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
    - 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
    - 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
    - Infrastructure required for
        - Hyperacute stroke management
        - Post-stroke inpatient care
        - Ongoing stroke rehabilitation
- Initial presentation may be delayed
    - 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
    - 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
    - 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
    - If yes, continue pathway
    - If no, transfer to nearest centre with CT scanner
- Primary survey
    - Airway, breathing, circulation
    - Measure glucose (rule out hypoglycaemia)
    - Oxygen saturation
    - ECG (rule out arrhythmia)
- Lab tests
    - If available: CBC, troponin, coagulation studies
- Establish time course
    - 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
    - If >4.5 hours, patient is not a candidate for thrombolysis
- Have symptoms resolved?
    - If yes, then treat as transient ischaemic attack (TIA) vs differential diagnosis
- Assess stroke severity
    - NIH Stroke Scale
- It is **not** possible to differentiate between an ischaemic and haemorrhagic stroke without a CT scan
    - Is there clinical evidence of raised ICP? If yes, suspect haemorrhagic stroke
- Is CT available?
    - If yes: urgent CT brain to differentiate between ischaemic and haemorrhagic stroke
    - 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 ≥ 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?