

STROKE IS AN EMERGENCY

**Rapid Evaluation &
Treatment for Patients
with
Acute Ischemic Stroke**

Stroke Epidemiology

❖ Acute Stroke

- 87% Ischemic
- 10% Hemorrhagic (Intercerebral)
- 3% Hemorrhagic (Subarachnoid)

❖ Acute AND Chronic health problem that poses significant impact on individuals, families, and health care systems

❖ 5th leading cause of death in the US

❖ Leading cause of disability

Stroke Epidemiology

❖ Risk Factors for Stroke

- ❖ Age (risk doubles each decade after 55 yrs)
- ❖ Gender (men, except women age 35-44 and >85 years)
- ❖ Race
- ❖ HTN (MOST important modifiable risk factor)
- ❖ Smoking tobacco
- ❖ Diabetes
- ❖ Hyperlipidemia
- ❖ Coagulopathy
- ❖ Low Birth Weight (< 5 lb 8 oz)
- ❖ Atrial Fibrillation
- ❖ Carotid Artery Stenosis
- ❖ Oral Contraceptives & HRT
- ❖ Obesity
- ❖ Migraine Headaches
- ❖ Sleep Disorders



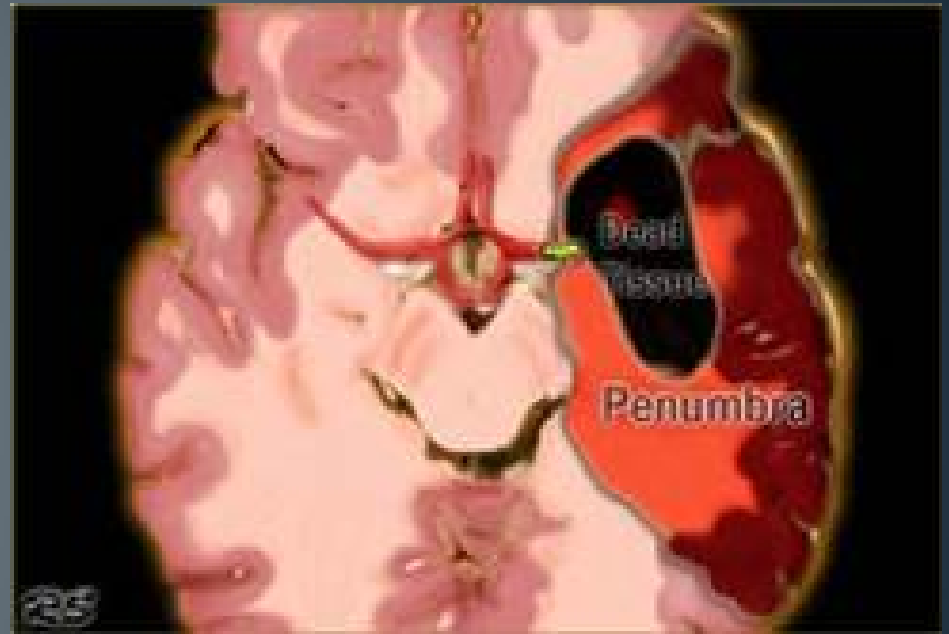
Acute Ischemic Stroke

- Thrombotic
- Embolic
- Large Vessel Disease
 - Approx 75%
- Small Vessel Disease
 - Approx 25%

Acute Ischemic Stroke Pathophysiology

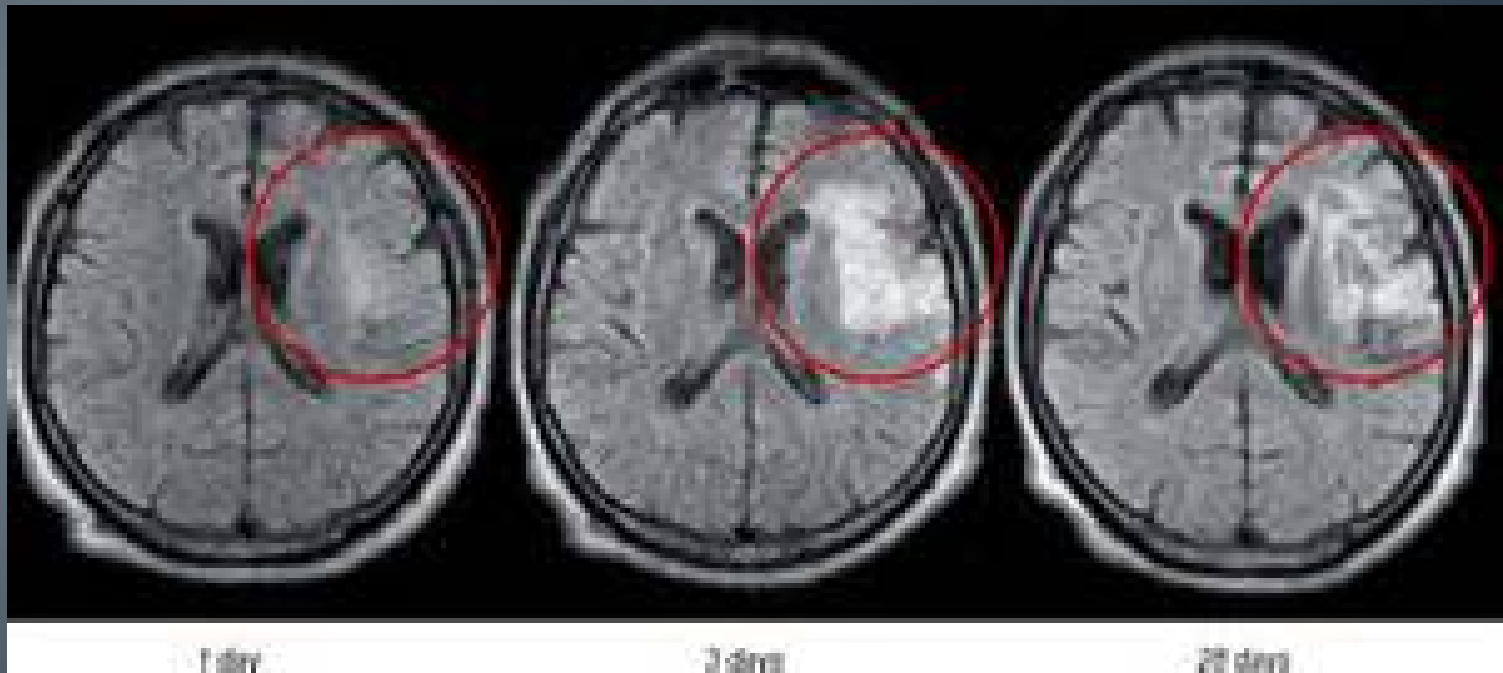
- Arterial blood flow to the brain fails to meet metabolic demands
 - Ischemia → Cellular death
- Zones of ischemic injury
 - Core
 - Penumbra
 - PRIMARY GOAL of acute ischemic stroke intervention is to restore adequate blood flow to penumbra

Acute Ischemic Stroke Pathophysiology



- Onset of ischemia
- Duration of ischemia
- Collateral circulation
- Systemic circulation
- Metabolic & hematologic factors

Acute Ischemic Stroke Pathophysiology



Stroke Symptoms



Stroke Symptoms

- Stroke involving Internal Carotid Arteries
 - Aphasia, if the dominant hemisphere is involved
 - Neglect, if the nondominant hemisphere is involved
 - Contralateral homonymous hemianopia
 - Contralateral motor and sensory loss of face, arm and leg,
 - Ipsilateral eye deviation
- Stroke involving Middle Cerebral Arteries
 - Aphasia, if dominant hemisphere is involved
 - Neglect, if nondominant hemisphere is involved
 - Contralateral motor and sensory loss of face, arm and leg
 - Homonymous hemianopia
 - Eye deviation toward the side of the lesion
 - May exhibit anosognosia (unawareness of neurological deficit)

Stroke Symptoms

- Stroke involving Anterior Carotid Artery
 - Contralateral motor and sensory deficits
 - Abulia (disinhibition)
 - Primitive frontal lobe reflexes may be present
 - Suck
 - Grasp
- Stroke involving Posterior Carotid Artery
 - Contralateral visual field homonymous hemianopia
 - Visual agnosia (inability to recognize familiar objects by sight)
 - Alexia (inability to understand written language)
 - with or without agraphia (inability to write) and prosopagnosia (inability to recognize familiar faces) if stroke occurs in dominant hemisphere

Stroke Symptoms

- Stroke involving Posterior Inferior Cerebellar Artery
 - Wallenberg Syndrome (AKA lateral medullary syndrome)
 - Results in loss of pain and temperature sensation in the contralateral trunk and ipsilateral face
 - Dysphagia
 - Dysarthria
 - Dysphonia
 - Ipsilateral loss of the corneal reflex

Stroke Symptoms

- Stroke involving Anterior Inferior Cerebellar Artery
 - Speech dysfunction
 - Tremor
 - Abnormal gait
 - Abnormal finger-to-nose or heel-shin testing
 - AICA syndrome or lateral pontine syndrome
 - Vertigo
 - Vomiting
 - Nystagmus
 - Falling forward towards the side of the lesion
 - Ipsilateral loss of sensation to the face/facial paralysis
 - Ipsilateral hearing loss

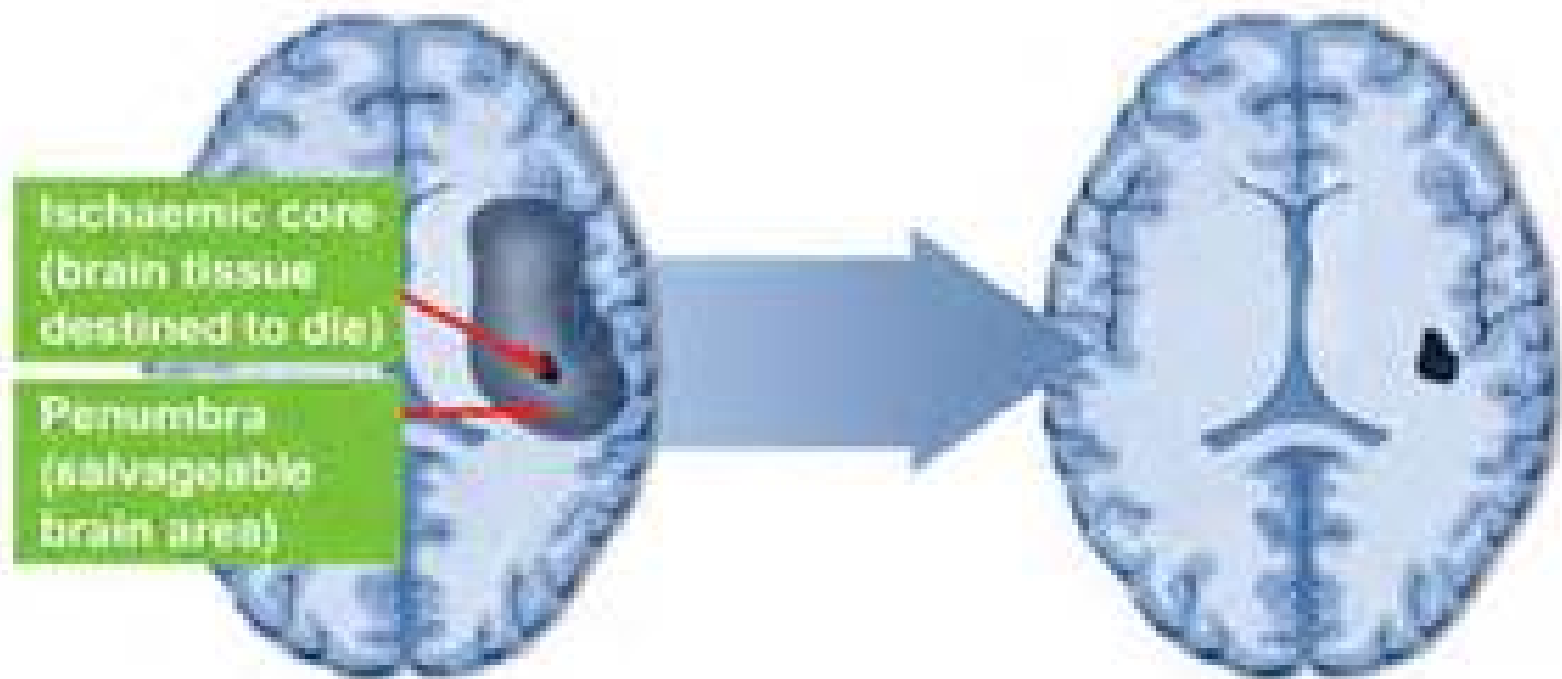
Stroke Symptoms

- Stroke involving Basilar Artery
 - Vertebrobasilar Artery Syndrome
 - Coma
 - Quadriparesis
 - Ataxia
 - Dysarthria
 - Cranial nerve dysfunction
 - Visual deficits
 - Locked-in Syndrome
 - Quadriparetic
 - Unable to speak, but cognition remains intact
 - Gaze paresis
 - Intranuclear ophthalmoplegia
 - Millard-Gubler Syndrome
 - CN VI and VII damage
 - Diplopia
 - Inability to rotate affected eye outward
 - Ipsilateral weakness of facial muscles
 - Loss of corneal reflex
 - May have contralateral weakness

Stroke Mimics

- Diseases that produce stroke like symptoms
- Mimics include:
 - Toxic Metabolic Syndromes (hypo/hyperglycemia, hypo/hyponatremia, hepatic encephalopathy, Wernicke's encephalopathy)
 - Seizure disorders
 - Migraine Headaches
 - Peripheral neuropathies
 - CNS tumor, Intracranial hypertension
 - Degenerative Neurological Conditions
 - Multiple Sclerosis, neuritis, myelopathy

**Rapid recognition and treatment
of acute ischemic stroke is the key
to survival and improved
outcomes for patients**



Rapid Evaluation & Triage

- **1.9 million brain cells are lost every second during stroke**
- **During acute ischemic stroke the brain ages:**
 - 8.7 hours per second
 - 3.1 weeks per minute
 - 3.6 years per hour
 - 11 years in just 3 hours



Rapid Evaluation & Triage

- Work with local EMS providers to ensure prehospital notification of potential stroke patient en route
 - CT scanner should be held for use
 - Personnel, protocols and equipment should be ready
- An organized protocol for the emergency evaluation of patients should be immediately available
 - Considering utilizing a checklist that includes time expectations
- A stroke rating scale, preferably the NIH Stroke Scale, should be utilized

AHA Recommendations for ED Triage & Eval

Door to Physician	≤ 10 minutes
Door to Stroke Team	≤ 15 minutes
Door to CT initiation	≤ 25 minutes
Door to CT interpretation	≤ 45 minutes
Door to drug (alteplase)	≤ 60 minutes
Door to stroke unit admit	≤ 3 hours

Immediate Triage

Date & Time of Last Known Well

- **MOST important piece of information**
 - Last witnessed / known time WITHOUT symptoms
 - **NOT** the time that patient woke with symptoms
- For patients with previous neurological symptoms that completely resolved consider the onset of new symptoms a new episode with its own date & time of last known well

Rapid Assessment

- **Glucose value**
 - ONLY lab value that is required to assess prior to initiation of fibrinolytic therapy
- **Physical Assessment**
 - ABC's
 - Detailed neurological assessment (BRIEF but THOROUGH)
 - Vital Signs
- **Patient History**
 - Past Medical History
 - Past Surgical History
 - Current Medications

Immediate Diagnostic Studies

- Noncontrast brain CT or MRI
- Blood Glucose
- Oxygen Saturation
- *Serum Electrolytes / Renal Function Tests
- *CBC with Platelets
- *Cardiac Markers
- *Prothrombin / INR
- *Activated Partial Thromboplastin Time
- *ECG

**although it is desirable to know the results of these tests prior to fibrinolytic therapy, therapy should not be delayed while awaiting results unless there is clinical suspicion of bleeding abnormality or thrombocytopenia, or the patient has received heparin or warfarin, or the patient has received other anticoagulants*

Goal of Acute Ischemic Stroke Care

The goal of rapid evaluation and triage is to complete an evaluation and begin fibrinolytic treatment within 60 minutes of patient's arrival in the ED



Fibrinolytic Therapy

- IV Fibrinolytic therapy is recommended in the setting of acute ischemic stroke
- ISMP Patient Safety recommendation to abolish the use of abbreviated drug nicknames and only utilize generic drug names in order to avoid detrimental drug mix-ups
 - Avera McKennan has removed “tPA” from all order sets, replaced with “alteplase”

Goal of Acute Ischemic Stroke Care

- eCARE services can be of SIGNIFICANT assistance in the triage, evaluation & treatment of potential stroke patients.
- Contact often, contact early.

Alteplase Administration – 3 hrs

- Alteplase 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

Alteplase Criteria – 3 hours

Inclusion Criteria

- Diagnosis of ischemic stroke causing measurable neurological deficit
 - NO minimum NIH SS value
- Onset of symptoms < 3 hours before initiation of treatment
- Age ≥ 18 years

Exclusion Criteria

- Significant head trauma / stroke in past 3 months
- Sx. consistent with SAH
- Arterial puncture @ noncompressible site in past 7 days
- Hx of previous ICH
- Intracranial neoplasm, AVM or aneurysm
- Recent intracranial or intraspinal surgery
- Elevated BP > 185 (s) or > 110 (d)
- Active internal bleeding
- Acute bleeding diathesis

Relative Exclusion Criteria

- Pregnancy
- Minor or rapidly improving symptoms
- Seizure @ onset of symptoms with postictal neuro impairments
- Major surgery or trauma within past 14 days
- Recent GI or urinary tract hemorrhage within past 21 days
- Recent acute MI within past 3 months

Alteplase Administration – 4.5 hours

- Alteplase 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 to 4.5 hours after stroke onset

Alteplase Criteria – 3 to 4.5 hours

Inclusion Criteria

- Diagnosis of acute ischemic stroke causing measurable neurologic deficit
 - NO minimum NIH SS score
- Onset of symptoms within 3 to 4.5 hours prior to initiation of treatment
- Age ≥ 18 years

Exclusion Criteria

- Age ≥ 80 years
- Severe Stroke
 - NIH SS > 25
- Patient taking oral anticoagulant, regardless of INR
- History of BOTH diabetes and prior ischemic stroke

Alteplase Administration

- Dose = 0.9 mg/kg
 - 10% of that dose to be administered over ONE MINUTE
 - Remaining dose to be infused over one hour
- Blood pressure must **FIRST** be safely lowered to < **185/110** mmHg prior to administration of IV alteplase
 - May utilize Labetalol IVP or Nicardipine IV gtt
 - Other agents such as hydralazine, enalaprilat, etc. may be considered
- Once IV alteplase has been initiated blood pressure must be **MAINTAINED <180/105** mmHg for at least the next 24 hours

Ongoing Assessment

- For patients thrombolized with alteplase Neuro Checks, Vital Signs & Orolingual Angioedema assessments should be completed:
 - Q 15 minutes x 8
 - Q 30 minutes x 12
 - Q 1 hour for at least 24 hours after alteplase administration

Immediate Supportive Care

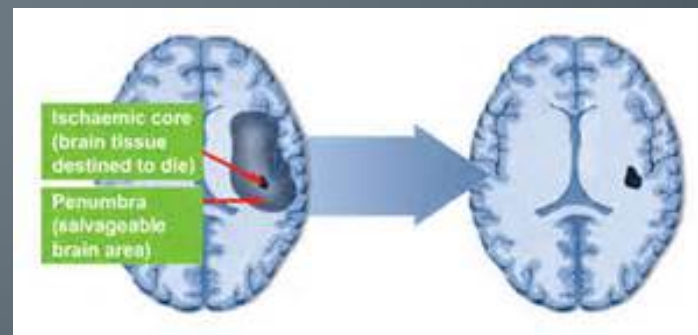
- **Cardiac monitoring should be initiated** to assess for dysrhythmia
 - Cardiac arrhythmias that may be reducing Cardiac Output should be corrected
- Blood pressure management
 - Fibrinolyzed patients: **maintain BP @ 180/105 for at least 24 hrs**
 - Non-fibrinolyzed patients: in patients with 'markedly elevated' blood pressure a reasonable goal is to lower BP by 15% during the first 24 hours after onset of stroke
 - **Consensus exists that meds should be withheld unless SBP is >220 mmHg or DBP is > 120 mmHg**
- Airway and ventilatory support are recommended for patients with decreased LOC or compromised airway status
- Supplemental O₂ should be provided to **maintain oxygen saturation >94%**

Immediate Supportive Care

- Sources of hyperthermia should be identified and treated, antipyretic meds should be administered to lower temperature in hyperthermic patients (temp $>38^{\circ}\text{C}$) with stroke (100.4°F)
- Hypovolemia should be corrected with IV NS
- Hypoglycemia (glucose < 60 mg/dL) should be treated with a goal to achieve normoglycemia
- Hyperglycemia should be treated to achieve blood glucose levels in the range of 140 to 180 mg/dL

Immediate Supportive Care

- Remember the zones of injury, salvage of the penumbra should be a primary goal
 - Perfusion
 - Oxygenation



Documentation and Communication

- Date & Time of Last Known Well should be clearly documented and communicated
- Date, time and score of NIH Stroke Scale should be clearly documented and communicated
- Date, time and dose of alteplase administration should be clearly documented and communicated
- Diagnostics (imaging and lab values), Vital Signs and Interventions should be clearly documented and communicated

Ongoing Assessment

- Patients suspected of having an acute stroke should have **ongoing, serial** assessments (physical assessment, detailed neurological assessment, vital signs) in order to follow trend of patient status
- Blood pressure should be monitored at least every 15 minutes
- Level of consciousness should be monitored closely

Program Evaluation

- Review step-by-step process for when your facility first receives notification of incoming potential stroke patient
 - Consider:
 - Holding CT scanner
 - Visible stroke protocol, visible alteplase indications, checklists
 - Lab draw versus IV start during CT phase of evaluation
 - Storage & supplies to reconstitute alteplase
 - Immediate eED notification
 - Routine staff education with mock patient situations
- Review door-to-physician, door-to-CT, door-to-CT interpretation and door-to-drug times to assessment for any areas of inefficiency
- Review patient outcomes to assess for any opportunities to impact quality of care

Questions



References

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- Livesay, S. (2014). Comprehensive review for stroke nursing. American Association of Neuroscience Nurses.

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- NIH Stroke Scale resources
- Alteplase resources
- Any additional resources or guidance for stroke care