Recognising a Stroke:

Face  Check their face. Has their mouth drooped?
Arms  Can they lift both arms?
Speech Is their speech slurred? Do they understand you?
Time  Time is critical.

www.strokefoundation.com.au

Transient Ischaemic Attack: TIA

- Sudden onset
- Focal neurological symptoms (anatomy - localising)
  - Negative loss of function
  - Maximal at onset
- Symptoms resolve within 24 hours
- RIND 24-72 hours and Stroke > 72 hours
- The distinction is probably “academic” as it is the cause that is important as treatment is needed

Approach to the patient with a Stroke:

- Is it a stroke? – Differential diagnosis
  - History, Examination, Investigations
- Where is the Stroke?
  - anatomical localisation
- What is the mechanism of the Stroke?
  - ischaemia, haemorrhage... why
- What treatment to prevent further events?

Approach to the patient:

Including but not exclusively:
- The patient:
  - occupation, social, recreational, domestic, supports
- Clinical history:
  - previous symptoms
  - onset, progression
  - symptoms to localise
  - fever, other systemic symptoms

Approach to the patient: 2

- Past Medical History:
  - vascular risk factors and vascular history
    - Smoking, BP, Cholesterol, Diabetes, Family History
    - Previous stroke / TIA
    - Cardiac problems (IHD, AMI, AF etc)
    - Procoagulant state,
      - other medical
      - miscarriages, DVT, malignancy,
- Medications: e.g
  - antiplatelet or ? stopped, warfarin interaction
  - NSAID added, PPI added to Clopidogrel?
Clinical cases:

With each case:

How would you manage the patient ...... ?

- Where is the lesion?
- What is the diagnosis?
- What investigations?
- What treatment?
  - medical treatment
  - nursing, allied health, social
  - other ... through to discharge

Mr A: 55 year old man

- Office worker

History:

- Sudden onset right sided weakness (leg> arm)
- Word finding difficulty and slurred speech
- Vomited x1, no headache
- otherwise recently well

Mr A: 55 year old man

PMH:
- Hypertension for 5-10 years, poor compliance
- Smoker 20/day for 40 years
- Previous duodenal ulcer - surgical repair
- Alcohol 6 standard drinks per day

Medications:
- nil

Examination:

- 150/105 - 170/108, sinus rhythm
- Alert, no visual field deficit, no visuospatial
- Right hemiparesis, 3/5 pyramidal
- Right sided hyper-reflexia and upgoing plantar
- Mild right hemisensory to pinprick

Mr A: Where is the lesion

Mr A: What is the lesion
Mr A: 55 year old man:

**What other investigations?**
- FBP: MCV 105fl (NL < 100)
- U & E: Normal
- LFTs:ALT 85 (<40), GGT 275 (<60)

**Fasting Lipids:**
- Cholesterol: 6.5 mmol/L (<5.0mmol/L)
- HDL Cholesterol: 1.6 mmol/L (>1.0mmol/L)
- LDL Cholesterol: 2.6 mmol/L (NL < 3mmol/L)
- Fasting BSL: 4.3 mmol/L

**Other**
- ECG: Normal
- Echo: Day 10

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**Mr A: 55 year old man**

**Treatment:**

- **Initial:**
  - Swallowing assessment
  - Bladder protocol
  - BP observations
  - Early mobilisations at 24 hours
- **Medical Treatment:**
  - BP 170/108 on admission and observed then commenced on Ramipril 2.5 mg mane
  - Atorvastatin 40mg

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**Mr B: 70 year old man**

**PMH:**
- AF on long term warfarin
- Occupational lung disease with fibrosis
- Osteoporosis
- Minimal alcohol (< 1 standard drink / day)
- Non smoker

**Medications:**
- Warfarin
- Inhalers
- Osteoporosis therapy

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**Mr B: 70 year old man**

**History:**
- Presented with sudden onset confusion and altered behaviour. Clothes on backwards, shoes on wrong foot.
- Recently had pneumonia treated with Ceftriaxone / Azithromycin followed by oral Amoxicillin / Clavullinic acid.

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**Mr B: 70 year old man**

**Examination:**
- 110/60, AF at 60 / minute

**Neurologically:**
- Alert, no visual field deficit,
- No hemiparesis deficit
- No hemisensory deficit
- Visuospatial.....
Mr B: Where / What is the lesion

Mr B: 70 year old man

What other investigations?
- FBP: Hb 120 g/L, WCC 20 x 10^9/L
- U & E, LFT: Normal
- INR: 1.8 (1.5 during recent illness)

Fasting Lipids:
- Cholesterol: 4.0 mmol/L (<5.0 mmol/L)
- HDL Cholesterol: 0.6 mmol/L (>1.0 mmol/L)
- LDL Cholesterol: 2.7 mmol/L (NL < 3 mmol/L)
- Fasting BSL: 4.4 mmol/L

Mr B: 70 year old man

What other investigations?
- ECG: AF
- Echo: Day 6
- Carotid dopplers: “Normal”
- MMSE: 22/30

Mr B: 70 year old man

Treatment:
- Initial:
  - Swallowing assessment
  - Bladder protocol
  - BP observations
  - Early mobilisations at 24 hours
- Medical Treatment:
  - Increased warfarin dose
    (2.5 mg baseline, single dose of 5 mg then 3 mg)
  - BP 110/60 on admission and observed
  - Atorvastatin 40 mg

Clinical predictors of ischaemic stroke in AF

<table>
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<tr>
<th>CHADS2 Score</th>
<th>Stroke rate per year%</th>
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<tr>
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Other Treatment:
- Ongoing Nursing care and therapy
- Ongoing Physiotherapy, OT, Speech therapy
- Plan issues related to:
  - domestic
  - Social
  - supports
Mr C: 70 year old man

Retired

History:
- Presented with sudden onset left sided facial droop and left arm and leg weakness.
- Otherwise recently well

PMH:
- Right leg BKA and prosthesis secondary to trauma
- COPD
- Ex-smoker: 50 pack/year history
- Hypercholesterolaemia
- Alcohol excess: 10 standard drinks / day

Medications:
- Aspirin
- Seretide inhaler
- Simvastatin

Examination:
- 145/90 sinus rhythm at 60 / minute
- Alert, no visual field deficit,
- Mild left facial weakness
- Arm 4/5 pyramidal weakness, (minimal leg)
- Mild left sided hyperreflexia, upgoing plantar
- Normal sensation

Investigation of Ischaemic Stroke:
- Cortical stroke is usually embolic
- Usually related to vascular risk factors
- Carotid disease
- Carotid disease
- Carotid disease
- Carotid disease

Investigate:
- Carotids
- Carotid doppler
- CT angiography
- Echocardiography
- Holter monitor (AF)
- +/- TOE
Mr C: 70 year old man

What other investigations?
- FBP: Hb 90 g/L, MCV 90 fl, Platelets 613 (NL < 400)
- U & E, LFT: Normal
- INR: 1.1
- Fasting Lipids:
  - Cholesterol: 5.1 mmol/L (<5.0mmol/L)
  - HDL Cholesterol: 0.8 mmol/L (>1.0mmol/L)
  - LDL Cholesterol: 3.2 mmol/L (NL < 3mmol/L)
  - Fasting BSL: 5.4 mmol/L (NL < 5.4 mmol/L)

Mr C: 70 year old man

What other investigations?
- ECG: NL
- Echo: report to follow (10 working days)
- Carotid Dopplers:
  - Right ICA stenosis: 80-90%, Left 50%
- Endoscopy:
  - Large gastric ulcer ? carcinoma

Mr C: What is the cause?

- ECG: NL
- Echo: report to follow (10 working days)
- Carotid Dopplers:
  - Right ICA stenosis: 80-90%, Left 50%
- Endoscopy:
  - Large gastric ulcer ? carcinoma

Mr C: 70 year old man

Treatment:
- Initial:
  - Swallowing assessment
  - Bladder protocol
  - BP observations
  - Early mobilisations at 24 hours
- Medical Treatment:
  - Clopidogrel added to Aspirin (high platelets / anaemia)
  - Continued statin
  - Added Pantoprazole (NB Clopidogrel)

Mr C: 70 year old man

Other Treatment:
- Carotid stent
- Sclerotherapy to ulcer ? Needs surgery
- Ongoing Nursing care and therapy
- Ongoing Physiotherapy, OT, Speech therapy
- Plan issues related to:
  - domestic
  - Social
  - supports

Carotid disease:

- Asymptomatic stenosis:
  - Aggressive management of vascular risk factors
- Symptomatic Carotid Stenosis
  - Aggressive management of vascular risk factors
  - Intervention if symptomatic and > 70%
  - Some benefit for men with > 50% and non ocular
  - Benefit of intervention greatest in first 2 weeks
  - Need to operate on 8 carotids > 70% to prevent one stroke at 2 years
Mr D: 60 year old man

Retired

History:
- Presented with sudden onset right sided weakness, face, arm and leg weak.
- Otherwise recently well

PMH:
- PTSD
- Smoker: 30/day
- Alcohol excess: 6 standard drinks / day

Family History: Brother and Sister IHD in 50s

Medications:
- Venlafaxine

Examination:
- 160/90 sinus rhythm at 60 / minute

Neurologically:
- Alert, no visual field deficit,
- Mild right facial weakness
- Right hemiparesis 4/5 pyramidal weakness
- No hemisensory deficit

Investigation of Ischaemic Stroke:
- Cortical stroke is usually embolic
- Carotid disease

Investigate:
- Carotids
- Carotid doppler
- CT angiography
- Heart echocardiography
- Holter monitor (AF)
- +/- TOE
Mr D: 60 year old man

What other investigations?
- FBP, U & E, LFT: Normal
- INR: 1.0

Fasting Lipids:
- Cholesterol: 5.9 mmol/L (<5.0 mmol/L)
- HDL Cholesterol: 1.0 mmol/L (>1.0 mmol/L)
- LDL Cholesterol: 3.4 mmol/L (NL < 3 mmol/L)
- Fasting BSL: 6.5 mmol/L (NL < 5.4 mmol/L)

What other investigations?
- ECG: NL
- Echo: mild LV dilatation
- Carotid Dopplers:
  - Few plaques, no stenosis

Mr D: 60 year old man

Treatment:
- Initial:
  - Swallowing assessment
  - Bladder protocol
  - BP observations
  - Early mobilisations at 24 hours
- Medical Treatment:
  - Aspirin
  - Commenced on Atorvastatin 40 mg/day
  - BP was 160/90 commenced on Ramipril 2.5 mg per day

Hypertension:
Reducing SBP by 8 mmHg and DBP by 4 mmHg
- reduces risk of recurrent stroke by 25%
- reduces risk of all vascular events by 20%
Benefits for all stroke types
Lower BP to ? 130/70 if tolerated (cerebral perfusion)
Which drug? any but side effects e.g B Blockers
Primary and Secondary prevention

Statins:
Reducing LDL by 1 mmol
- reduces risk of recurrent ischaemic stroke by 17%
- reduces risk of all vascular events by 20%
? Avoid in haemorrhagic strokes
? Greater reduction is better
? Earlier is better

Antiplatelet:
- Aspirin
  - NB – effect of NSAIDs
- Clopidogrel
  - NB – effect of PPIs
- Asasantin
- Caution with Combinations:
Mr D: 60 year old man
Other Treatment:
- Smoking cessation
- Ongoing Nursing care and therapy
- Ongoing Physiotherapy, OT, Speech therapy
- Plan issues related to:
  - Domestic / driving
  - Social
  - supports

Mr E: 70 year old man
Retired
History:
- Presented with sudden onset headache, vomiting and right sided clumsiness with unsteadiness.
- Otherwise recently well

Mr E: 70 year old man
Examination:
- 150/90 sinus rhythm at 68/ minute

Neurologically:
- Mildly drowsy, no visual field deficit,
- Normal power and sensation
- Right hemiataxia

Mr E: 70 year old man
PMH:
- Hypertension
- IHD

Medications:
- Aspirin
- Perindopril

The reason to distinguish carotid from vertebrobasilar ischaemic events is if it is carotid revascularisation may be considered.

Symptoms that mainly occur with Carotid disease:
- Monocular blindness
- Dysphasia

Symptoms that indicate posterior circulation disease:
- Diplopia
- Vertigo / “ataxia”
- Bilateral weakness
- Bilateral sensory loss
- Crossed signs

Mr E: Where / What is the lesion
Mr E: 70 year old man

Treatment:
- Initial:
  - Swallowing assessment
  - Bladder protocol
  - BP observations
  - Hourly FNOs
- Medical Treatment:
  - Clopidogrel added to Aspirin
  - Transfer to RPH
  - Neurosurgery consult

Who to Transfer?

Consider:
- acute stroke ? thrombolytic therapy *
- large intra-cerebral haemorrhage / stroke ? decompressive craniectomy *
- cerebellar infarction or posterior fossa stroke
- younger patients
- cases where neurological diagnosis is unclear and further diagnostic advanced workup is required
  * see protocols

Mr E: Outcome

Stroke:
Effectiveness of intervention (NNT)
- Aspirin 100
- Clopidogrel/Asasantin 80
- Hypertension management 50
- Smoking cessation 43
- Carotid stenosis (>70% symptomatic) 24
- Stroke unit care 18
- Anticoagulation in Atrial fibrillation 12
- Acute thrombolysis 8

ED Triage and Assessment of Acute Stroke:

If a patient presents with any of the symptoms below with duration of less than 4 hours and an acute stroke is suspected, the patient should be triaged as Level 2.

Sudden onset of any of the following symptoms:
- Facial weakness
- Arm Weakness
- Speech disturbance (Aphasia / Dysarthria)
- Hemiparesis or hemisensory disturbance
- Ataxia
- Diplopia / Visual loss

ACTION
- To be seen by a doctor within 10 minutes

Emergency Department Staff:
(thinking of TPA) – see protocol

- “ABCs”
- Contact Stroke team early to assist in / facilitate acute management
- Vital signs: temperature, blood pressure, heart rhythm and rate
- Order urgent plain CT head
- IV access - FBP, Finger prick Dextrostix, COAGS, BSL, U+E, Gp and hold (Only results of platelet count and BSL are required prior to tPA unless the patient is on Warfarin)
- ECG (do not delay CT for this)
- Consider CXR but do not delay CT or tPA
- Ask family to stay and be available to Stroke team
**Stroke team staff:**

1. Confirm time of onset and review history
   - tPA indicated less than 3 hours (? 4.5 hours)
2. Review checklist for thrombolysis eligibility
3. Focussed neurological examination using National Institutes of Health Stroke Scale
4. Accompany patient to CT and continue assessment if necessary, then review CT

**Eligibility criteria for IV tPA < 3 hours**

1. Onset of ischaemic stroke <3 hours
2. Measurable and significant deficit (>4) on NIHSS
3. Patient's CT does not show haemorrhage or nonvascular cause of stroke
   (Subtle signs of ischaemia on CT scan are not an absolute contraindication to tPA but may be associated with an increased risk of intracranial haemorrhage with tPA treatment.)
4. Patient’s age is >18 years and < 80 years

**tPA Contraindications – ABSOLUTE**

1. Uncertainty about time of stroke onset
2. Very Large stroke (? NIHSS > 22)
3. SBP ≥ 180mmHg; or DBP >110mmHg (can treat – then OK)
4. Clinical presentation suggestive of SAH even if normal CT
5. Presumed septic embolus
6. Heparin within 48 hours and elevated APTT or known haemorrhagic diathesis (Lupus anticoagulant OK)
7. INR >1.7
8. Known advanced liver disease, advanced right heart failure, or anticoagulation, and INR > 1.4 (no need to wait for INR result in the absence of these conditions)
9. Known platelet count <100,000 uL
10. Serum glucose is < 2.8mmol/l or >22.0 mmol/l

**tPA Contraindications – Relative**

1. Risk of bleeding > benefit
   e.g recent surgery or head injury
2. Very Large stroke on CT scan
3. Rapidly improving deficit
4. Seizure – in case Todd's paresis, unless seizure secondary to the stroke.

**Post TPA care:**

- Admit to ICU/ HAD or Stroke unit with 1:1 nursing for 8 hours.
- Neuro obs and BP every 15 minutes during the infusion of tPA, every 30 minutes for next 6 hours, then hourly until 24 hours
- If the patient develops severe headache, acute hypertension, nausea, or vomiting, cease infusion and obtain urgent CT head
- If diastolic blood pressure 110mmHg or systolic blood pressure exceeds 180 mmHg, follow unit protocols for post stroke hypertension. e.g GTN infusion

**Post TPA care 2**

- No catheterisation of bladder within 90 minutes after starting tPA. Avoid until 8 hours post tPA infusion if patient not already catheterised
- Leave IV cannula insitu for blood collection. If venopuncture required, apply direct pressure to the site for 20 minutes
- Avoid NGT insertion until 8 hours post tPA infusion
- No antiplatelet therapy or anticoagulants within 24 hours after starting tPA
Counselling of Patients and Families

There are many ways of expressing the benefits and risks:

IV Recombinant tPA has been shown to improve functional outcome in selected patients if given within 3 hours of onset of symptoms, despite an increased risk of intracranial haemorrhage.

The benefit is greater the earlier thrombolysis is given.

Time to treatment is an important factor in defining outcome. This can be expressed as the number needed to treat to achieve an excellent neurological outcome (defined as a Modified Rankin score at 3 months of 0 or 1 ie independence).

\[
\begin{align*}
\text{Time to treatment:} & \\
\text{Number needed to treat for significantly improved outcome}^* & \\
< 90 \text{ minutes} & 3 \text{ patients} \\
< 180 \text{ minutes} & 8 \text{ patients} \\
< 279 \text{ minutes} & 14 \text{ patients} \\
\end{align*}
\]

*Note: the NNT quoted already takes account of the haemorrhages

Assoc Professor David Blacker (personal communication)

Suspect intracranial haemorrhage

- Stop infusion immediately
- Immediate CT scan
- Draw blood – urgent PT, PTT, FBC and fibrinogen
- If CT confirms haemorrhage:
  - Contact haematologist, inform neurosurgeon
  - FFP 10-20 ml/kg (if PT, PTT prolonged)
  - Cryoprecipitate 1-2 units/10 kg (if fibrinogen < 1)
  - Platelets 6-8 units

What are the components of effective stroke unit care?

- Peter Langhorne, Alex Pollock in conjunction with The Stroke Unit ‘Studet’ Collaboration

  Age and Ageing 2002; 31: 365–371

i) assessment procedures
- medical, nursing and therapy assessments

ii) early management policies
- early mobilization; avoidance of urinary catheterization;
  treatment of hypoxia, hyperglycaemia and suspected infection, oral intake management

iii) ongoing rehabilitation policies
- co-ordinated multidisciplinary team care, early assessment for discharge

Orololingual Angiooedema*

- (swollen lips or tongue, dyspnoea)
- Stop alteplase infusion
- Phenergan 25 mg IM
- Ranitidine 50 mg IV
- Hydrocortisone 200 mg IV
- Observe vital signs for signs of progression, dyspnoea, anaphylactic shock

*More likely if patient is on ACEI
*Adrenaline less effective and BP concerns
*If sx are mild and non-progressive, alteplase can be restarted under close observation

Khaja, Lancet 2007; 368:318-330

Bringing it down to the individual

NNH for worsened outcome by any degree attributable to t-PA related SICH is 29.7 – 40.1

For 100 treated ~3 patients will have worsened outcome

NNT for better outcome by any degree is 3.1

For 100 treated ~32 will benefit

LHH Likelihood of being helped vs harmed

LHH = NNH/NNT = 10

t-PA is 10 times more likely to help than harm eligible patients