Transient ischaemic attacks (TIAs) are a warning sign of stroke, with 20% of patients having a subsequent stroke within 90 days. Stroke is a leading cause of disease in Australia, with approximately 50,000 strokes occurring per year. The subsequent consequences can be devastating, with 20% of patients dying within 1 month of their first stroke and of survivors, one-third remaining disabled.

The assessment and management of TIAs can be difficult, particularly as symptoms resolve quickly and patients may be unaware of their importance and the urgency of early medical attention. With difficulty in ascertaining cases, and cases undiagnosed in the community, there is limited data on the incidence of TIAs both within Australia and internationally. Studies overseas have estimated the incidence of TIA to be 68–83 per 100,000 population, with the majority of cases occurring in the 75–84 years age group. This provides an opportunity for stroke prevention, with evidence suggesting that early assessment and management of TIAs reduce the risk of stroke by up to 80%.

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**Definition of TIA**

In 1978, the World Health Organization defined TIA as an ‘episode of sudden focal neurological deficit lasting less than 24 hours and of vascular origin’. A stroke in contrast, is defined as ‘rapidly developing symptoms and/or signs of focal (or global) loss of brain function lasting longer than 24 hours or leading to death with no apparent cause other than of vascular origin’. With advances in imaging, in particular magnetic resonance imaging (MRI), up to 48% of patients with a diagnosis of TIA have evidence of infarction on diffusion weighted imaging and so have actually had an ischaemic stroke. Furthermore, the use of intravenous thrombolysis in acute ischaemic stroke has been shown to be effective up to 4.5 hours from the onset of symptoms. Thus, the American Stroke Association has recently adopted a new definition for TIA, being a ‘transient episode of neurological dysfunction caused by focal brain, spinal cord or retinal ischaemia, without acute infarction’ and they recommend that all TIA patients undergo neuro-imaging, preferably MRI scanning. This new definition has not yet been adopted fully but it is clear the
previous definition was hampered by an arbitrary time restraint which is now less meaningful.

### Diagnosis

The diagnosis of TIA remains a clinical one, and even for neurologists can be a challenge, with many other medical conditions posing as mimics. One study reviewed 100 patients with transient neurological symptoms presenting at a hospital emergency department and found only 40 were confirmed cases of TIA (Table 1).14

Symptoms more suggestive of a TIA include:
- sudden onset
- focal symptoms (eg. unilateral weakness, speech disturbance).

Many transient episodes that present in general practice have mixed symptoms and posterior circulation symptoms, which can be difficult to interpret. Taking a detailed history from both the patient and, if possible, any witnesses, is very important in diagnosing any transient neurological episode.

In educating patients about the symptoms of stroke and TIA, the mnemonic FAST (Face, Arm, Speech, Time to act) should be discussed, having been shown to identify 88.9% of TIAs in one study.15

While the use of imaging, particularly MRI scans, has been advocated with the new proposed definition, in Australia there is no Medicare rebate available for general practitioners ordering this investigation and there are major issues surrounding access and costing, which make its routine use unrealistic currently. The presence of protein biomarkers in blood, similar to troponin in ischaemic heart disease, would be useful in assisting in diagnosing or stratifying TIAs, but as yet none have been found particularly useful.16 Studies have also demonstrated that a genetic risk for stroke and genetic biomarkers may contribute to stratifying risk and preventing stroke.17,18

### Assessment

In general practice the diagnosis can be a challenge, especially given that a TIA is a medical emergency with the risk of stroke varying between 10–20% in the following 90 days. Half of such patients will have a stroke within 48 hours of the TIA.19

Risk stratification can assist GPs in assessing this early risk of stroke. Johnston et al devised the ‘Age, Blood pressure, Clinical features, Duration, Diabetes’ tool (ABCD2 score) (Table 2) to assist with predicting the risk of stroke in TIs at 48 hours.20 This easy assessment provides clinicians with a tool to determine how urgently and where the TIA patient might be best managed. There is limited research on where best to manage TIA patients and, in particular, the usefulness of acute stroke units for patients with TIAs. Opinions on the most appropriate setting differ within the neurology community and as a result there are variable models of care both nationally and internationally.21

A recent survey of Australian hospitals co-ordinated by the National Stroke Foundation confirmed the variable services for TIA assessment and management. These ranged from admitting all patients (15%) to specialist follow up (35%) in neurology outpatient clinics, specialist rooms or a TIA clinic. With delays in both assessment and treatment, the study suggested there is a significant gap between the evidence and current practice, concluding that determining the best model of care requires urgent investigation.22

Until the evidence is clearer, the most accepted recommendation is that patients classified at higher risk (ABCD2 score greater than 4) should be referred urgently for a comprehensive assessment in an acute unit, either a dedicated hospital TIA clinic or stroke unit. Patients with atrial fibrillation (AF) or crescendo TIAs should also be considered high risk. A study of a 24 hour hospital TIA clinic reported that 74%

### Table 1. TIA mimics

<table>
<thead>
<tr>
<th>Mimic</th>
<th>Timing/onset</th>
<th>Suggested by</th>
</tr>
</thead>
<tbody>
<tr>
<td>Migraine</td>
<td>Progressive</td>
<td>Nausea, vomiting, aura, headache</td>
</tr>
<tr>
<td>Partial seizures</td>
<td>‘March’ of symptoms</td>
<td>No recall of events</td>
</tr>
<tr>
<td>Vestibular disorders</td>
<td>Recurrent episodes</td>
<td>Hearing loss, tinnitus, balance disturbance</td>
</tr>
<tr>
<td>Intracranial lesion</td>
<td>Gradual, fluctuating</td>
<td>Headache, vomiting Episodic symptoms may be from oedema, bleeding or focal seizures</td>
</tr>
<tr>
<td>Metabolic, eg. hypoglycaemia</td>
<td>Variable, recurrent</td>
<td>Co-existing morbidities and medications</td>
</tr>
<tr>
<td>Transient global amnesia</td>
<td>Sudden, duration hours</td>
<td>No recall of events, no loss of personal identity, repetitive questioning, no loss of consciousness</td>
</tr>
<tr>
<td>Syncope</td>
<td>Sudden</td>
<td>Nonfocal symptoms, loss of consciousness</td>
</tr>
<tr>
<td>Delirium, eg. sepsis</td>
<td>Variable, fluctuating</td>
<td>History of dementia, confusion rather than speech disturbance, fluctuating consciousness</td>
</tr>
<tr>
<td>Other neurological disorders, eg. multiple sclerosis, motor neuron disease, myasthenia gravis</td>
<td>Progressive</td>
<td>Recurrent episodes and deterioration</td>
</tr>
<tr>
<td>Psychogenic</td>
<td>Recurrent, situational</td>
<td>Lack of vascular risk factors, hyperventilation, nonorganic signs</td>
</tr>
</tbody>
</table>
of patients were discharged home after prompt assessment and treatment, potentially lowering costs. There is limited data on the cost effectiveness of the variable models of care. Liaising with a regional stroke centre is required to establish a pathway of care. In metropolitan Adelaide (South Australia) for example, a model of TIA care is being investigated which uses TIA clinics in the hospital and within the community for rapid assessment and management in close association with the regional stroke unit. The community TIA service utilises GPs who have been trained in stroke medicine, with a ‘special interest in stroke’. Other pathways may also address delays in assessment and treatment. One group has suggested that a 24 hour, 7 day telephone hotline with access to a stroke physician is effective and feasible.

Irrespective of location, patients with a lower risk (ABCD² score equal to or less than 4) should have a computerised topography (CT) brain scan to exclude haemorrhage and other space occupying lesions (e.g. tumour), and carotid duplex ultrasound (if symptoms are within the carotid artery territory and the patient would be potentially suitable for carotid re-vascularisation) as soon as possible (within 48–72 hours).

Other routine investigations should include:

- full blood count, electrolytes, renal function, lipids, blood glucose levels, and erythrocyte sedimentation rate, and
- electrocardiogram.

Given the risk of subsequent stroke and its devastating consequences, if there is any doubt about the diagnosis or concerns about assessing the patient, the safest approach would be to refer the patient to an acute care hospital. The evidence surrounding the value of the ABCD² score remains uncertain and the American Stroke Association has a different approach. Their guidelines are more conservative and suggest that it is reasonable to hospitalise patients with TIA if they present within 72 hours of the event and any of the following criteria are present:

- ABCD² score of equal to or greater than 3
- ABCD² score of 0–2 and uncertainty that diagnostic workup can be completed within 2 days as an outpatient
- ABCD² score of 0–2 and other evidence that indicates the patient’s event was caused by focal ischemia.

Management

The treatment of a suspected TIA aims to prevent further TIAs and subsequent ischaemic stroke. This management may be best carried out by the patient’s GP in the community setting following initial acute and focused management by a TIA clinic or acute stroke unit. The close communication between GP and TIA physician for optimum secondary prevention is fundamental (Figure 1).

Lifestyle modifications

All patients with a suspected TIA should be counselled to:

- quit smoking
- adopt a low fat, low sodium diet
- exercise regularly, and
- avoid excessive alcohol consumption.

Antiplatelets

Long term antiplatelets should be commenced in all patients with TIA who are not on anticoagulant therapy. Studies have demonstrated that antiplatelet treatment significantly reduces the risk of stroke, with the combination of aspirin and dipyridamole shown to be more effective than aspirin alone. Low dose aspirin and modified release dipyridamole or clopidogrel alone should be commenced.

Anticoagulation

After a CT has excluded haemorrhage, warfarin should be commenced in all TIA patients who have atrial fibrillation, cardio-embolic stroke from valvular heart disease, or recent myocardial infarction. A Cochrane review in 2004 concluded that anticoagulation can reduce the risk of stroke in patients with non-rheumatic atrial fibrillation.

Cholesterol lowering agent

Together with dietary advice, a statin should be considered in all patients following a TIA.

Blood pressure lowering

Evidence suggests that all patients should receive blood pressure lowering treatment after a TIA unless contraindicated by symptomatic hypotension. Angiotensin converting enzyme inhibitors (ACEIs) and diuretics separately and together, have the most evidence and in one study were shown to decrease vascular events, with treatment recommended within the first week after a TIA. However, most antihypertensives have been found to be effective and choices should be tailored to the patient’s comorbidities. The addition of an angiotensin receptor blocker has not shown any further benefit.

Carotid surgery

Carotid endarterectomy has been found to reduce the risk of disabling stroke or death for patients with stenosis exceeding 70%, in surgically fit patients operated on by surgeons with low complication rates (less than 6%).
Diabetes care
Blood glucose should be monitored in all patients following a TIA as it is an independent risk factor for stroke, while patients with diabetes or glucose intolerance should aim for good control.23

Hormone therapy
There may be a risk of increased stroke associated with hormone therapy,40 and following a TIA patients should be individually counselled regarding the risks and benefits.23

Conclusion
Transient ischaemic attacks can be a trap for the unwary, given the difficulty in diagnosis and the limited evidence on the best location for assessment and management. Given the significant risk of subsequent stroke, GPs play a highly important role in the initial assessment and subsequent longer term secondary prevention. Early assessment and initiation of treatment, which may be in general practice for lower risk patients, could lower the risk of stroke and potentially lower healthcare costs significantly, although more research is needed in this area. But any doubts about either the diagnosis or the risk of stroke should result in an immediate referral to hospital. Liaising with regional stroke units is required to establish an optimal pathway of care.

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