ACUTE STROKE

Acute stroke is a medical emergency. Appropriate initial management can reduce disability and mortality resulting from stroke.

Patient presenting to hospital with suspected stroke should receive:

- **Complete Rapid initial stroke screen (ROSIER SCALE)** - see Table 1. Beware stroke mimics—see Table 2.
- **Urgent CT** - see TBHSG Stroke & TIA 72 hour clinical pathway for management of CT findings.
- **Is there an acute neurosurgical emergency? E.g. ICH/SAH/SDH. Discuss with GCUH Neurosurgery.**
- **Assess eligibility for thrombolysis including inclusion and exclusion criteria.**
- **Consult with GCUH neurologist on call.** See thrombolysis in stroke guideline from GCUH or LBH.

<table>
<thead>
<tr>
<th><strong>ECG</strong></th>
<th>see table 4.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Pathology</strong></td>
<td>FBE, serum electrolytes, serum glucose, renal function, troponin I. Consider coagulation studies, ESR or CRP, lipid studies. Only time critical pathology required before thrombolysis - glucose and platelet count. Include INR if patient on warfarin or suspected coagulopathy.</td>
</tr>
<tr>
<td><strong>Nil by mouth until bedside swallow screen (ASSIST)</strong></td>
<td>Assist = acute swallow screen in stroke and TIA</td>
</tr>
<tr>
<td><strong>Aspirin as soon as possible (within 48 hours and after cleared by swallow screen)</strong></td>
<td>AFTER haemorrhage excluded on CT scan and patient not a candidate for thrombolysis (withdraw aspirin for 24 hours after giving thrombolysis and commence after follow up imaging excludes haemorrhage).</td>
</tr>
<tr>
<td><strong>Carotid Vessel Imaging</strong> (e.g. CTA, MRA, Doppler US). Perform for patients with carotid territory symptoms where large artery disease is suspected.</td>
<td>Carotid surgery is most beneficial early after non-severely disabling stroke. Should be undertaken as part of the initial diagnostic workup in selected patients.</td>
</tr>
<tr>
<td><strong>ABCD2 assessment when TIA suspected.</strong></td>
<td>See Table 8.</td>
</tr>
<tr>
<td><strong>CHA2DS2-VASc assessment in patient with non-valvular atrial fibrillation.</strong></td>
<td>See Table 9.</td>
</tr>
</tbody>
</table>

**Tweed Hospital currently (2017) has**
- Stroke unit with stroke coordinator
- Neurologist—VMO for consultations

**Tweed Hospital does not have**
- On call acute stroke team.
- Neurosurgeon on site

There is no evidence to support the safety or effectiveness of thrombolysing then transferring patients to another hospitals.

**Physiological monitoring and management:**
- Neurological status
- Blood glucose
- Blood pressure
- Hydration status
- Temperature
Table 1: Rosier stroke screen tool:
ED staff should use a validated stroke screen tool (ROSIER) to assist in rapid accurate clinical assessment for all people with suspected stroke. Helps exclude stroke mimics (see table 2)

Table 2: Stroke Mimics
Clinicians disagree on the clinical diagnosis of stroke (versus stroke mimic) in about 20% of patients.
- Neurological
  - Seizures/postictal state
  - Complicated/hemiplegic migraine
  - Subdural haematoma
  - Abscess
  - Cerebral tumours/malignancy
  - Hypertensive Encephalopathy
  - MS or other demyelinating process
  - Vertigo
  - Cranial and peripheral neuropathies
  - Spinal cord or disc disease
  - Transient global amnesia
  - Bell’s palsy
  - Encephalitis
- Metabolic Disorders
  - Hypoglycaemia
  - Hyperglycaemia
  - Hyponatraemia
  - Hepatic encephalopathy
  - Drug overdose
- Psychiatric
  - Conversion Syndromes
  - Malingering
- Sepsis
- Other - syncope

Table 3: Glasgow Coma Scale

<table>
<thead>
<tr>
<th>Best Eye Response (E)</th>
<th>Best Verbal Response (V)</th>
<th>Best Motor Response (M)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. No eye opening</td>
<td>1. No verbal response</td>
<td>1. No motor response</td>
</tr>
<tr>
<td>2. Eye opening to pain</td>
<td>2. Incomprehensible sounds</td>
<td>2. Extension to pain</td>
</tr>
<tr>
<td>3. Eye opening to verbal command</td>
<td>3. Intelligible but inappropriate words</td>
<td>3. Flexion to pain</td>
</tr>
<tr>
<td>5. Oriented</td>
<td>5. Localizing pain</td>
<td>5. Obey commands</td>
</tr>
</tbody>
</table>

Acute stroke can occur simultaneously with acute myocardial infarction.

All patients require initial ECG, cardiac monitoring and assessment.
### ACUTE STROKE

Table 5: NNSW LDH Stroke & TIA 72 hours Clinical Pathway (ED part of)
- Flow diagram for management of CT abnormalities (see pathway for more information).
- ED part must be completed in ED and pathway kept as part of the patient medical record to allow documentation for inpatient ward.

#### NURSING

<table>
<thead>
<tr>
<th>NURSING</th>
<th>DAY 1: ED</th>
<th>Please circle</th>
<th>Comments</th>
<th>Name &amp; Signature</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assessment and Monitoring</td>
<td>O2H HR &amp; BP. Notify MO if BP &gt;200-220/110 for ischemic stroke and &gt;180/100 for ICH. Avoid hypotension (&lt;100/60)</td>
<td>Y / N</td>
<td>Y / N</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Admission BGL then Q6h, inform MO if &gt;10mmol/L</td>
<td>Y / N</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Strict NBM until swallow assessment by Speech Pathologist or Consultant review</td>
<td>Y / N</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Position HOB &gt;30° to prevent aspiration</td>
<td>Y / N</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Assess and maintain adequate hydration, IVF if NBM or dehydrated</td>
<td>Y / N</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Fluid balance chart maintained</td>
<td>Y / N</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Upright positioning for all meals</td>
<td>Y / N</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Requires assistential supervision with meals</td>
<td>Y / N</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Manual handling devices used</td>
<td>Y / N</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pressure area care performed, Q2-3h.</td>
<td>Y / N</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Assess urinary function &amp; establish toileting regime. IDC for retention only. Please circle: Continent/ Incontinent. Pads/ IDC/ Others:</td>
<td>Y / N</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Eye care performed, Q4h if JLOC</td>
<td>Y / N</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Oral care performed, Q2h oral care if NBM</td>
<td>Y / N</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### MEDICAL

<table>
<thead>
<tr>
<th>MEDICAL</th>
<th>DAY 1: ED</th>
<th>Please Circle</th>
<th>Comments</th>
<th>Name &amp; Signature</th>
</tr>
</thead>
<tbody>
<tr>
<td>Investigation</td>
<td>Consider consult from GCUH</td>
<td>Y / N</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>NBM until Speech Pathology review in business hours</td>
<td>Y / N</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Commence IVF</td>
<td>Y / N</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Aspirin (for ischemic strokes) unless CI</td>
<td>Y / N</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Continuous O2 @ 2L via NP unless CI</td>
<td>Y / N</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Assess BP parameters &amp; medication for HTN</td>
<td>Y / N</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>CXR</td>
<td>Y / N</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>CT brain</td>
<td>Y / N</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>ECG, Telemetry(för 48hrs), TTE</td>
<td>Y / N</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>FBC, UCE, glucose</td>
<td>Y / N</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Manage BGL &gt;10mmol/L</td>
<td>Y / N</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Consider saphic screen if temp above 38.0</td>
<td>Y / N</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Condition explained to patient &amp; family</td>
<td>Y / N</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Allied Health order set** found by going into orders on the stroke / TIA patient.
Type “TTH Stroke” in search box ->

Click TTH Allied Health Major Stroke—this order set appears ————> Sign order
- will request consult physio to fill out reason for consult
- will request consult stroke coordinator—your phone/page number & reason for consult.
### ACUTE STROKE

#### COMMON PATTERNS OF NEUROLOGICAL ABNORMALITIES

<table>
<thead>
<tr>
<th>LEFT (DOMINANT) HEMISPHERE</th>
<th>RIGHT (NON DOMINANT) HEMISPHERE</th>
<th>BRAIN STEM/CEREBELLAR/POSTERIOR HEMISPHERE</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Aphasia</td>
<td>• Motor or sensory loss in all limbs</td>
<td>• Crossed signs</td>
</tr>
<tr>
<td>• Rt hemiparesis</td>
<td>• Lt sided neglect</td>
<td>• Limb or gait ataxia</td>
</tr>
<tr>
<td>• Rt sided sensory loss</td>
<td>• Lt sided visual field deficit</td>
<td>• Dysarthria</td>
</tr>
<tr>
<td></td>
<td>• Lt Hemiparesis</td>
<td>• Dysconjugate gaze</td>
</tr>
<tr>
<td></td>
<td>• Lt sided sensory loss</td>
<td>• Nystagmus</td>
</tr>
<tr>
<td></td>
<td>• Poor Lt conjugate gaze</td>
<td>• Amnesia</td>
</tr>
<tr>
<td></td>
<td>• Dysarthria</td>
<td>• Bilateral field defects</td>
</tr>
<tr>
<td></td>
<td>• Spatial disorientation</td>
<td></td>
</tr>
</tbody>
</table>

**SMALL SUBCORTICAL HEMISPHERE OR BRAIN STEM (PURE MOTOR STROKE)**

- Weakness of face and limbs on one side of body
- Intact higher functions
- Intact sensation
- Intact vision

**SMALL SUBCORTICAL HEMISPHERE OR BRAIN STEM (PURE SENSORY STROKE)**

- Decreased sensation of face and limbs on one side of body
- Intact higher functions
- Intact sensation
- Intact vision

### Table 6: Diagnostic Imaging: CT scan

**ALL PATIENTS REQUIRE A NON CONTRAST BRAIN CT**

- Brain CT is available 24 hours/7 days.
- CT technician on site from 0800 to 2400 hours daily.
- Out of hours brain CT scan should be performed immediately (within one hour) if there are:
  - Indications for thrombolysis or early anticoagulation treatment.
  - Patient on anticoagulant.
  - Patient has known bleeding tendency.
  - Depressed level of consciousness.
  - Progressive fluctuating symptoms.
  - Papilloedema.
  - Neck stiffness.
  - Fever.
  - Severe headache at symptom onset.

If patient meets criteria for thrombolysis (time critical <4.5 hours) and suspected stroke - order CT perfusion.
- Notify Radiology department that have time critical CT. Must make CT scanner available.
- CT perfusion requires contrast but do not wait for renal function. This is an emergency scan.
- FACEM notification and approval is required if CT perfusion ordered.
- If CT perfusion indicates thrombolysis would be beneficial for patient, there are no contraindications and thrombolysis over clot retrieval by interventional radiologist is not the preferred option and available, then proceed to thrombolysis. See thrombolysis in stroke guideline.
ACUTE STROKE

Table 7: INTERPRETING THE CT SCAN

- Clinicians disagree on the clinical diagnosis of stroke (vs stroke mimic) in about 20% of patients. Brain imaging can help discriminate ischaemic stroke from haemorrhagic stroke and stroke mimics and should be performed urgently to differentiate so appropriate treatment can be initiated.
- Brain CT is the modality of choice for the initial brain scan.
- Brain CT can provide information on:
  - Ischaemic penumbra
  - Early signs of oedema, hydrocephalus, hypodensity usually indicates:
    - Severe injury
    - Poor outcome
    - High risk of Haemorrhagic transformation
  - Early ischaemic changes such as mass effect from oedema, middle cerebral artery embolic material, other vascular lesions and prior cerebral infarctions.
- A CT scan can miss a small SAH. The absence of blood strongly supports the diagnosis of an ischaemic stroke. If SAH is strongly suspected a LP should be undertaken.

CT perfusion in ischaemic stroke [A.Prof Frank Gaillard et al. Radiopedia]
Differentiation of salvageable ischaemic brain tissue (the penumbra) from irrevocably damaged infarcted brain (the infarct core). This is useful when assessing a patient for treatment (thrombolysis or clot retrieval).

The three parameters typically used in determining these two areas are:
1. Mean transit time (MTT) or time to peak (TTP) of the deconvolved tissue residue function (Tmax) 3
2. Cerebral blood flow (CBF)
3. Cerebral blood volume (CBV)

Normal perfusion parameters are:
- Gray matter
  - MTT: 4 s
  - CBF: 60 mL/100 g/min
  - CBV: 4 mL/100 g
- White matter
  - MTT: 4.8 s
  - CBF: 25 mL/100 g/min
  - CBV: 2 mL/100 g

The infarct core is the part of the ischaemic brain which has already infarcted or is destined to infarct regardless of therapy. It is defined as an area with prolonged MTT or Tmax, markedly decreased CBF and markedly reduced CBV. Note, that if one uses CBF alone to visually assess core size, it is easy to overestimate infarct core, as the penumbra often has reduced CBF also.

The ischaemic penumbra, which in most cases surrounds the infarct core, also has prolonged MTT or Tmax but in contrast has only moderately reduced CBF and, importantly, near normal or even increased CBV (due to autoregulatory vasodilatation).

Practical points
In patients with poor cardiac output, atrial fibrillation, severe proximal arterial stenosis or poor placement of arterial and venous density regions of interest, the decreased blood flow can lead to inaccurate perfusion maps and specifically to overestimated MTT (i.e. erroneous diagnosis of extensive ischaemia or global hypoperfusion) and underestimated CBF.
Most CT perfusion protocols are centred upon the basal ganglia and supra-ganglionic level. This excludes a large volume of brain, e.g. the posterior fossa and superior cerebral hemispheres.
Small infarcts (e.g. lacunar infarcts) are poorly visualised on perfusion maps due to their low resolution.
In cases of seizures, the ictal region shows hyperperfusion, which may lead to an interpretation of hypoperfusion in the contralateral hemisphere mimicking infarct.

Summary
The CBV, and to a lesser extent CBF, differentiates penumbra and core infarct:
- Core
  - increased MTT/Tmax
  - markedly decreased CBF
  - markedly decreased CBV
- Penumbra
  - increased MTT/Tmax
  - moderately reduced CBF
  - near normal or increased CBV
ACUTE STROKE

Table 8: ABCD²

Initial evaluation of suspected TIA and minor (ie, nondisabling) ischemic stroke includes a risk assessment such as ABCD² to determine STROKE RISK after TIA (see below)

All patients with suspected TIA should have a full assessment that includes assessment of stroke risk using the ABCD² tool at initial point of health care contact.

TIA and minor stroke patients are at high risk of subsequent stroke, with up to 10% suffering a stroke within the following 48 hours (2.5-5% at 2 days; 5-10% at 30 days; 10-20% at 90 days). Efficiency and accuracy of TIA diagnosis and management in the ED is important in reducing the incidence of subsequent stroke.

<table>
<thead>
<tr>
<th>Risk Factor</th>
<th>Points</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td></td>
<td></td>
</tr>
<tr>
<td>≥ 60 years</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Blood pressure</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Systolic BP ≥ 140 mm Hg OR Diastolic BP ≥ 90 mm Hg</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Clinical features of TIA (choose one)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unilateral weakness with or without speech impairment OR</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Speech Impairment without unilateral weakness</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Duration</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TIA duration ≥ 60 minutes</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>TIA duration 10-59 minutes</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Diabetes</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td><strong>Total ABCD² score</strong></td>
<td>0-7</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ABCD² score</th>
<th>2 day stroke risk</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-3</td>
<td>1.0%</td>
<td><strong>Low risk patient.</strong> Should have CT brain and carotid ultrasound (where indicated) as soon as possible but within 48-72 hours unless there is another indication (e.g. new atrial fibrillation)</td>
</tr>
<tr>
<td>4-5</td>
<td>4.1%</td>
<td><strong>Moderate risk patient.</strong> Admit to facilitate rapid assessment, early therapy and secondary prevention. Urgent brain imaging as soon as possible but within 24 hours. Carotid artery Doppler imaging within 48 hours.</td>
</tr>
<tr>
<td>6-7</td>
<td>8.1%</td>
<td><strong>High risk patient.</strong> Admit to facilitate rapid assessment, early therapy and secondary prevention. Urgent brain imaging as soon as possible but within 24 hours. Carotid artery Doppler imaging within 48 hours.</td>
</tr>
</tbody>
</table>
ACUTE STROKE

Table 9: CHA$_2$DS$_2$VASc  Stroke/TIA and atrial fibrillation

Among patients with non-valvular AF, the risk of ischaemic stroke averages 5% per year (range, 3%–8%), about 3–5 times that of people in sinus rhythm. CHA$_2$DS$_2$VASc score estimates stroke risk in non-valvular AF. The threshold of stroke risk where the benefit of anticoagulation exceeds the risk is controversial, but is somewhere between 3% and 5% per year, depending on the bleeding risks and preferences of the patient. This equates to a CHA$_2$DS$_2$VASc score of ≥2. Patients with a CHA$_2$DS$_2$VASc=0 do not require anticoagulation, and can be managed with aspirin 81–325 mg. If intolerant to aspirin can use clopidogrel 75mg daily. Recommendations for CHADS$_2$=1 either aspirin or anticoagulation (with warfarin, dabigatran, rivaroxaban or apixaban) may be used.

Valvular AF (e.g. rheumatic mitral valve disease) carries a 17-fold increased risk of stroke and requires anticoagulation with warfarin.

Patients commenced on warfarin, dabigatran, rivaroxaban or apixaban must have clear instructions for use, education, consumer medication information and follow-up.

<table>
<thead>
<tr>
<th>CHA$_2$DS$_2$VASc: stroke risk assessment in people with non-valvular AF</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Congestive Heart Failure (signs/symptoms of heart failure confirmed with objective evidence of cardiac dysfunction)</td>
<td>+1</td>
</tr>
<tr>
<td>Hypertension (resting BP&gt;140/90mmHg ≥ 2 occasions or current antihypertensive medication)</td>
<td>+1</td>
</tr>
<tr>
<td>Age ≥ 75 years</td>
<td>+2</td>
</tr>
<tr>
<td>Diabetes mellitus (fasting glucose &gt; 7mmol/L)</td>
<td>+1</td>
</tr>
<tr>
<td>Stroke, TIA, or thromboembolism (including any history of cerebral ischaemia)</td>
<td>+2</td>
</tr>
<tr>
<td>Vascular disease (prior MI, peripheral arterial disease, or aortic plaque)</td>
<td>+1</td>
</tr>
<tr>
<td>Age 65 to 74 years</td>
<td>+1</td>
</tr>
<tr>
<td>Sex Category (female) - female gender confers higher risk</td>
<td>+1</td>
</tr>
</tbody>
</table>

Stroke risk based on CHA$_2$DS$_2$VASc score (use calculator to determine score and to provide more detail)

<table>
<thead>
<tr>
<th>Total CHA$_2$DS$_2$VASc score</th>
<th>Risk of Stroke</th>
<th>Recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Low</td>
<td>No treatment</td>
</tr>
<tr>
<td>1</td>
<td>Moderate</td>
<td>Antiplatelet or oral anticoagulant Note: if the 1 point is for female sex then this is a weak predictor and no treatment is required.</td>
</tr>
<tr>
<td>2-9</td>
<td>High</td>
<td>Oral anticoagulant</td>
</tr>
</tbody>
</table>

Note: if commencing oral anticoagulant then use HASBLED score to also determine bleeding risk vs benefit from anticoagulation and discuss with patient.
ACUTE STROKE

MEDICAL MANAGEMENT

- **Antithrombotic therapy**
  - **Atherothrombotic TIA:** daily long-term antiplatelet therapy such as Asasantin SR (combination extended-release dipyridamole plus aspirin)-first choice, clopidogrel or aspirin alone. Anticoagulation is not recommended.
  - **Cardioembolic TIA:** see management of stroke/TIA with atrial fibrillation (Table 9).
- **Hypertension:** In general, blood pressure lowering should be avoided in the acute phase of stroke (first 48 hours); exceptions may include patients with malignant hypertension, hypertensive encephalopathy or those receiving alteplase. In the longer term lower BP to < 140/90 or < 130/80 for diabetics, with ACE inhibitor alone or in combination with a diuretic, or with an angiotensin-receptor blocker.
- **Lipids:** Initiate a daily statin. Goal LDL-cholesterol level < 2.9 mmol/L
- **Smoking:** initiate cessation program.
- **Diabetes:** Fasting blood glucose goal < 7 mmol/L
- **Physical activity:** Recommend ≥ 10 min of exercise such as walking, bicycling, running or swimming ≥ 3 times/week.

WHEN DO YOU LOWER BP?  (Always consult with Emergency Physician)

Withhold antihypertensive therapy till MAP > 130 or systolic > 220 mmHg.

If antihypertensive treatment required, aim to decrease MAP by 20—25% over 6—12 hours. Oral therapy is preferred whenever possible.

### ORAL THERAPY

- **Labetalol**
  - 200 mg orally every 6 hours

### PARENTERIAL TREATMENT

- **Nitroprusside**
  - Start at 0.2—0.5 mcg/kg/min increasing every 5 minutes to max 8 mcg/kg/min
  - * Needs arterial pressure monitoring

**AVOID SUBLINGUAL CALCIUM ANTAGONISTS**

- If hypotension presents it is usually due to volume depletion.
- Identify and correct cause.
- Intravenous fluids are usually required.
- Vasopressors may be needed.
- Identify causes of fever if present.
- Administer antipyretics.
- Don’t forget to check blood glucose level

Acute treatment with antithrombotic or antiplatelet drugs should only be started in the ED after specialist consultation
Supportive care starts in the ED

- Optimum nursing care
- Frequent reassessment of vital signs and neurological status.
  - Hourly neuro obs and cardiac monitoring in ED.
  - As inpatient - hourly neuro obs and telemetry for first 24.
- Early assessment of nutritional status and swallowing ability
  - If swallowing impaired OR
  - Gag impaired OR
  - Voluntary cough impaired OR
  - Dysphonia present OR
  - Cranial nerves involved OR
  - GCS ≤ 13:

  Aspiration risk high

- Aggressively rule out sepsis, especially pneumonia
- Avoid IDC whenever possible because of risk of infection
- In immobilised patients, consider DVT Prophylaxis

### References

5. eTG 2013—acute ischaemic stroke
6. Up to date: accessed June 2014
9. NNSW-LHD-PRO-7465-15 Referral, Retrieval and Return Pathway of Northern New South Wales Local Health District (NNSW LHD) Acute Stroke Patients to Gold Coast University Hospital (GCUH)
10. GUCH neurosurgery/Neurology stroke protocol section on neurosurgical intervention in stroke

### For further information

### Potential Neurosurgical management

- **Acute neurosurgical interventions** (from GCUH stroke protocol 2018):
  - All referrals must be discussed with the attending consultant before contacting the Neurosurgical Registrar. GCUH kindly request that referrals are from registrar to registrar and not from the resident.
  - Malignant MCA infarction (typically complete distal carotid or middle cerebral artery occlusion) carries a poor outcome despite medical management and has an associated mortality of over 78%. Many succumb to the progressive cerebral oedema and herniation. Decompressive Craniotomy remains controversial in this particular group of patients. *This treatment, while controversial, may reduce the mortality rate by 50%, however, most survivors are left with some degree of disability. Seek advice from neurosurgery GCUH (uptodate).*
  - For haemorrhagic stroke, decompressive craniotomy with gentle and limited clot evacuation is for mass effect control but will not change neurological condition. The clot must present close to the surface.
  - GCUH will consider decompressive craniotomy in the following but it is not absolute that surgery will be offered because each case needs to be evaluated on its merits:
    - Age less than 60 years
    - No thrombolysis or anticoagulation
    - GCS greater than 8 or recent deterioration.
    - No pupillary changes or if recent then corrected with mannitol.
    - Non-dominant lobe.
    - Dominant lobe haemorrhage or ischaemia may be considered if other factors like very young age, should be a consultant to consultant discussion.
    - Minimal co-morbidities
    - No malignancy
    - Patient/family consent despite probability of significant neurological disability. If they know the individual would not want survival with a disability then there is no point in consulting the neurosurgical service. Many families have strong opinions about this so the discussion needs to be had first.
    - DWI volume >145 ... predicts likely transformation to malignant MCA infarct
    - Presentation within 72 hours of ictus
    - For intracerebral haematomas, poor prognostic factors include large volume >30mL, brainstem location, intraventricular extension and shift of >1cm.
  - Very few patients are candidates for this treatment and urgent expert advice should be sort from a referral to GCUH neurosurgery (see transfer to GCUH guideline in further information).
  - Uptodate also suggests oedema surrounding large cerebellar infarcts/haemorrhage is associated with a mortality of more than 80%. Ventricular drainage, to relieve acute hydrocephalus, and posterior fossa decompression are the treatments of choice for large space-occupying cerebellar infarcts/haemorrhage. Randomised trials of this approach have not been performed; however, case series show that surgery results in:
    - Reduction of mortality to less than 30% and
    - Good functional outcome in survivors.

- **Carotid endarterectomy** (see also carotid ultrasound on page 1)
  - Preferably within 2 weeks of cerebral or retinal TIA in those with TIA attributed to a high-grade internal carotid artery stenosis.
  - 70-99% internal carotid artery stenosis: **recommended**.
  - 50-69% stenosis: **recommended for certain patients** and only at centres with perioperative complications rates < 6%
  - <50% stenosis: **not recommended**.