent disabilities (such as brain damage, hearing loss, and learning disabilities) can result from the infection.

Several types of bacteria can cause meningitis:

- ◆ Streptococcus pneumoniae
- ◆ Group B Streptococcus
- ◆ Neisseria meningitidis
- ◆ Haemophilus influenzae
- ◆ Listeria monocytogenes

Meningitis symptoms include sudden onset of

- Fever
- Headache
- Stiff neck
- Nausea
- Vomiting
- Photophobia (eyes being more sensitive to light)
- Altered mental status (confusion)

□ Kernig sign (pain in the neck when the thigh is flexed on the abdomen and the leg extended at the knee)

□ Positive Brudzinski sign (involuntary flexion of the hips when the neck is flexed toward the chest )

◆ Acute bacterial meningitis must be treated immediately with intravenous antibiotics and sometimes corticosteroids.


◆ This helps to ensure recovery and reduce the risk of complications, such as brain swelling and seizures.

# SPINAL CORD INJURY

- ◆ The most common causes of SCI are motor vehicle crashes, falls, acts of violence (primarily gunshot wounds), sports injuries, and diving accidents.
- ◆ SCI produces two types of shock.
- ◆ Spinal shock is an electrical silence of the cord below the level of injury that causes complete loss of motor, sensory, and reflex activity

- ◆ Neurogenic shock occurs from disruption of autonomic pathways, resulting in temporary loss of autonomic function below the level of the injury.
- ◆ Sympathetic input is lost, causing vasodilation and distributive shock, which manifests as hypotension, bradycardia, and hypothermia.
- ◆ Bradycardia may be so severe that a temporary pacemaker is required



- 
- ◆ A complete lesion causes total, permanent loss of motor and sensory function below the level of injury.
  - ◆ An incomplete lesion is more common and results in the sparing of some motor and sensory function below the level of injury

# Nursing and Medical Interventions

- ◆ Maintaining a patent airway and respiratory function is a priority.
- ◆ Endotracheal intubation and mechanical ventilation are often required, especially in high cervical spine injuries
- ◆ Patients with complete cervical injury may be placed on a bed that provides side to side rotation to optimize pulmonary function
- ◆ Immobilization of the spinal cord must occur to prevent further injury

- Surgical stabilization of vertebral instability may be required and is usually performed within 24 hours of injury
- Fluid volume administration and vasopressor drugs may be needed to sustain the BP
- Administration of glucocorticoids.
- prevent venous thromboembolism