Emergency department management of stroke

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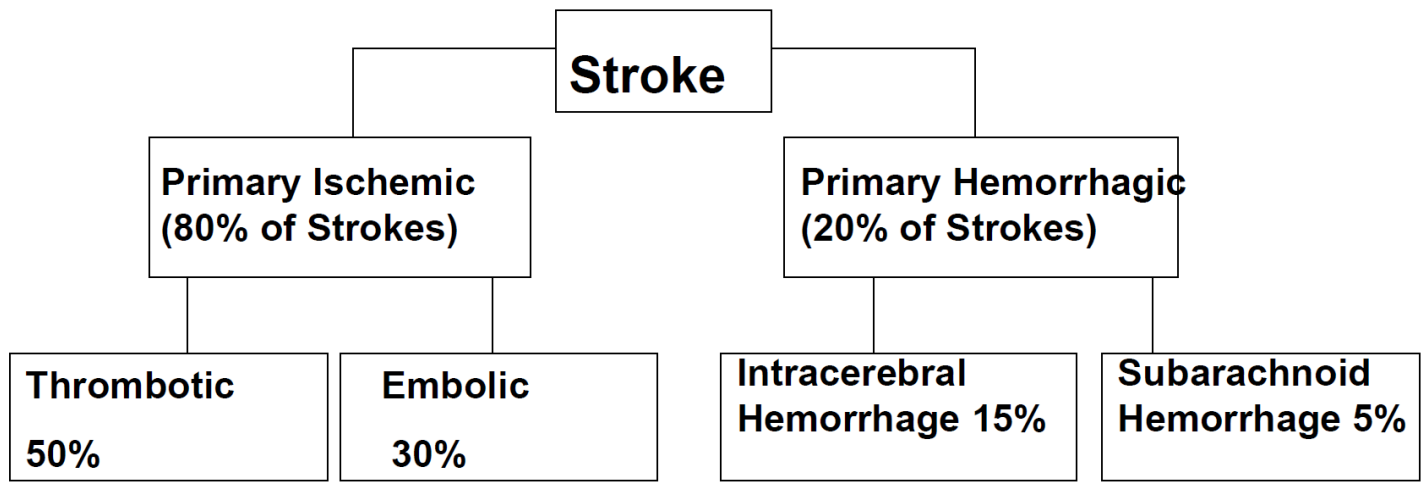
DEFINITION

Stroke(CVA) is defined by the World Health Organization as a clinical syndrome consisting of ‘rapidly developing clinical signs of focal (at times global) disturbance of cerebral function, lasting more than 24 h or leading to death with no apparent cause other than that of vascular origin’.

CLASSIFICATION OF STROKE

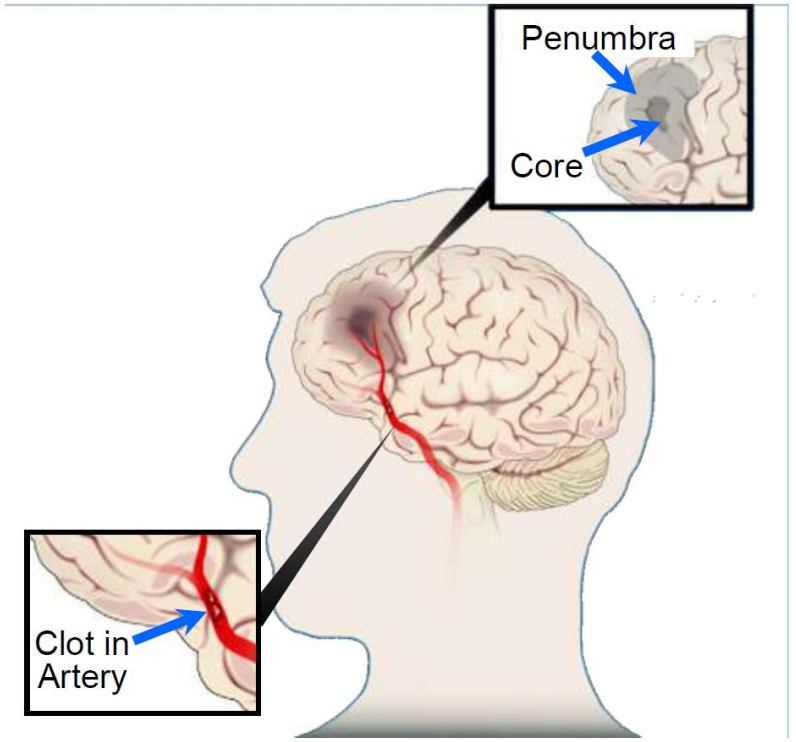


"TIME IS BRAIN: SAVE THE PENUMBRA"

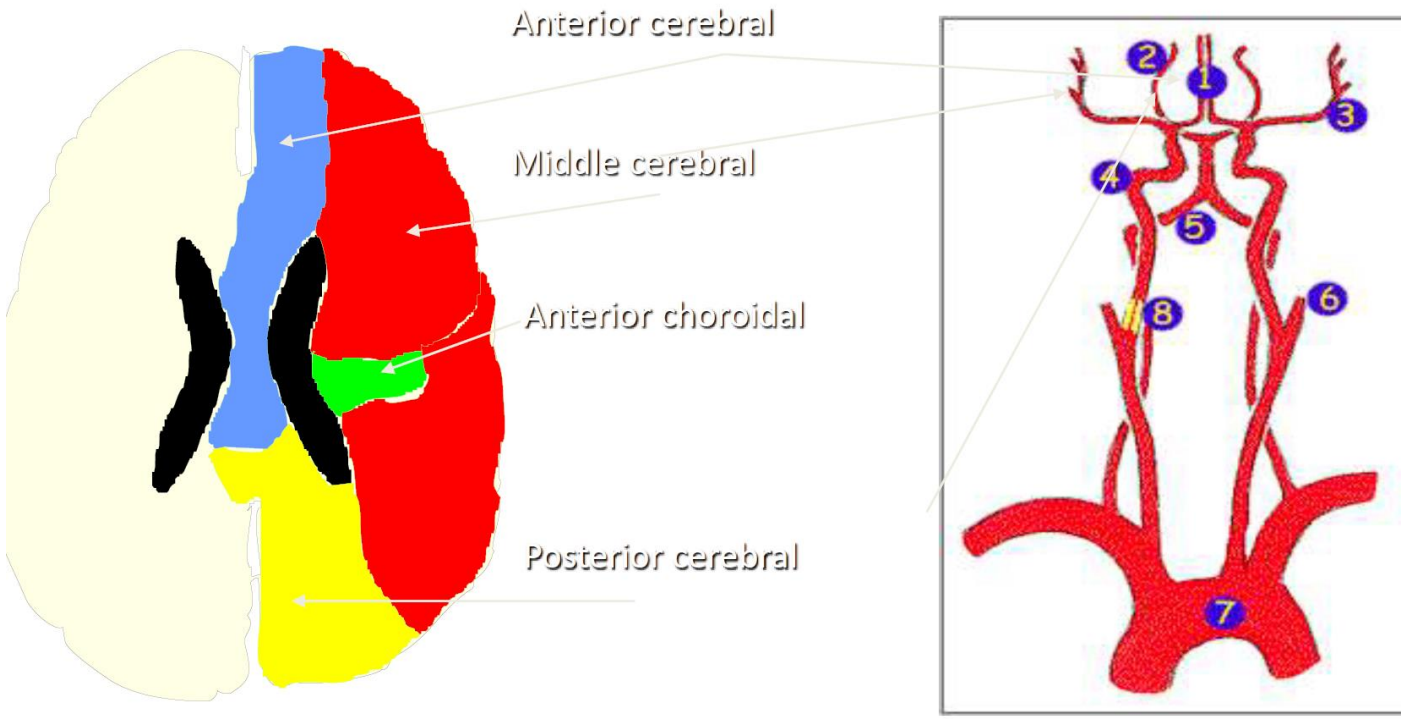
Penumbra is zone of reversible ischemia around core of irreversible infarction—salvageable in first few hours after ischemic stroke onset

Penumbra damaged by:

- *Hypoperfusion*
- *Hyperglycemia*
- *Fever*
- *Seizure*



Cerebral Arterial territory



- Is it a stroke ?
- What type of stroke ?
- Why did it happen ?
- How does it affect the patient ?
- What is the prognosis ?

Stroke - questions

Immediate Diagnostic Studies: Evaluation of a Patient With Suspected Acute Ischemic Stroke

All patients
- Noncontrast brain CT or brain MRI
- Blood glucose
- Serum electrolytes/renal function tests
- ECG
- Markers of cardiac ischemia
- Complete blood count, including platelet count*
- Prothrombin time/international normalized ratio (INR)*
- Activated partial thromboplastin time*
- Oxygen saturation

Selected patients
- Hepatic function tests
- Toxicology screen
- Blood alcohol level
- Pregnancy test
- Arterial blood gas tests (if hypoxia is suspected)
- Chest radiography (if lung disease is suspected)
- Lumbar puncture (if subarachnoid hemorrhage is suspected and CT scan is negative for blood)
- Electroencephalogram (if seizures are suspected)

INVESTIGATIONS

- full blood count, serum electrolytes, renal function tests, cardiac enzymes, and coagulation studies
- Blood sugar is mandatory to exclude hypoglycemia or diagnose diabetes mellitus
- Full blood count to detect Polycythaemia,ESR for endocarditis,
- clotting studies for Hypercoagulable States
- An electrocardiogram (ECG) : arrhythmias and myocardial infarction. Baseline ECG is recommended in all patients with stroke(AHA/ASA Guidelines)

NEUROIMAGING

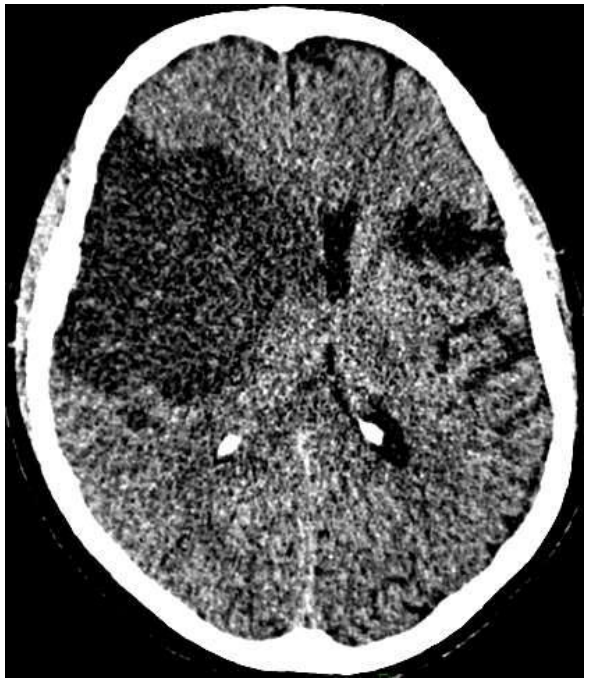
- Brain CT scan: CT is sensitive to the intracranial blood and is readily available.

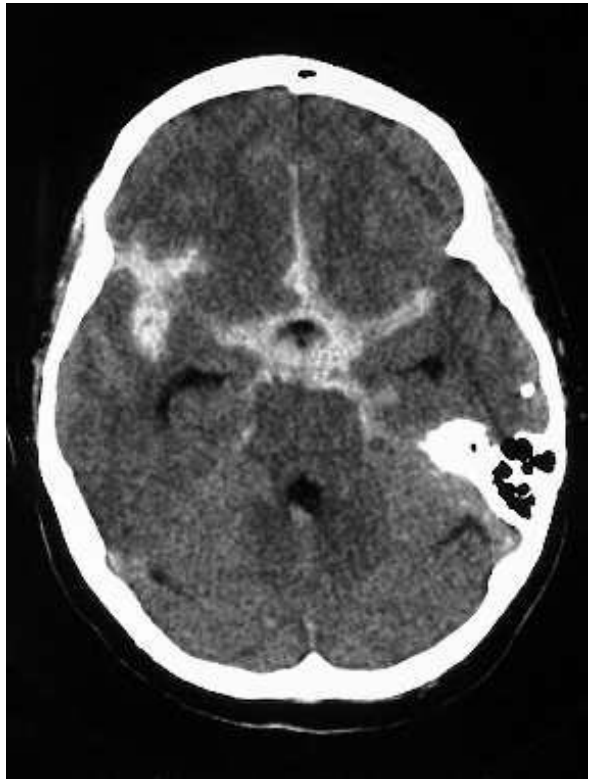
Normal early CT therefore rules out haemorrhagic stroke.

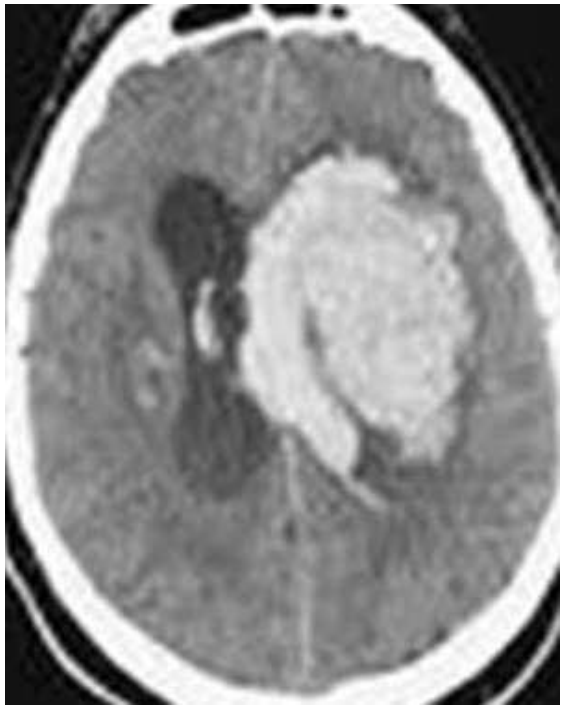
CT Scan changes in ischemic stroke may take several days to develop.

- MRI: MRI is better at detecting posterior fossa lesions especially in posterior circulation stroke such as Pons or cerebellum
- It is also recommended that all patients with transient neurologic symptoms have a neuroimaging within 24 hours or as soon as possible.(Class 1,LOE B)

3 types of stroke







AIRWAY AND VENTILATION

- Airway – Foreign Bodies, dentures, tongue
- Patients who exhibit a decreasing level of consciousness or signs of brain stem dysfunction are candidates for elective intubation .
- Indications for intubation

- hypoxia (pO2 <60 mm Hg or PCO2 >50 mm Hg) - risk of aspiration with or without impairment of arterial oxygenation

- elective tracheostomy should be performed after 2 weeks for prolonged coma or pulmonary complications

SUPPLEMENTAL OXYGEN

- Adequate tissue oxygenation is important to prevent further brain injury
- Current American Stroke Association recommendations call for supplemental oxygen to be given as needed to maintain an oxygen saturation of more than 95% by pulse Oximetry.

VOLUME STATUS

- Hypovolaemia has been associated with worse outcome and increased mortality in acute ischemic stroke.
- Isotonic saline, i.e. "normal" or 0.9%, should be used for volume repletion and maintenance, typically 3 litres per day is given.
- Do not give hypotonic solution, eg 5% Dextrose in water, as it may worsen cerebral oedema.

TEMPERATURE

- FEVER in the setting of acute stroke is associated

with poor outcome possibly due to

- 1. increased metabolic demands
- 2.enhanced release of neurotransmitters
- 3.increased free radical production
- Lowering acutely elevated body temperature

might improve the prognosis in stroke pateints .Antipyretic agents like acetaminophen and coolIng devices might be used .

- Relevant antibiotics might also be used.

TEMPERATURE

- Fever worsens outcome:
- for every 1°C rise in temp, risk of poor outcome doubles (Reith, Lancet 1996)
- Greatest effect in the first 24 hours
- Brain temp is generally higher than core
- Treat aggressively with acetaminophen

BLOOD PRESSURE MANAGEMENT

- Reduction of BP in acute stroke phase is controversial
- BP Should be kept within higher normal limits since low BP could precipitate perfusion failure
- When treatment is indicated, cautious lowering of blood pressure by approximately 15 percent during the first 24 hours after stroke onset is suggested
- Systolic blood pressure > 185 and diastolic > 110 is a contraindication for thrombolysis

BLOOD PRESSURE MANAGMENT

- Some authorities believe BP should not be actively lowered in the 1st 10 days after stroke unless MAP > 145 (SBP > 220; DBP>120)
- Indications for lowering BP:

-dissecting aortic aneurysm

-Myocardial Ischemia or acute myocardial infarction

-Acute pulmonary oedema.

-Rapid decline in renal function.

- Aim: MAP = 130; DBP = 105; (185/105)

In patients with markedly elevated blood pressure who do not receive fibrinolysis, a reasonable goal is to lower blood pressure by 15% during the first 24 hours after onset of stroke. The level of blood pressure that would mandate such treatment is not known, but consensus exists that medications should be withheld unless the systolic blood pressure is >220 mm Hg or the diastolic blood pressure is >120 mm Hg (Class I; Level of Evidence C).

BLOOD PRESSURE MANAGMENT

• Evidence from one clinical trial indicates that initiation

of antihypertensive therapy within 24 hours of stroke is relatively safe. Restarting antihypertensive medications is reasonable after the first 24 hours for patients who have preexisting hypertension and are neurologically stable unless a specific contraindication to restarting treatment is known (Class IIa; Level of Evidence B).

BLOOD PRESSURE MANAGEMENT

- No data are available to guide selection of medications for the lowering of blood pressure in the setting of acute ischemic stroke
- If systolic BP >180–230 mm Hg or diastolic BP >105–120 mm Hg:

-Labetalol 10 mg IV followed by continuous IV infusion 2–8 mg/min; or

-Nicardipine 5 mg/h IV, titrate up to desired effect by 2.5 mg/h every 5–15 minutes, maximum 15 mg/h

- If BP not controlled or diastolic BP >140 mm Hg, consider IV sodium nitroprusside
- use oral agents (captopril, calcium channel blockers)

BLOOD PRESSURE MANAGEMENT

- Systolic > 220 OR Diastolic 121 to 140: treat with goal of a 10% to 15% reduction in blood pressure using:

1. Labetalol 10 to 20 mg intravenously over 1 to 2 minutes (may repeat or double every 10 minutes; max dose is 300 mg) or
2. Nicardipine infusion, 5mg/hour, titrate up by 0.25 mg/hour at 5- to 15-minute intervals, maximum dose 15 mg/hour. When desired blood pressure is attained, reduce to 3 mg/hour

GUIDELINES FOR BP MGT IN HAEMORRHAGIC STROKE

- 1. Until ongoing clinical trials of BP intervention for ICH

are completed, physicians must manage BP on the basis of the present incomplete efficacy evidence. Current suggested recommendations for target BP in various situations are available and may be considered (Class IIb; Level of Evidence: C). (Unchanged from the previous guideline)

- 2. In patients presenting with a systolic BP of 150 to 220 mm Hg, acute lowering of systolic BP to 140 mm Hg is probably safe (Class IIa; Level of Evidence: B).

GLYCAEMIC CONTROL

Hyperglycemia may augment brain injury by several mechanisms including

- increased tissue acidosis from anaerobic metabolism
- free radical generation
- increased blood brain barrier permeability.
- Aggressive Glycaemic control utilizing a continuous insulin,

potassium, and glucose infusion(GKI) is feasible.

- For patients with blood glucose >200 mg/dl, 6 units of

insulin hrly can be given until blood sugar is <120 mg/ dl.

- GKI infusion may need to be continued in comatose

patients or those unable to swallow

GLYCAEMIC CONTROL

- **HYPOGLYCEMIA**- Hypoglycemia can cause focal neurologic deficits mimicking stroke, and severe hypoglycemia alone can cause neuronal injury
- Check the blood sugar and rapidly correct low serum glucose
- Hypoglycemia (blood glucose <60 mg/dL) should be treated in patients with acute ischemic stroke (Class I; Level of Evidence C).
- The goal is to achieve normoglycemia.

GLYCAEMIC CONTROL

- Evidence indicates that persistent in-hospital hyperglycemia during the first 24 hours after stroke is associated with worse outcomes than normoglycemia, and thus, it is reasonable to treat hyperglycemia to achieve blood glucose levels in a range of 140 to 180 mg/dL and to closely monitor to prevent hypoglycemia in patients with acute ischemic stroke (Class IIa; Level of Evidence C).

NIHSS

Category	Score/Description		Date/Time Initials	Date/Time Initials	Date/Time Initials	Date/Time Initials	Date/Time Initials
1a. **Level of Consciousness** (Alert, drowsy, etc.)	0 = Alert 1 = Drowsy 2 = Stuporous 3 = Coma						
1b. **LOC Questions** (Month, age)	0 = Answers both correctly 1 = Answers one correctly 2 = Incorrect						
1c. **LOC Commands** (Open/close eyes, make fist/let go)	0 = Obeys both correctly 1 = Obeys one correctly 2 = Incorrect						
2. **Best Gaze** (Eyes open - patient follows examiner's finger or face)	0 = Normal 1 = Partial gaze palsy 2 = Forced deviation						
3. **Visual Fields** (Introduce visual stimulus/threat to pt's visual field quadrants)	0 = No visual loss 1 = Partial Hemianopia 2 = Complete Hemianopia 3 = Bilateral Hemianopia (Blind)						
4. **Facial Paresis** (Show teeth, raise eyebrows and squeeze eyes shut)	0 = Normal 1 = Minor 2 = Partial 3 = Complete						
5a. **Motor Arm - Left** 5b. **Motor Arm - Right** (Elevate arm to 90° if patient is sitting, 45° if supine)	0 = No drift 1 = Drift 2 = Can't resist gravity 3 = No effort against gravity 4 = No movement X = Untestable (Joint fusion or limb amp)	Left					
		Right					
6a. **Motor Leg - Left** 6b. **Motor Leg - Right** (Elevate leg 30° with patient supine)	0 = No drift 1 = Drift 2 = Can't resist gravity 3 = No effort against gravity 4 = No movement X = Untestable (Joint fusion or limb amp)	Left					
		Right					
7. **Limb Ataxia** (Finger-nose, heel down shin)	0 = No ataxia 1 = Present in one limb 2 = Present in two limbs						
8. **Sensory** (Pin prick to face, arm, trunk, and leg - compare side to side)	0 = Normal 1 = Partial loss 2 = Severe loss						
9. **Best Language** (Name item, describe a picture and read sentences)	0 = No aphasia 1 = Mild to moderate aphasia 2 = Severe aphasia 3 = Mute						
10. **Dysarthria** (Evaluate speech clarity by patient repeating listed words)	0 = Normal articulation 1 = Mild to moderate slurring of words 2 = Near to unintelligable or worse X = Intubated or other physical barrier						
11. **Extinction and Inattention** (Use information from prior testing to identify neglect or double simultaneous stimuli testing)	0 = No neglect 1 = Partial neglect 2 = Complete neglect						
	TOTAL SCORE						

INITIAL	SIGNATURE	INITIAL	SIGNATURE	INITIAL	SIGNATURE

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Indication of t-PA

INDICATIONS

- Ischemic stroke onset within 3 hours of drug administration.
- Measurable deficit on the NIH stroke scale examination.
- Computed tomography (CT) scan does not show hemorrhage or nonstroke cause of deficit.
- Age >18 years.

CONTRAINDICATIONS

- Symptoms are minor or improving rapidly.
- Patient had seizure at onset of stroke.
- Patient had another stroke or serious head trauma within the past 3 months.
- Patient had major surgery within the past 14 days.
- Patient has a known history of intracranial hemorrhage.
- Patient has sustained systolic blood pressure >185 mmHg.
- Patient has sustained diastolic blood pressure >110 mmHg.
- Aggressive treatment is necessary to lower the patient's blood pressure.
- Patient has symptoms suggestive of subarachnoid hemorrhage.
- Patient had gastrointestinal or urinary tract hemorrhage within the past 21 days.
- Patient had arterial puncture at a noncompressible site within the past 7 days.
- Patient received heparin within the past 48 hours and has elevated partial thromboplastin time (PTT).
- Prothrombin time (PT) is >15 seconds.
- Platelet count is < 100,000 mL.
- Patient's serum glucose is < 50 mg/dL or > 400 mg/dL.

RELATIVE CONTRAINDICATIONS

- Patient has a large stroke with NIH Stroke Scale score > 22.
- CT scan shows evidence of large middle cerebral artery territory infarction (sulcal effacement or blurring of gray-white junction in more than one-third of MCA territory).

Reprinted with permission from: American College of Emergency Physicians. Policy Resource and Education Paper: Use of intravenous tPA for the management of acute stroke in the emergency department. ACEP web site www.acep.org/1,5005,0.html, February 2002. Accessed 2/12/2004.

THROMBOLYSIS

- Thrombolysis within 1st 4.5 hrs (3-15% pts)
- rtPA, alteplase; streptokinase.
- Door to needle < 1 hr.
- Patient

- Normal CT scan
- BP <180/100 mmHg.
- No bleeding tendency

- Dose - 0.9mg /Kg. (max 90mg)
- - 10% bolus, Rest 60 min by infusion
- Risk - ICH in 6% of patients
- - Reduced morbidity by 30%

t-PA

American Heart Association | American Stroke Association

VIII. Intravenous Fibrinolysis

Class I Recommendations	Class, Level of Evidence (LOE)
IV rtPA (0.9 mg/kg, maximum dose 90 mg) is recommended for selected patients who may be treated within 3 hours of onset of ischemic stroke. *(Unchanged from the previous guideline)*.	Class I, Level of Evidence A
In patients eligible for IV rtPA, benefit of therapy is time-dependent, and treatment should be initiated as quickly as possible. The Door to Needle time (time of bolus administration) should be within 60 minutes from hospital arrival. *(New recommendation)*.	Class I, Level of Evidence A
IV rtPA (0.9 mg/kg, maximum dose 90 mg) is recommended for administration to eligible patients who can be treated in the time period of 3 – 4.5 hours after stroke onset. The eligibility criteria for treatment in this time period are similar to those for persons treated at earlier time periods within 3 hours, with the following additional exclusion criteria: patients older than 80 years, those taking oral anticoagulants regardless of INR, those with a baseline NIHSS score > 25, those with imaging evidence of ischemic injury involving more than one-third of the middle cerebral artery territory, or those with both a history of stroke and diabetes. *(Revised from the 2009 IV rtPA Science Advisory)*	Class I, Level of Evidence B
IV rtPA is reasonable in patients whose blood pressure can be lowered safely (to below 185 / 110 mm Hg) with antihypertensive agents, with the physician assessing the stability of the blood pressure before starting IV rtPA. *(Unchanged from the previous guideline)*	Class I, Level of Evidence B

Antiplatelate

Antiplatelet Agents

Class I Recommendations	Class, Level of Evidence (LOE)
Oral administration of aspirin (initial dose is 325 mg) within 24 to 48 hours after stroke onset is recommended for treatment of most patients. Unchanged from the previous guideline	Class I, Level of Evidence A

Antiplatelate

Antiplatelet Agents

Class II Recommendations	Class, Level of Evidence (LOE)
The usefulness of clopidogrel for the treatment of acute ischemic stroke is not well established. Further research testing the usefulness of the emergency administration of clopidogrel in the treatment of patients with acute stroke is required. Revised from the previous guideline	Class IIb, Level of Evidence C
The efficacy of intravenous tirofiban and eptifibatide are not well established and should be used in the setting of clinical trials. New recommendation	Class IIb, Level of Evidence C

Antiplatelate

Antiplatelet Agents

Class III Recommendations	Class, Level of Evidence (LOE)
Aspirin is not recommended as a substitute for other acute interventions for treatment of stroke, including IV rtPA. Unchanged from the previous guideline	Class III, Level of Evidence B
The administration of other IV antiplatelet agents that inhibit the glycoprotein IIb/IIIa receptor is not recommended. Further research testing the usefulness of emergency administration of these medications as a treatment option in patients with acute ischemic stroke is required. Revised from the previous guideline.	Class III, Level of Evidence B
The administration of aspirin (or other antiplatelet agents) as an adjunctive therapy within 24 hours of IV fibrinolysis is not recommended. Revised from the previous guideline	Class III, Level of Evidence C

Antithrombotic

Anticoagulants

- The results of several clinical trials demonstrate an increased risk of bleeding complications with early administration of either UFH or LMWH
- Early administration of UFH or LMWH does not lower the risk of early recurrent stroke, including among persons with cardioembolic sources.
- The role of anticoagulants as an adjunct in addition to mechanical or pharmacological fibrinolysis has not been established.
- The PREVAIL study gives the strongest evidence of the superiority of LMWH in prevention of venous thromboembolism following ischemic stroke.

Seizures

- Protect patient from injury during ictus
- Maintain airway
- Benzodiazepines:

– lorazepam (1-2 mg IV)

– diazepam (5-10 mg IV)

- Phenytoin:

– 15 mg/kg loading dose, at 25-50 mg/min infusion with

cardiac monitor

- No need for prophylaxis

COMMON PITFALLS IN MANAGEMENT OF STROKE

- Aggressive early treatment of blood pressure in stroke.
- Misdiagnosis of haemorrhagic stroke as hypertensive encephalopathy.
- Failure of adequate hydration of patients
- Failure to diagnose and treat hypo/hyperglycemia
- Inability to effective diagnose and manage complications of stroke

POOR PROGNOSTIC FACTORS IN STROKE

- Accompanying fever
- Hypotension and severe hypertension
- Low oxygen saturation
- Hyperglycaemia and hypoglycemia
- Total anterior circulation stroke (55% dead)
- Pontine Haemorrhage
- Low GCS score
- heart failure
- severity of hemiparesis

MANAGEMENT OF SAH

- Bed rest Analgesic
- Blood pressure control
- TRIPLE – H therapy(hypervolemia , induced hypertension, hemodilution)
- Oral nimodipine 60mg q6hx21 days
- Angiography for localization of bleeding
- If aneurysm
- Immediate surgical clipping for
- Grade 1-3 patient without contraindication
- Grade 4-5 with intracerebral clot and deterioratio