



Stroke Pathway

Background

- 3rd leading cause of [mortality in India](#)
- [Age adjusted prevalence](#): 84-262/100,000 in rural, 224-424/100,000 in urban areas
 - o Lower rate in rural – is this due to higher mortality? Or inadequate ascertainment?
- Higher mortality rate in rural compared to urban settings ([28-day mortality 37.1% rural vs 24.5% urban in one study](#))
- Timely CT scan/stroke response capacity does not exist [in rural settings](#)
- Very low rate of thrombolysis
 - o [Approx 100 centers](#) country-wide equipped for thrombolysis
- Indian National Stroke Guidelines contain reasonable recommendations, but the resources required to implement these are lacking

Global standard of care for stroke (high income settings)

- Time sensitive and resource dependent (that are difficult to implement in resource limited settings)
- Initial/hyperacute management is guided by CT imaging (to differentiate between ischaemic and haemorrhagic causes of stroke) □ determines ongoing management

Considerations for stroke care in India

- Healthcare system capacity
 - o Infrastructure required for
 - Hyperacute stroke management
 - Post-stroke inpatient care
 - Ongoing stroke rehabilitation
- Initial presentation may be delayed
 - o In a [case series of 524 stroke patients from Jaipur](#), Rajasthan, the mean presentation time was 26 hours post-symptom onset, and the mean distance between place of residence and hospital was 66km
 - o Only 10.3% of patients presented within 4 hours

Management of stroke of uncertain type (SOUT)

- [Treatment paradigm for stroke depends on aetiology](#)
- It is difficult to treat stroke without establishing cause
- Initiation of aspirin in first 48 hours after ischaemic acute stroke decreased risk of recurrent ischaemic stroke and in-hospital death compared to placebo
 - o [Subgroup analysis of the IST and CAST](#) studies showed no outcome difference in patients with haemorrhagic stroke who (inadvertently) received aspirin – but study not designed to assess this
- Implications: it [may be safe to give aspirin to SOUT, but this is unclear](#)
- Given the benefit seen in IST/CAST was when aspirin was initiated in first 24 hours, and highest risk of ICH expansion is in first 24 hours, [giving aspirin between 25 and 48 hours may be an option](#)



- However, these recommendations are made by physicians in high income countries
- What is the magnitude of benefit?

Initial Workup (Hyperacute Stage)

- Is there a CT scanner at your facility
 - o If yes, continue pathway
 - o If no, transfer to nearest centre with CT scanner
- Primary survey
 - o Airway, breathing, circulation
 - o Measure glucose (rule out hypoglycaemia)
 - o Oxygen saturation
 - o ECG (rule out arrhythmia)
- Lab tests
 - o If available: CBC, troponin, coagulation studies
- Establish time course
 - o If <4.5 hours, patient may be a candidate for **thrombolysis**
 - **INFO Box**
 - Establishing stroke onset is extremely important
 - If stroke symptoms have been present since awakening (i.e. “wake up stroke”) then assume onset of symptoms was when the patient was last seen well
 - Thrombolysis may be carefully considered in patients with severe stroke symptoms and if there is capability to deliver tissue plasminogen activator AND manage complications of thrombolysis
 - N.B. there is limited thrombolysis capability in India, and the vast majority of patients arrive outside of the thrombolysis window
 - o If >4.5 hours, patient is not a candidate for thrombolysis
- Have symptoms resolved?
 - o If yes, then treat as transient ischaemic attack (TIA) vs differential diagnosis
- Assess stroke severity
 - o [NIH Stroke Scale](#)
- It is **not** possible to differentiate between an ischaemic and haemorrhagic stroke without a CT scan
 - o Is there clinical evidence of raised ICP? If yes, suspect haemorrhagic stroke
- Is CT available?
 - o If yes: urgent CT brain to differentiate between ischaemic and haemorrhagic stroke
 - o If haemorrhagic stroke:
 - Reverse anticoagulation (if required)
 - [Blood pressure control](#):
 - If SBP > 220, then immediate treatment to reduce systolic BP below 220mmHg. Subsequent treatment over 1-2 hours to reduce systolic BP to 140-160 mmHg
 - If SBP between 150 and 220 mmHg, reduce SBP to 140 mmHg within 1 hour



- Transfer patient to higher centre for management
- If ischaemic stroke, start aspirin (300mg), atorvastatin (80mg daily)
 - Consider thrombolysis if available and within window
- Is thrombolysis available?
 - **Indications for thrombolysis**
 - Clinical diagnosis of ischaemic stroke causing measurable neurologic deficit
 - Onset of symptoms within 4.5 hours
 - Age \geq 18 years
 - **Contraindications to thrombolysis**
 - Mild, non-disabling stroke symptoms (NIHSS score 0-5 without disabling deficit)
 - Haemorrhagic stroke
 - Ischaemic stroke in the last 3 months
 - Severe head trauma within the last 3 months
 - Acute head trauma
 - Intracranial/intraspinal surgery in last 3 months
 - History of intracranial haemorrhage
 - Subarachnoid haemorrhage
 - GI malignancy or GI bleed within 21 days
 - Coagulopathy or recent therapeutic anticoagulation
 - Concomitant Abciximab
 - Concomitant IV aspirin
 - Infective endocarditis
 - Aortic arch dissection
 - Intra-axial intracranial neoplasm
 - Alteplase dose: Infuse 0.9 mg/kg (maximum dose 90 mg) over 60 min, with 10% of the dose given as a bolus over 1 min.
 - Ensure BP is $<$ 185/110 prior to alteplase
 - **Do not use streptokinase – Alteplase/tPA must be used**
- If haemorrhagic stroke, stop anticoagulation, consider transfer
- If patient is not being thrombolysed, [hypertension does not require acute management unless SBP \$>\$ 220](#)
- Consider need for transfer to higher centre/stroke unit (if available)
- If CT is not available:
 - Urgent transfer to nearest centre with stroke capability
 - The judicious use of aspirin in patients with stroke WITHOUT CT SCAN can be considered, based on subgroup analysis from major trials that suggests this may be safe
 - Blood pressure targets: If patient is not being thrombolysed, [hypertension does not require acute management unless SBP \$>\$ 220](#)
- Definitive investigations for stroke (likely requires transfer to higher centre)
 - CT brain + US carotids
 - If available, MRI/MR angio



- Cardiac monitoring (exclude cardiac cause) and echocardiogram
 - At least 24 hours of cardiac monitoring
 - If embolic phenomenon is suspected, prolonged external telemetry (Zio patch/ILR). To be contextualised
- If symptoms have resolved
 - TIA is defined as a transient episode of neurologic dysfunction caused by focal brain, spinal cord, or retinal ischemia, **without** acute infarction
 - Start aspirin **300mg** immediately (reversibility of symptoms suggested ischaemic cause, as haemorrhagic progress would not expect to be reversible)
 - Consider differential diagnosis:
 - Seizure, migraine with aura, syncope
 - Use ABCD2 score to estimate subsequent stroke risk
 - If ABCD2 < 4, start [aspirin monotherapy](#)
 - If ABCD2 ≥4, consider [dual antiplatelet therapy with clopidogrel for 21 days. If unavailable, aspirin monotherapy is acceptable](#)
 - Transfer to higher centre for ongoing workup

Inpatient Care

- To be completed at the district hospital
- [Stroke unit guidelines for India are available](#)

Prevention of recurrence/risk factor modification

- Smoking cessation
- Exercise/diet/alcohol
- Management of co-morbidities that increase risk of stroke
 - HTN
 - Diabetes
 - Atrial fibrillation (AF)
 - Hypercholesterolaemia
- If ischaemic stroke, commence antiplatelets and statin
- If stroke due to AF, commence anticoagulation (warfarin or DOAC)
- Measure H1bA1c

Stroke Rehabilitation and Ongoing Recovery

- Inpatient rehab
- Functional assessment
- Spasticity/contractures
- Falls risk
- Telehealth integration

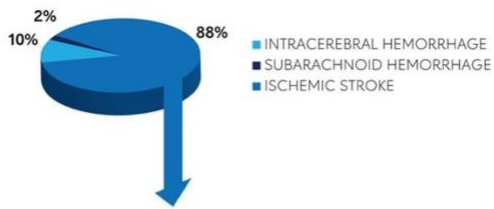
Points for contextualisation

- In high income settings, the majority of strokes are ischaemic in nature ([see AHA figure below](#))
 - Approx 88% of ischaemic stroke, 10% intracerebral haemorrhage, 2% subarachnoid haemorrhage

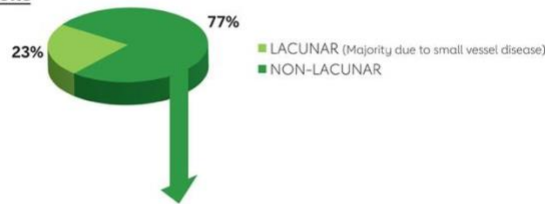


- Of these ischaemic strokes, 77% are non-lacunar and 23% are lacunar
- Is the epidemiology similar in India? Does this require further investigation?

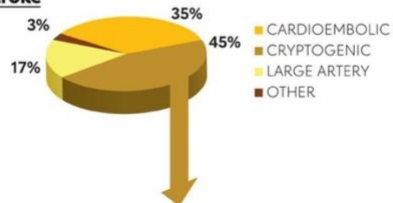
Stroke



Ischemic Stroke



Non-lacunar Stroke



Cryptogenic Stroke

