

The GP's role in acute stroke management

An acute stroke is a medical emergency. For most GPs, their role in acute stroke management lies in prior patient education and formulating triage systems that minimise time from event to patient arrival at a specialist centre.

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An acute stroke is a medical emergency and a potentially devastating event. Although GPs frequently deal with patients experiencing health sequelae of stroke, acute presentations to the GP of patients with acute stroke are relatively uncommon.¹

A GP's response to a patient with acute stroke is determined by significant bodies of evidence in two areas. The first is evidence for the efficacy of thrombolytic therapy with a recombinant tissue plasminogen activator (rt-PA) by reducing stroke severity in patients with an acute ischaemic stroke. The second is evidence for the efficacy of specialised stroke units in reducing death and disability in patients after stroke.

A list of Australian hospitals that have specialised stroke units and/or the capacity to deliver thrombolysis is available online at the National Stroke Foundation website.²

Call an ambulance, FAST

In an area within range of a stroke unit delivering thrombolysis, the imperative is for the patient with acute stroke to present to the hospital within the

current approved time window for treatment with rt-PA (alteplase). Presently, this is within three hours from stroke onset to delivery of rt-PA.³ However, recent randomised trial evidence suggests that this time frame could be extended to 4.5 hours.⁴

The typical patient loses 1.9 million neurons during each minute in which a stroke is untreated.⁵ It is estimated that in most countries less than 2% of patients with stroke receive rt-PA, mostly because of delays in reaching a stroke unit.⁶ Evidence from the UK and Ireland suggests that involvement of the GP in the process of care-seeking after stroke delays rather than expedites prompt access to appropriate secondary care.^{7,8} The optimal patient response to an acute stroke is to call an ambulance rather than a GP. GPs can facilitate this process in two ways.

The first is to educate patients about the symptoms that signify a possible acute stroke. There is evidence that a patient's lack of knowledge regarding stroke symptomatology increases the time from stroke onset to presentation at the hospital emergency department.⁹ Education should include

IN SUMMARY

- Care in a specialised stroke unit and thrombolysis with recombinant tissue plasminogen activator (rt-PA) both reduce mortality and disability in patients with acute stroke.
- Thrombolysis requires administration of rt-PA within three hours of stroke onset for maximal efficacy.
- GPs should expedite prompt ambulance transport of patients with acute stroke to a hospital with the capacity to deliver thrombolysis.
- Patient and staff education regarding the symptomatology of stroke may play a role in facilitating this prompt access to thrombolysis.

the directive to call an ambulance in the presence of defined symptoms suggestive of an acute stroke. Public education programs promoting the themes 'time is brain', stroke is 'brain attack' and 'FAST' (face, arm, speech, time)^{10,11} have been running in Australia, the USA, the UK and other countries in recent years. These programs are analogous to the campaigns to promote the concept of 'heart attack' and rapid access to ambulance services and hospital care for patients with chest pain in the 1980s and 1990s.¹²

The level of sophistication and clinical detail that these stroke symptom awareness campaigns should include is a matter of controversy.¹¹ However, the simpler models (including FAST) are probably preferable in public education programs and are likely to be efficacious.¹³ GPs can reinforce these education programs with waiting room posters (Figure). It may also be appropriate to deliver directed education opportunistically to patients at highest risk of experiencing a stroke – for example, patients with a past history of stroke or transient ischaemic attack (TIA), known carotid stenoses, atrial fibrillation or recent myocardial infarction.

The second way in which GPs can facilitate appropriate referral of patients with acute stroke to ambulance services is via the education of receptionists, nurses and other staff within the practice who perform patient triage, take patient telephone calls or make appointments. A patient report of possible stroke symptoms should prompt an ambulance to be called urgently with directions to take the patient to a centre with thrombolysis capability. A more comprehensive set of potential symptoms than that promoted in public awareness programs, such as the 'suddens' criteria (Table 1),¹¹ would be applicable as the basis of triage decisions by the nurse or receptionist.

Prompt referral to a specialised stroke unit

Despite the above measures, many patients will not present to or contact their GP within the three-hour time window for thrombolysis. The efficacy of specialised stroke units in reducing death and disability after a stroke means that a 'therapeutic nihilism' approach is no longer appropriate in this setting.¹⁴ Prompt referral, even beyond the current recommended three-hour window, to a centre

Acute stroke management

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The GP's role in the management of a patient with acute stroke is to facilitate prompt ambulance transport to a stroke unit or hospital with the capacity to deliver thrombolysis. Patient and staff education about the common presenting symptoms of stroke is essential for best patient outcomes.

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with a specialised stroke unit will provide patients who have had an acute stroke with optimum management and the best chance of good functional outcome.

Inpatient care of patients with stroke

Patients will return to their GPs following discharge from hospital care after a stroke. It is important that GPs have an appreciation of the patients'

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Figure. A poster from the National Stroke Foundation's FAST campaign.

management during their hospital admissions. A knowledge of the investigations undertaken, medical and surgical therapeutic interventions employed and principles of stroke unit care may all be relevant to post-discharge care.

Although rural and remote GPs who

provide inpatient care to patients with stroke might not have access to thrombolysis, many other aspects of optimal medical management are achievable.

Investigations

All patients with suspected stroke should have urgent brain imaging with either computed tomography (CT) or magnetic resonance imaging (MRI).¹⁵ This is primarily to exclude the presence of intracerebral haemorrhage, identify any absolute contraindications to thrombolysis, and rule out the presence of other pathologies mimicking ischaemic or haemorrhagic stroke. Some hospitals offer more sophisticated imaging techniques (such as CT and MRI with perfusion), although these are not available routinely, even in many tertiary centres. MRI is more sensitive than CT for detecting acute ischaemic changes, and has an equivalent high sensitivity for detecting haemorrhage.¹⁵ However, direct referral by GPs for MRIs is not currently possible, and even in hospital MRIs are not usually a practical option because of poor accessibility and potential time delays.

Table 2. Investigations in patients with acute stroke

- All acute stroke patients should undergo emergent brain imaging
- Routine blood tests should be performed to assess for contraindications to thrombolysis and to guide secondary prevention techniques
- Carotid Doppler ultrasound should be performed in patients with carotid circulation symptoms potentially fit for carotid interventions
- Other investigations may be required if the source of ischaemic stroke is not found or in patients with no 'conventional' vascular risk factors

Table 1. 'Suddens' criteria for the assessment of patients with stroke

- Sudden numbness or weakness of the face, arm or leg, especially on one side of the body
- Sudden confusion, or trouble speaking or understanding
- Sudden trouble seeing in one or both eyes
- Sudden trouble walking, dizziness, or loss of balance or co-ordination
- Sudden severe headache with no known cause

Other routine investigations include (consensus opinion¹⁵): full blood count; measurement of urea, electrolyte and creatinine levels; measurement of erythrocyte sedimentation rate; measurement of C-reactive protein level; measurement of fasting lipids and glucose; electrocardiography; and coagulation studies (Table 2). These investigations are performed acutely to assess for contraindications to thrombolysis (Table 3), and also to help guide secondary prevention of stroke.

All patients with carotid circulation symptoms that can potentially be operated on should undergo carotid imaging (Doppler duplex),¹⁵ usually performed within the first few days of admission to hospital.

Selected patients may undergo MRI, echocardiography, angiography, vasculitic and prothrombotic screens, and/or syphilis serology, generally when the source of ischaemic event has not been found or the patient does not have 'conventional' risk factors.¹⁵

Acute stroke treatment: thrombolysis
Rapid administration of intravenous rt-PA to patients after stroke results in improved outcomes.³⁶ Thrombolysis has no effect on the rate of mortality in patients with

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Table 3. Contraindications to thrombolysis

Absolute

- Uncertainty about the time of stroke onset (e.g. symptoms present on waking)
- Minor stroke or rapidly improving condition
- Blood pressure consistently above 185/110 mmHg
- Heparin treatment within the past 48 hours or raised activated partial thromboplastin time
- International normalised ratio above 1.5
- Platelet count less than 100,000 per μL
- Blood glucose level below 2.8 mmol/L or above 22 mmol/L

Relative

- Very severe stroke
- Stroke or serious head trauma within the past three months
- Intracranial haemorrhage ever
- Major surgery within the past two to four weeks
- Gastrointestinal or genitourinary bleeding within the past three weeks
- Noncompressible arterial puncture within the past week

stroke.^{3,4,6} The advantages of thrombolysis are summarised in Table 4. rt-PA has been licensed in Australia for selected patients with acute ischaemic stroke since 2003.¹⁶ In 1995, the National Institute of Neurological Disorders and Stroke (NINDS) trial showed that rt-PA was effective in patients treated within three hours of the onset of ischaemic stroke.¹⁷ These results were subsequently confirmed in a meta-analysis of six large multicentre randomised placebo-controlled trials.³

More recently, trials have shown the efficacy and safety of rt-PA use in the three- to 4.5-hour window after a stroke.^{4,6}

The stroke treatment guidelines from some countries (e.g. Canada) have been amended to include the 4.5-hour time window for rt-PA administration.¹⁶ Position statements from a number of emergency medicine colleges, including the American College of Emergency Physicians and the American Academy of Emergency Medicine, suggest that there is insufficient evidence for rt-PA to be considered as standard care.¹⁶ However, the recent Australian clinical stroke guidelines from the National Stroke Foundation and position statements from stroke physician groups advocate rt-PA use in appropriately selected patients managed in stroke care units.^{15,16}

There is a clear time-to-treatment effect with thrombolysis, with a reduction in the odds ratio of a favourable outcome with increasing time.^{3,4,6} It is suspected that the disappearance of the ischaemic penumbra (the area of underperfused but still viable tissue surrounding a core of infarct) is the major factor accounting for the reduction in outcome effect with time.³

Thrombolysis is associated with an increased risk of significant intracranial haemorrhage (4 to 5% increase in absolute risk) independent of time.^{3,4,6} It should be remembered, however, that the overall rate of death and dependency is still reduced despite this increase in intracranial haemorrhage.

The Safe Implementation of Thrombolysis in Stroke – Monitoring Study (SITS-MOST) is a worldwide web-based data register designed to monitor the use of rt-PA in routine clinical practice. This study has confirmed that worldwide, and in the 14 Australian centres who provide data, thrombolysis with rt-PA is at least as safe and efficacious as in clinical trials.¹⁶

Thrombolysis should only be given, and is only approved for use, under the authority of a specialist physician and interdisciplinary acute care team with expert knowledge in its use in patients with stroke.¹⁶ Thrombolysis is therefore not to

Table 4. Advantages of thrombolysis

- Thrombolysis is a safe and effective treatment when given within three hours of stroke onset in selected patients (and within 4.5 hours in some patients) in a specialist stroke care unit
- Thrombolysis is associated with an increased risk of intracranial haemorrhage, but has no effect on the rate of mortality
- There is a reduction in the benefit of thrombolysis with time – ‘time is brain’

be undertaken outside of this setting.

rt-PA is given intravenously, 10% as a bolus, with the remaining being infused over one hour to a total dose of 0.9 mg/kg. The contraindications to rt-PA treatment are based on exclusion criteria from trial data, and are similar to those in patients with myocardial infarction (Table 3).

Acute stroke treatment: other management

Prevention of further strokes should begin immediately after the stroke and continue indefinitely.¹⁸ Much of the evidence base for the treatment of risk factors is for the secondary prevention of stroke (see ‘Managing risk factors to prevent stroke’ in the September 2009 issue of *Medicine Today* and ‘Emerging risk factors for stroke’ in the November 2009 issue of *Medicine Today*).^{19,20} However, treatment of risk factors should start early, and there is evidence for improved outcomes when some treatments are started in the acute phase of the condition (Table 5).

Antithrombotic therapy

Aspirin 150 to 300 mg once a day should be given to patients as soon as possible after excluding intracranial haemorrhage by imaging.¹⁵ This has proven to be beneficial

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Table 5. Other treatments in patients with acute stroke

- Once intracranial haemorrhage has been excluded, all patients with acute stroke should receive antiplatelet therapy
- Acute blood pressure lowering is generally indicated only for patients with extreme hypertension (above 220/120 mmHg) and ischaemic stroke
- In patients with haemorrhagic stroke, blood pressure control can usually be more aggressive
- Some younger patients with large strokes may require neurosurgical intervention
- If carotid endarterectomy is required, it generally should be performed early (within two weeks of stroke onset)
- Physiological homeostasis should be attempted (treat hypoxia, hyperglycaemia, pyrexia)
- Multidisciplinary assessment should commence early, including assessment of swallowing and nutrition and early mobilisation

when commenced within 48 hours of stroke onset.²¹ However, the routine use of anticoagulation in unselected patients is not recommended.²²

Acute blood pressure lowering

The evidence for the treatment of hypertension in patients with acute ischaemic stroke is controversial, with both hypertension and hypotension leading to worse outcomes.²³ Consensus opinion is to institute cautious therapy in patients with extreme hypertension (above 220/120 mmHg), and to continue the therapy received before the patient had a stroke in the absence of symptomatic hypotension.¹⁵ In patients with acute haemorrhagic stroke, acute

Table 6. Acute stroke units

- Patients cared for in stroke units are more likely to survive, return home and maintain independence
- All patients with suspected stroke should ideally be cared for in a stroke unit
- Smaller hospitals can provide most of the aspects required for a stroke unit, including physiological monitoring, multidisciplinary assessment, early mobilisation and rehabilitation

blood pressure management is often more aggressive, aiming for a mean arterial blood pressure below 130 mmHg, although definitive trial data are awaited.¹⁵

For secondary prevention, after stroke or TIA all patients should commence anti-hypertensive therapy unless they have symptomatic hypotension.¹⁵ There is level II and III evidence that antihypertensive therapy can be started within the first week after a stroke.¹⁵

Surgery

Hemicraniectomy may be required in patients younger than 60 years with large middle cerebral artery strokes.²⁴ Consideration should, therefore, be given to early neurosurgical referral for these patients.¹⁵

Carotid endarterectomy should preferably be performed within two weeks of stroke onset in appropriate patients – that is, those with 70 to 99% symptomatic stenosis according to the criteria from the North American Symptomatic Carotid Endarterectomy Trial (NASCET).²⁵ The procedure should be performed by a specialist surgeon with audited perioperative morbidity and mortality rates of less than 5% in patients with 70 to 90% symptomatic stenosis and less than 3% in selected patients with a 50 to 69% symptomatic stenosis.²⁵

Physiological control

A patient's physiological and neurological status should be monitored, with the intention of preventing or treating hypoxia, hyperglycaemia, pyrexia (all three of which are associated with worse outcomes) or neurological deterioration.¹⁵ Management of the consequences and prevention of complications of stroke should be rigorously instituted by the multidisciplinary team, and should include early mobilisation, assessment and management of dysphagia, management of adequate nutrition, management of incontinence, communication assessment and deep vein thrombosis prevention.¹⁵ This area of patient management is mostly provided by the stroke unit (see below).

Acute stroke treatment: stroke unit care

A stroke unit is a hospital unit or part of a unit that exclusively cares for patients with stroke (Table 6). Stroke units should provide multidisciplinary care by specialised medical, nursing, physiotherapy, occupational therapy, speech pathology and social work staff in a co-ordinated manner. There is high-level evidence that patients cared for in stroke units are more likely to survive, return home,¹⁸ and regain independence than patients receiving conventional care in general hospital units.^{14,26} There is also a modest reduction of about four days in the length of hospital stay.¹⁴

It is therefore recommended that patients with a suspected stroke should be transported as soon as possible to a unit providing organised stroke care. In fact, of all interventions for acute stroke, stroke unit care has the greatest potential to reduce the burden of stroke illness nationally.¹⁶

It is difficult to define the factors that confer the proven benefit of stroke units, but they are most likely to involve the minimisation of preventable complications and enhancement of functional independence.²⁶ Factors that may contribute to the benefit of stroke units include:

Consultant's comment

Acute stroke care is changing rapidly across Australia. The greater penetration of stroke care units and ambulatory care rapid-access stroke clinics across metropolitan and regional Australia is driving increased implementation of thrombolytic therapy, and improvements in implementation of early targeted secondary prevention.

The GP plays a central role in the continuum of care for patients with stroke, assisting early identification and rapid triage of patients with likely acute stroke to capable acute care centres. Importantly, GPs also manage and co-ordinate secondary prevention strategies. Although the GP may not directly be involved in the inpatient care for acute stroke, an appreciation of the scope of activities in the modern acute stroke care unit will assist in integrating the patient's care.

Drs Magin and Loiselle review the recent advances in acute stroke care and the GPs' role in the stroke 'chain of survival and recovery'.

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- comprehensive assessment of medical impairment and/or disability
- maintenance and/or management of physiological homeostasis (preventing hypoxia, hyperglycaemia, pyrexia and dehydration)
- early mobilisation
- skilled nursing care
- early rehabilitation
- early assessment and planning of discharge needs.¹⁸

In addition, patients cared for in stroke units are:

- more likely to receive early treatment with aspirin or, in cases of atrial fibrillation, anticoagulation
- less likely to aspirate
- fed sooner
- monitored more frequently
- more likely to undergo diagnostic tests
- more likely to adhere to protocols and processes of care
- more likely to receive rehabilitation in the acute setting.¹⁸

Stroke care in regional, rural and remote areas

The *National Guidelines for Acute Stroke Management* suggest that smaller hospitals

should consider models of care that adhere as closely as possible to that of specialised stroke units and should attempt to provide stroke care where possible in a discrete unit.¹⁵ Obviously in rural centres this may not be practical; however, many aspects of care can still be provided, such as early mobilisation, rehabilitation, a multidisciplinary team and education.

Ideally smaller hospitals should be networked with larger stroke specialist centres, and include procedures for rapid transfers and teleconferencing. It is also suggested that networks should link large stroke specialist centres with smaller regional and rural centres. These links should facilitate protocols governing rapid assessment, pathways for direct communication with specialist centres and rapid transfers.

Conclusion

For most GPs in Australia, a direct role in the management of patients with acute stroke is limited. However, an appreciation of the urgency of hospital presentation and of the in-hospital components of current evidence-based best practice for the management of patients with stroke

should inform general practice policies on patient education and triage before stroke and patient support after stroke. **MT**

References

A list of references is available on request to the editorial office.

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