



CLINICAL PRACTICE GUIDELINES

**Stroke and Transient
Ischaemic Attacks**
Assessment, Investigation,
Immediate Management and
Secondary Prevention



Ministry
of Health

**National Committee
on Neuroscience**

NMRC
National Medical
Research Council

Mar 2003

MOH Clinical Practice Guidelines 3/2003

Levels of evidence and grades of recommendation

Levels of evidence

Level	Type of Evidence
Ia	Evidence obtained from meta-analysis of randomised controlled trials.
Ib	Evidence obtained from at least one randomised controlled trial.
IIa	Evidence obtained from at least one well-designed controlled study without randomisation.
IIb	Evidence obtained from at least one other type of well-designed quasi-experimental study.
III	Evidence obtained from well-designed non-experimental descriptive studies, such as comparative studies, correlation studies and case studies.
IV	Evidence obtained from expert committee reports or opinions and/or clinical experiences of respected authorities.

Grades of recommendation

Grade	Recommendation
A (evidence levels Ia, Ib)	Requires at least one randomised controlled trial, as part of the body of literature of overall good quality and consistency, addressing the specific recommendation.
B (evidence levels IIa, IIb, III)	Requires availability of well conducted clinical studies, but no randomised clinical trials on the topic of recommendation.
C (evidence level IV)	Requires evidence obtained from expert committee reports or opinions, and/or clinical experiences of respected authorities. Indicates absence of directly applicable clinical studies of good quality.
GPP (good practice points)	Recommended best practice based on the clinical experience of the guideline development group.

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Assessment, Investigation, Immediate
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MOH Clinical Practice Guidelines 3/2003

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Statement of Intent

These guidelines are not intended to serve as a standard of medical care. Standards of medical care are determined on the basis of all clinical data available for an individual case and are subject to change as scientific knowledge advances and patterns of care evolve.

The contents of this publication are guidelines to clinical practice, based on the best available evidence at the time of development. Adherence to these guidelines may not ensure a successful outcome in every case. These guidelines should neither be construed as including all proper methods of care, nor exclude other acceptable methods of care. Each physician is ultimately responsible for the management of his/her unique patient, in the light of the clinical data presented by the patient and the diagnostic and treatment options available.

Foreword

Stroke is the second most common cause of death worldwide and is the fourth leading cause of death in Singapore. In addition, stroke is a leading cause of disability and the need for long-term nursing care. It is imperative therefore that every effort is made to prevent stroke in the first instance, and where stroke has occurred, to optimise management to achieve good clinical and functional outcomes.

For the primary prevention of stroke, the single most important measure is optimal control of hypertension. It is also very important that secondary prevention of stroke is initiated in high risk patients, through the timely institution of the strategies outlined in these guidelines.

The guidelines also provide comprehensive coverage of the acute treatment of strokes, for which enhanced clinical outcomes can be obtained through a well-organised multi-disciplinary care process spanning initial assessment to rehabilitation.

The first edition of these guidelines was prepared by the Stroke Subcommittee of the National Committee on Neuroscience in 1999. Since then, there have been significant advances in the management of stroke, which have necessitated the production of these updated guidelines.

I hope that doctors and medical professionals will find these guidelines useful and incorporate them into their normal clinical practice.

**PROFESSOR TAN CHORH CHUAN
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Executive summary of recommendations

Details of recommendations can be found in the main text at the pages indicated.

Service delivery

A Acute inpatient care for patients admitted to hospital with a stroke should be organised as a multidisciplinary stroke service based in designated stroke units. (pg 21)

Grade A, Level Ia

C Hospitals and general practitioners should agree on a local admissions policy and a local protocol for referral to specialist assessment clinics for those not requiring hospital admission. (pg 20)

Grade C, Level IV

Assessment and investigation

C A full medical assessment should be undertaken and multidisciplinary assessment considered for all patients with acute stroke or transient ischaemic attack (TIA) to define the nature of the event, the need for investigations, further management and rehabilitation. (pg 9)

Grade C, Level IV

C Written local protocols should be available, setting out indications for both routine and more specialised investigations which the clinical situation may merit. (pg 10)

Grade C, Level IV

C & GPP All patients with acute stroke should undergo brain scanning (CT or MRI) as soon as possible*, preferably within 24 hours[†]. A local protocol for more urgent scans should be made available[†].(pg 11)

***Grade C, Level IV**

†GPP

C All patients with acute stroke or TIA should have the following investigations: ECG, chest X-ray, full blood count, serum urea and electrolytes, blood glucose and lipids. (pg 11)

Grade C, Level IV

B A swallowing assessment should be undertaken at home or in hospital as part of the clinical assessment of stroke. (pg 10)

Grade B, Level III

Immediate management

A The routine use of drugs to limit neural damage, including the administration of corticosteroids, neuroprotectants, plasma volume expanders, barbiturates and streptokinase, is of no proven benefit and should be discouraged. (pg 14)

Grade A, Levels Ia & Ib

A Antiplatelet therapy, normally aspirin, should be prescribed immediately in patients who have sustained an ischaemic stroke. (pg 13)

Grade A, Levels Ia & Ib

A Mild and moderately elevated blood pressure should not routinely be lowered in the acute phase of stroke as this may worsen outcome. (pg 14)

Grade A, Level Ia

C Urgent neurosurgical assessment should be available for selected patients, such as those with large cerebellar infarcts or haemorrhage or acute hydrocephalus, and for selected cases of cerebral haemorrhage. (pg 15)

Grade C, Level IV

C Patients receiving anticoagulants or recent thrombolytic therapy or those with bleeding diatheses require urgent correction of coagulation defects. Thrombolytics, anti-platelet therapy and anticoagulants should be discontinued. (pg 14)

Grade C, Level IV

C Measures should be taken to combat fever in acute stroke patients. Stroke patients with fever should be fully investigated for possible sources of infection and started on early antibiotic therapy if appropriate. (pg 15)

Grade C, Level IV

C Reasonable glyceimic control should be maintained in all acute stroke patients. (pg 15)

Grade C, Level IV

C Measures should be instituted to prevent complications after acute stroke such as infections, decubitus ulcers, deep venous thrombosis and depression. (pg 16)

Grade C, Level IV

Secondary prevention

A Antiplatelet therapy should be continued on the long term for the secondary prevention of recurrent stroke and other vascular events in patients who have sustained an ischaemic cerebrovascular event. (pg 17)

Grade A, Levels Ia & Ib

A Warfarin should be considered for use in stroke and TIA patients with non-valvular atrial fibrillation. (pg 17)

Grade A , Level Ia

C Warfarin should also be considered after cardioembolic stroke or TIA from valvular heart disease and recent myocardial infarction. (pg 18)

Grade C, Level IV

A Patients with moderate or severe internal carotid artery ipsilateral to a carotid TIA or non-disabling ischaemic stroke should be considered for carotid endarterectomy by an experienced surgeon. (pg 18)

Grade A, Level Ia & 1b

A Blood pressure lowering should be considered for patients after the acute phase of stroke. (pg 19)

Grade A, Level Ia

A Cholesterol lowering should be considered for patients after the acute phase of stroke. (pg 19)

Grade A, Level Ib

C The control of risk factors such as diabetes mellitus and cigarette smoking, should be initiated once the initial event has stabilised. (pg 19)

Grade C, Level IV

Rehabilitation

A All stroke patients should be assessed for rehabilitation potential, and rehabilitation therapy started as soon as the patient's condition permits. (pg 21)

Grade A, Level Ib

A Stroke patients should be rehabilitated in a stroke rehabilitation unit. Where this is not available, rehabilitation should be provided in a generic rehabilitation ward. (pg 22)

Grade A, Level Ia

1 Introduction

1.1 Epidemiology

Stroke is the second leading cause of death world-wide.² It is presently the fourth leading cause of death in Singapore, third for most years since 1970, accounting for approximately 10 to 12% of all deaths.³ Our incidence of stroke is 1.8/1000 person-years⁴; there is no local prevalence data. Data from our Ministry of Health shows a rise in the number of admissions to hospitals for cerebrovascular disorders (CVD), from 3732 in 1986 to 10 250 in 2001.^{5,6} As some patients may prefer to remain at home rather than go to hospital, the actual numbers are probably higher.

CVD is not a homogeneous disease. There are clear pathological sub-types – transient ischaemic attack (TIA), cerebral infarction, primary intracerebral haemorrhage and subarachnoid haemorrhage - with more than 100 potential underlying causes. In Singapore, over 74% of strokes are due to cerebral infarction, about 24% result from primary intracerebral haemorrhage and approximately 2% are due to subarachnoid haemorrhage.⁷

CVD can affect men and women of any age and race. Its manifestations range from a minor episode lasting less than 24 hours (TIA), to a major life threatening or disabling event, and even death. The survivors of first and subsequent strokes will either make a complete recovery or will have varying degrees of disability. About 63% of Singapore stroke survivors are still moderately or severely disabled 3 months after the stroke.⁸

1.2 Need for guidelines on CVD management

Active research into various aspects of stroke has yielded useful information, particularly with regard to the appropriateness of certain investigations and treatment modalities. In view of this, evidence-based clinical practice guidelines for the management of stroke were published in 1999, so that appropriate care can be provided to stroke patients in Singapore wherever they may be managed.

With the availability of new information, this update of the guidelines has been developed. The guidelines also include the management of TIAs as TIAs are harbingers of stroke. TIAs may be considered as being at one end of the spectrum of cerebrovascular disorders, the other end being a devastating stroke. TIAs may be

viewed as “mini-strokes”, and as such the approach to the management of TIAs closely resembles the approach to stroke.

1.3 Scope of the guidelines

These guidelines address the assessment, investigations, immediate management and strategies for secondary prevention of stroke. Areas not addressed by these guidelines are:

- primary prevention - this important issue is common to all vascular diseases
- subarachnoid haemorrhage - investigation and initial management is different from other types of stroke
- stroke in young people - these patients require special investigations beyond those discussed in these guidelines.

These guidelines make recommendations which involve the clinical practice of medical, nursing and paramedical staff. The principles identified should form the basis for local discussion and facilitate the development of local protocols. Some aspects require the involvement of primary and secondary care professionals to develop a common protocol for the interface between the services.

1.4 Objectives of the guidelines

The primary aim of these guidelines is to assist individual clinicians, hospital departments and hospital administrators in producing local protocols for:

- (a) assessment, investigation and immediate management of individuals with a TIA or acute stroke (other than a subarachnoid haemorrhage)
- (b) secondary prevention and risk factor management following a TIA or acute stroke

The secondary aim of these guidelines is to suggest methods for implementation and for clinical audit. These guidelines are in keeping with the goals of health care for stroke patients, which are to:

- reduce the incidence of stroke through the use of valid primary preventive methods
- reduce case fatality after a stroke has occurred

- implement secondary prevention strategies to reduce the risk of a further vascular event.
- reduce the level of disability due to stroke

1.5 Who the guidelines are for

These guidelines are developed for all health care professionals involved in the care of the stroke patient, including doctors, nurses, therapists, dieticians, medical social workers and hospital and health care administrators. They can be applied in primary care and in hospital-based and shared-care settings.

1.6 Development process of the guidelines

The workgroup tasked with developing and updating these guidelines comprises specialists from the fields of neurology, neurosurgery, neuroradiology, rehabilitation and family medicine. The guidelines are based on the Scottish Intercollegiate Guidelines Network's Clinical Practice Guidelines on the Management of Patients with Stroke¹, which were reviewed and modified to meet local needs. New information in recent publications that impact on patients care were also reviewed and included.

1.7 What's new in the revised guidelines

The following is a list of major changes or additions to the guidelines:

- Section 1.1 – Information on the epidemiology of stroke in Singapore has been updated.
- Section 2.5 – The recommendation on brain scanning now includes MRI and more emphasis that brain scanning should be performed within 24 hours.
- Section 3.4 – This section on medical management is new. Recommendations on fever, glycemic control and prevention of complications have been added.
- Sections 3.1 and 4.1 – The evidence on antiplatelet therapy has been updated.

- Section 4.3 – The evidence on carotid endarterectomy has been updated.
- Section 4.4 – This section on blood pressure lowering after the acute phase of stroke has been added.
- Section 4.5 – This section on cholesterol lowering after the acute phase of stroke has been added.
- Section 5.4 – A recommendation has been added that stroke patients should be rehabilitated in a stroke rehabilitation unit or, if not available, a generic rehabilitation ward.

2 Assessment and investigation of acute stroke and TIA

The results of assessment and investigation should answer the following questions:

- (1) *Is this a vascular event, i.e. a stroke or transient ischaemic attack (TIA)?*
- (2) *Which part of the brain is affected?*
- (3) *Is it an ischaemic or haemorrhagic vascular event?*
- (4) *What is the cause of the vascular event?*
- (5) *What functional and social problems does this cause the patient?*
- (6) *What other medical problems co-exist with and affect the management of the stroke?*
- (7) *What facilities are required for the management of this patient?*

This process should involve one or more members of the multidisciplinary team, and will require the support of investigative facilities, together with appropriate referrals to specialist stroke services.

2.1 Medical assessment

An acute stroke or TIA can be diagnosed reliably only after a doctor has taken a good history and performed a physical examination. The clinical assessment will guide further management regarding the necessity for hospital referral, admission and intervention. Such an approach should result in answering questions (1), (2), (6) and (7) in the above list. (*See also section 2.5*)

2.2 Multidisciplinary assessment

Multidisciplinary assessment, involving nursing and other professions allied to medicine, should begin as soon as possible in the management of a patient with a disabling stroke. This will contribute to answering question (5) above.

C A full medical assessment should be undertaken and multidisciplinary assessment considered for all patients with acute stroke or transient ischaemic attack (TIA) to define the nature of the event, the need for investigations, further management and rehabilitation.

Grade C, Level IV

2.3 Swallowing assessment

Dysphagia, a potentially serious consequence of stroke, may go unrecognised unless patients are systematically screened for it. Approximately a third of patients with hemispheric stroke and about two thirds of those with brainstem stroke have dysphagia.^{9,10} The mortality rate for patients with dysphagia is high: 46% of patients admitted with acute stroke and dysphagia die within six weeks. Although aspiration pneumonia may contribute to mortality in these patients, dysphagia may, in some cases, reflect the severity of the stroke.

Assessment of swallowing by trained staff should be undertaken either at home or in hospital before any oral intake is permitted. Nurses working in specialist units may be trained to perform an initial dysphagia screening test. Patients with swallowing defects should be referred to a speech and language therapist.

B A swallowing assessment should be undertaken at home or in hospital as part of the clinical assessment of stroke.

Grade B, Level III

2.4 Investigations

Investigations are undertaken:

- to confirm the nature of the vascular event [question (1) above] and to elucidate upon the underlying cause [questions (3) and (4)]
- to determine the appropriate strategy for secondary prevention
- to identify prognostic factors.

GPP Local written protocols should be available, setting out indications for both routine and more specialised investigations which the clinical situation may merit.

GPP

2.5 Neuroimaging (CT and MRI Brain Scans)

Randomised trials on the use of brain scanning have not been performed, but a clinical consensus exists that the assessment of most patients with acute stroke or TIA should include brain scanning because:

- clinical scoring systems have been found to be unreliable in distinguishing ischaemic from haemorrhagic strokes.¹¹
- specific treatment of intracranial haemorrhage (e.g. neurosurgery, cessation/reversal of antithrombotic therapy) may be indicated once the condition is diagnosed
- early treatment of ischemic stroke (e.g antiplatelet therapy) may be initiated once the condition is diagnosed (see sections 3 and 4)
- there is conclusive evidence for the efficacy of antiplatelet and anticoagulant agents in the secondary prevention of ischaemic stroke, but they should be avoided in cases of haemorrhagic stroke (see sections 3 and 4).

The timing of brain scanning is important. The identification of intracranial haemorrhage or non-stroke pathology is important for their specific management.

- In view of its relative cost and widespread availability, **computed tomography (CT)** is the most widely used neuroimaging technique in acute stroke. **Magnetic resonance imaging (MRI)**, particularly MR diffusion-weighted imaging, may enable identification of ischaemic lesions within the first few hours. MRI allows distinction between haemorrhagic and ischaemic lesions several weeks after the acute stroke, and the identification of small brainstem strokes that may be missed on CT.¹²

C & GPP All patients with acute stroke should undergo brain scanning (CT or MRI) as soon as possible*, preferably within 24 hours[†]. A local protocol for more urgent scans should be made available[†].

*Grade C, Level IV

† GPP

2.6 Other routine investigations

Haematological and biochemical investigations should be performed to establish a baseline for management and to screen for concomitant disease. Chest X-ray and ECG examinations in patients with acute stroke or TIA may provide evidence of cardiac disease, and therefore of possible embolic sources.¹²

C All patients with acute stroke or TIA should have the following investigations: ECG, chest X-ray, full blood count, serum urea and electrolytes, blood glucose and lipids.

Grade C, Level IV

2.7 Additional investigations

The necessity for additional investigations is determined by the clinical situation, e.g. young patients, clinical evidence of cardiac disease, recent trauma.

- **Carotid Doppler ultrasonography** should be used in patients with a carotid territory TIA or a non-disabling carotid territory ischaemic stroke, and who are considered to be suitable for surgery. It helps in the selection of suitable candidates for carotid endarterectomy.¹²
- **Echocardiography** may be indicated in the investigation of patients with evidence of cardiac disease or in whom other risk factors are absent, especially if multiple cerebrovascular events have occurred.¹²
- **Other haematological investigations** may also be appropriate in certain situations e.g. hypercoagulable states, bleeding diatheses and in young patients with strokes or TIAs.¹²

3 Immediate management following acute stroke

The management of a newly diagnosed stroke is determined by two relevant questions:

- Is there active treatment which can be directed at the cerebrovascular event?
- What facilities or support are required to provide immediate care for the stroke patient? (*see section 5*)

All patients with acute stroke should be admitted to a **Stroke Unit** for initial management (*see also section 5*)

3.1 Cerebral infarct

- Early initiation of aspirin (within 48 hours) after ischemic stroke reduces stroke recurrence at 14 days.¹³ It also improves outcome, with fewer in-hospital deaths and non-fatal strokes at 4 weeks¹⁴ and fewer dead or dependant patients at 6 months¹⁵. The use of aspirin appears to be safe in the acute phase of stroke.¹³

A **Antiplatelet therapy, normally aspirin, should be prescribed immediately for patients who have sustained an ischemic stroke**

Grade A, Levels Ia & Ib

- A randomised study of intravenous r-TPA in cerebral infarction demonstrated significant improvement in functional outcome in selected patients treated in specialist units within 3 hours of the onset of stroke,¹⁶ as did an intra-arterial trial of prourokinase within 6 hours of stroke onset.¹⁷ The use of streptokinase is contraindicated in view of its lack of beneficial effect on mortality and morbidity¹⁸. The management of patients with acute ischaemic stroke using thrombolytic therapy carries the risk of catastrophic intracerebral haemorrhage;¹⁹ there is difficulty in predicting who might benefit or be at most risk of hemorrhage. Thrombolysis should not yet be regarded as routine therapy.
- The use of heparins (unfractionated heparin, low molecular weight heparin or heparinoids) is not routinely recommended as it does not reduce mortality in patients with acute ischaemic stroke.^{15,20,21}

- Corticosteroids have been used in attempts to reduce the level of cerebral oedema associated with acute stroke. However, there is no evidence that the administration of steroids improves outcome.²²⁻²⁴
- Haemodilution techniques have been used in attempts to increase cerebral perfusion in patients with acute stroke. No beneficial effect has been found.²⁵
- The rationale of therapy with neuroprotectants in patients with acute ischaemic stroke is that neuronal damage may be prevented. No benefit has been found to be associated with this type of therapy.²⁶

A The routine use of drugs to limit neural damage, including the use of corticosteroids, neuroprotectants, plasma volume expanders, barbiturates and streptokinase, is of no proven benefit and should be discouraged.

Grade A, Levels Ia & Ib

- An excessive reduction in blood pressure should not normally be undertaken in the acute phase of stroke. In a number of randomised controlled trials, a reduction of blood pressure which occurred as a side effect of treatment was associated with a worsening of outcome.²⁷

A Mild and moderately elevated blood pressure should not routinely be lowered in the acute phase of stroke as this may worsen outcome.

Grade A, Level Ia

3.2 Intraparenchymal haemorrhage (excluding subarachnoid haemorrhage)

C Patients receiving anticoagulants or recent thrombolytic therapy or those with bleeding diatheses require urgent correction of coagulation defects. Thrombolytics, anti-platelet therapy and anticoagulants should be discontinued.

Grade C, Level IV

3.3 Neurosurgical intervention

Surgical evacuation of intraparenchymal hematomas could be considered, if the hematoma is thought to be causing clinical deterioration. Further research is needed to clarify this type of intervention.^{28,29}

Ventricular shunting and decompression surgery should be considered in patients with acute hydrocephalus associated with cerebellar stroke due to compression of the aqueduct of Sylvius by blood or oedema.³⁰

C Urgent neurosurgical assessment should be available for selected patients, such as those with large cerebellar infarcts or haemorrhage or acute hydrocephalus, and for selected cases of cerebral haemorrhage.

Grade C, Level IV

3.4 Medical management

Hyperthermia after acute stroke is associated with increased mortality and morbidity.³¹ Experimental animal studies indicate that hyperthermia exacerbates ischemic neuronal injury.

C Measures should be taken to combat fever in acute stroke patients. Stroke patients with fever should be fully investigated for possible sources of infection and started on early antibiotic therapy if appropriate.

Grade C, Level IV

Hyperglycemia in diabetic patients with stroke often requires sliding scale insulin coverage in addition to their regular treatment. Acute hyperglycemia predicts increased risk of in-hospital mortality after ischemic stroke in nondiabetic patients and increased risk of poor functional recovery in nondiabetic stroke survivors.³² There are no data to address whether early treatment is beneficial, or what level of blood sugar control is adequate in acute stroke.

C Reasonable glycemic control should be maintained in all acute stroke patients.

Grade C, Level IV

Common or potentially life-threatening complications of stroke include aspiration pneumonia, urinary infection, decubitus ulcers, deep venous thrombosis/pulmonary embolism, and depression.³⁰

C Measures should be instituted to prevent complications after acute stroke such as infections, decubitus ulcers, deep venous thrombosis and depression

Grade C, Level IV

Appropriate strategies for secondary prevention can only be determined once the nature of the vascular event is defined by investigation, including brain scanning. When intracerebral haemorrhage has been excluded, the following treatment should be considered for patients diagnosed as having ischaemic stroke or TIA.

4.1 Antiplatelet therapy

Long-term antiplatelet therapy reduces the risk of serious vascular events (recurrent stroke, myocardial infarction or vascular death) following an ischemic stroke or TIA by 22%; 36 serious vascular events will be avoided over two years per 1000 patients with previous stroke or transient ischaemic attack.¹³

Aspirin was the most widely studied antiplatelet drug, with doses of 75-150 mg daily being at least as effective as higher daily doses. The effects of doses lower than 75 mg daily were less certain.¹³

Alternative antiplatelet medications include ticlopidine, clopidogrel and dipyridamole.³³⁻³⁵ These medications may be considered for patients with aspirin allergy, aspirin failure, aspirin intolerance, or aspirin contraindications.

A Antiplatelet therapy should be continued in the long term for the secondary prevention of recurrent stroke and other vascular events in patients who have sustained an ischaemic cerebrovascular event.

Grade A, Levels Ia & Ib

4.2 Anticoagulation therapy

Warfarin reduces the *relative* risk of a further ischaemic stroke in patients with atrial fibrillation to the same extent as its primary preventive action in atrial fibrillation. However, the reduction in *absolute* risk is higher. The risk of recurrent stroke following a TIA or minor non-disabling stroke is reduced by approximately two-thirds.^{36,37}

A Warfarin should be considered for use in stroke and TIA patients with non-valvular atrial fibrillation (Target INR* = 2-3)

*INR=International Normalised Ratio

Grade A, Level Ia

C Warfarin should also be considered after cardioembolic stroke or TIA from valvular heart disease and recent myocardial infarction.

Grade C, Level IV

Warfarin does not have benefit over aspirin in reducing vascular events after non-cardioembolic stroke.³⁸ The optimum timing of introduction of anticoagulant after the stroke has not been clearly defined. The risk of haemorrhagic transformation should be considered.

4.3 Carotid endarterectomy

The role of carotid endarterectomy (CEA) was studied in 3 large randomised controlled trials.³⁹ When combined with aspirin, CEA has been found to be effective in reducing the risk of recurrent stroke, compared to taking aspirin alone, in patients with 70-99% (NASCET-measured[†]) internal carotid stenosis ipsilateral to a carotid territory TIA or non-disabling ischaemic stroke. CEA may also benefit selected high-risk patients with symptomatic 50-69% (NASCET-measured) stenosis. The benefit seen with CEA among patients with symptomatic stenosis is generalisable only to surgically fit patients operated on by surgeons with acceptable complication rates.

Carotid angioplasty, with or without stenting, is still an investigational procedure, and should only be carried out under appropriate clinical trial protocols.

[†] NASCET = North American Symptomatic Carotid Endarterectomy Trial. The measurement is the diameter of a normal-looking portion of the more distal internal carotid artery minus the diameter of the narrowest portion of the proximal internal carotid artery, divided by the diameter of the normal-looking portion of the more distal internal artery, multiplied by 100.

A Patients with moderate or severe internal carotid artery stenosis ipsilateral to a carotid TIA or non-disabling ischaemic stroke should be considered for CEA by an experienced surgeon.

Grade A, Level Ia & 1b

4.4 Blood pressure lowering

While aggressive lowering of mild to moderately elevated blood pressure is not recommended during the acute phase of stroke,²⁷ blood pressure reduction commencing beyond the acute phase results in a further reduction of vascular events.⁴⁰ The benefit is seen in both ischemic and hemorrhagic stroke, in both hypertensive and non-hypertensive subjects.⁴¹

A Blood pressure lowering should be considered after the acute phase of stroke

Grade A, Level Ia

4.5 Lipid lowering

Statins have been shown to reduce the occurrence of vascular events among high risk patients, including those with CVD.⁴²

A Cholesterol lowering should be considered after the acute phase of stroke.

Grade A, Level 1b

4.6 Other risk factors

There are few randomised clinical trials studying the effects of risk factor modification in the secondary prevention of ischaemic or haemorrhagic stroke. Inferences can be drawn from the findings of primary prevention trials. Cessation of cigarette smoking should be advocated.⁴³

C Control of risk factors such as diabetes mellitus and cessation of cigarette smoking should be advocated once the initial event has stabilised.

Grade C, Level IV

5 Implications for service delivery

The adequate assessment of patients with clinically suspected recent stroke or TIA requires access to a multidisciplinary team to provide both the initial assessment and, if necessary, on-going support and rehabilitation. Adequate investigation of patients with recent stroke or TIA requires rapid access to hospital-based facilities via either hospital admission or a specialist outpatient clinic.¹

C Hospitals and general practitioners should agree on a local admissions policy and a local protocol for referral to specialist assessment clinics for those not requiring hospital admission.

Grade C, Level IV

5.1 Admission policies

A meta-analysis of trials comparing the management of patients with acute stroke in specialised units and in general medical units has shown that the management of patients with stroke in a stroke unit is associated with a reduction in death, dead or disability, and death or institutionalisation. More patients managed in stroke units are discharged home and remain at home.⁴⁴ Benefits occur by reducing death from secondary complications of stroke and reducing the need for institutional care through a reduction in disability.⁴⁵

In the majority of these trials, stroke care was provided in a designated area or ward, as opposed to a roving stroke care team. Members of the multidisciplinary team could include nurses, physiotherapists, occupational therapists, speech therapists, dietitians, medical social workers, case managers and patient educators.

A Patients who have suffered an acute stroke should be admitted to a Stroke Unit.

Grade A, Level Ia

5.2 Stroke assessment clinics

In the period following a TIA, the risk of stroke is approximately seven times the risk in the general population of the same age: 12% in the first year and 7% per annum thereafter.⁴⁶

Patients who have sustained minor strokes or TIA and who are not admitted to hospital require urgent assessment. The risk of a further more serious stroke is highest in the few weeks immediately following a transient ischaemic attack. The aim should be for all such patients to be assessed at specialist outpatient clinics as soon as possible after recognition of the TIA

C Patients with suspected TIA or minor stroke who are not admitted to hospital should have rapid access to urgent assessment and investigation (brain scanning, carotid Doppler examination and echocardiography). Initial assessment should usually be completed within 1-2 weeks of referral.

Grade C, Level IV

5.3 Organisation of care for patients admitted to hospital with a stroke

The 1996 Declaration of Helsingborg called for organisation of stroke care by a multidisciplinary service.⁴⁷ It is the view of the guideline development group that an identified clinician with a special interest in stroke should have overall responsibility for this service, which should include rapid investigation and diagnosis, optimal nursing care and planning of secondary prevention. In addition, prompt assessment of neurological impairment and disability, and involvement of a multidisciplinary team are beneficial. These are important components of stroke units.⁴⁴

A Acute inpatient care for patients admitted to hospital with a stroke should be organised as a multidisciplinary stroke service based in designated stroke units.

Grade A, Level Ia

5.4 Rehabilitation

Evidence from clinical trials suggests that early rehabilitation intervention leads to improved physical and functional outcomes after stroke.^{48,49}

A All stroke patients should be assessed for rehabilitation potential, and rehabilitation therapy started as soon as the patient's condition permits.

Grade A, Level Ib

A meta-analysis has shown that patients managed in a stroke rehabilitation unit had better outcomes than patients managed in a mixed rehabilitation unit.⁴⁴ Patients managed in a mixed rehabilitation ward had better outcomes than patients managed in a general medical ward.

A Stroke patients should be rehabilitated in a stroke rehabilitation unit. Where this is not available, rehabilitation should be provided in a generic rehabilitation ward.

Grade A, Level Ia

Hospital managers and professional directors should consider these guidelines in audit planning, especially in units where a large number of acute patients are admitted (e.g. general medical and geriatric units). Primary care practitioners should also consider the implications of these guidelines for clinical audit and the potential for audit at the interface between primary and secondary care.

6.1 Audit of key outcome indicators

Key outcome indicators are listed at Annex 1. The desired outcomes of clinical assessment, investigation and immediate management are accuracy of diagnosis, identification of care needs in disabling strokes and the provision of supportive care. Audit of individual episodes of care will ascertain if these goals have been met.

Particular attention should be paid to accuracy of diagnosis. Appropriate secondary prevention is dependent on an accurate diagnosis. This can best be judged in audit of individual episodes of care and a retrospective review of cases when new stroke or TIA events occur. The key outcome indicator is reduction of stroke events and deaths, which can only be judged at a population level, i.e. from epidemiological data.

6.2 Audit of process

Audit of process at ward level is strongly recommended. The minimum provisions and clinical core dataset required for audit of process are listed at Annex 2. It will be advantageous to establish current baseline practice against which change may be measured.

6.3 Quality assurance and continuous quality improvement

Hospital managers and clinical directors, involving their hospital audit committees as appropriate, should ensure that performance is satisfactory with regard to providing appropriate care for the stroke patient in terms of clinical assessment and investigation, and introducing secondary prevention in appropriate patients.

7 Implementation of guidelines

Stroke patients should be managed in stroke units.

It is expected that these guidelines will be adopted after discussion involving clinical staff and hospital authorities. Providers should consider how best to implement these guidelines and audit their use. One commonly used method is the development of stroke carepaths. Local protocols should be discussed with and circulated to all relevant staff.

7.1 Continuing education

Continuing education of relevant staff (medical, nursing, paramedical, pharmaceutical) at hospital, unit and general medical practice levels should be conducted through lectures, tutorials and policy reviews.

Hospitals and units may wish to appoint a staff member to co-ordinate this activity, which may be most appropriately delivered by the multidisciplinary stroke team.

7.2 Funding

Adequate funding/subsidy is required for effective and appropriate care to be given to all stroke and TIA patients.

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Key outcome indicators

- 1 For the component of stroke care covered by these guidelines, the quality of care given can be defined if:
 - the nature of stroke and its aetiology have been accurately defined in the case record
 - in either a primary or secondary stroke event, appropriate secondary prevention is introduced, considering both aetiology and risks and benefits to the individual patient
 - a reduction in recurrent stroke events is achieved
- 2 The first two of these outcome indicators are amenable to audit in either primary or secondary care centres; the third requires a population-based audit or epidemiological study. The quality of the audit will in part be dictated by the way in which clinical information is recorded and, in the hospital setting, how effectively episodes or care are coded.
- 3 Routine collection of data for these outcome indicators may be problematic. Hence, audit of *process* is preferred because:
 - the reduction of stroke events and deaths is a long term outcome, i.e. over months and years
 - the choice of secondary prevention is determined by individual patient needs

Minimum provisions and core dataset required for audit of process by hospital units

Provisions

- access to unit case records, prescription forms and patients
- access to unit protocols, care plans and procedures
- lists of admissions (stroke register)
- time for audit

Core dataset for audit

Clinical assessment

- initial diagnosis on admission
- identification of neurological impairment
- identification of functional and social impairment

Investigations

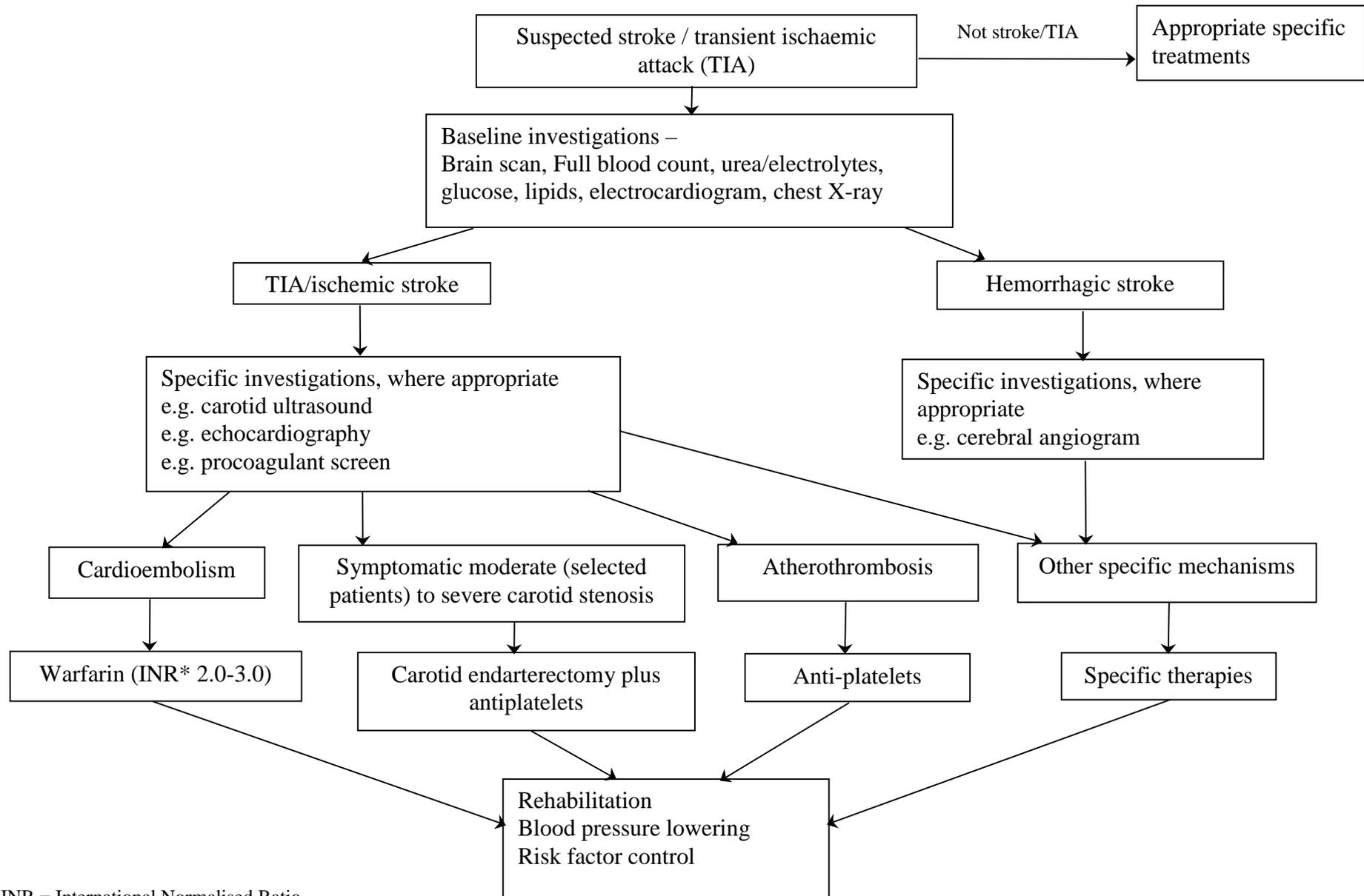
- brain scan results
- ECG
- baseline investigations
- other specific investigations

Secondary prevention

- use of antiplatelets
- use of anticoagulation

Surgical intervention

Management of Suspected Stroke/TIA



* INR = International Normalised Ratio

Self-assessment (MCQs)

After reading the Clinical Practice Guidelines, you can claim one CME point under Category III (Self-Study) of the SMC Online CME System. Before you login to claim the CME point, we encourage you to evaluate whether you have mastered the key points in the Guidelines by completing this set of MCQs. This is an extension of the learning process and is not intended to “judge” your knowledge and is not compulsory. The answers can be found at the end of the questionnaire.

Instruction: Choose 'True' or 'False'

1. Stroke is among Singapore's top 5 leading causes of death, and a cause of rising hospital admissions

True

False

2. Acute stroke patients should be managed in stroke units (SUs) as SUs reduce death and disability post-stroke

True

False

3. Suspected stroke patients need not undergo brain scan as soon as possible as there are no effective early therapies

True

False

4. Elevated blood pressure should be aggressively reduced in all acute stroke patients

True

False

5. Corticosteroids, neuroprotectant drugs, hemodilution are proven therapies, and should be given to all stroke patients

True

False

6. Hyperthermia and hyperglycemia in the acute stroke patient are best left untreated

True

False

7. Antiplatelet therapy should be started as soon as possible after acute ischemic stroke

True

False

8. Anticoagulation is preferred for patients with non-disabling cardioembolic stroke

True

False

9. Carotid endarterectomy is recommended for non-disabling stroke and TIA patients with severe symptomatic carotid stenosis

True

False

10. Blood pressure lowering after the acute phase of stroke results in further reduction of adverse events

True

False

Answers:

1. T
2. T
3. F
4. F
5. F
6. F
7. T
8. T
9. T
10. T

Workgroup members

The members of the workgroup, who were appointed in their personal professional capacity, are:

Chairman: Dr N V Ramani
Department of Neurology
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MOH CLINICAL PRACTICE GUIDELINES 3/2003

STROKE AND TRANSIENT ISCHAEMIC ATTACKS (TIAs) Assessment, Investigation, Immediate Management and Secondary Prevention



Ministry
of Health

National Committee
on Neuroscience

NMRC
National Medical
Research Council

Executive summary of recommendations

Details of recommendations can be found in the main text at the pages indicated.

Service delivery

A Acute inpatient care for patients admitted to hospital with a stroke should be organised as a multidisciplinary stroke service based in designated stroke units. (pg 21)

Grade A, Level Ia

C Hospitals and general practitioners should agree on a local admissions policy and a local protocol for referral to specialist assessment clinics for those not requiring hospital admission. (pg 20)

Grade C, Level IV

Assessment and investigation

C A full medical assessment should be undertaken and multidisciplinary assessment considered for all patients with acute stroke or transient ischaemic attack (TIA) to define the nature of the event, the need for investigations, further management and rehabilitation. (pg 9)

Grade C, Level IV

C Written local protocols should be available, setting out indications for both routine and more specialised investigations which the clinical situation may merit. (pg 10)

Grade C, Level IV

C & GPP All patients with acute stroke should undergo brain scanning (CT or MRI) as soon as possible*, preferably within 24 hours[†]. A local protocol for more urgent scans should be made available[†].(pg 11)

*Grade C, Level IV

[†]GPP

C All patients with acute stroke or TIA should have the following investigations: ECG, chest X-ray, full blood count, serum urea and electrolytes, blood glucose and lipids. (pg 11)

Grade C, Level IV

B A swallowing assessment should be undertaken at home or in hospital as part of the clinical assessment of stroke. (pg 10)

Grade B, Level III

Immediate management

A The routine use of drugs to limit neural damage, including the administration of corticosteroids, neuroprotectants, plasma volume expanders, barbiturates and streptokinase, is of no proven benefit and should be discouraged. (pg 14)

Grade A, Levels Ia & Ib

A Antiplatelet therapy, normally aspirin, should be prescribed immediately in patients who have sustained an ischaemic stroke. (pg 13)

Grade A, Levels Ia & Ib

A Mild and moderately elevated blood pressure should not routinely be lowered in the acute phase of stroke as this may worsen outcome. (pg 14)

Grade A, Level Ia

C Urgent neurosurgical assessment should be available for selected patients, such as those with large cerebellar infarcts or haemorrhage or acute hydrocephalus, and for selected cases of cerebral haemorrhage. (pg 15)

Grade C, Level IV

C Patients receiving anticoagulants or recent thrombolytic therapy or those with bleeding diatheses require urgent correction of coagulation defects. Thrombolytics, anti-platelet therapy and anticoagulants should be discontinued. (pg 14)

Grade C, Level IV

C Measures should be taken to combat fever in acute stroke patients. Stroke patients with fever should be fully investigated for possible sources of infection and started on early antibiotic therapy if appropriate. (pg 15)

Grade C, Level IV

C Reasonable glycemc control should be maintained in all acute stroke patients. (pg 15)

Grade C, Level IV

C Measures should be instituted to prevent complications after acute stroke such as infections, decubitus ulcers, deep venous thrombosis and depression. (pg 16)

Grade C, Level IV

Secondary prevention

A Antiplatelet therapy should be continued on the long term for the secondary prevention of recurrent stroke and other vascular events in patients who have sustained an ischaemic cerebrovascular event. (pg 17)

Grade A, Levels Ia & Ib

A Warfarin should be considered for use in stroke and TIA patients with non-valvular atrial fibrillation. (pg 17)

Grade A , Level Ia

C Warfarin should also be considered after cardioembolic stroke or TIA from valvular heart disease and recent myocardial infarction. (pg 18)

Grade C, Level IV

A Patients with moderate or severe internal carotid artery ipsilateral to a carotid TIA or non-disabling ischaemic stroke should be considered for carotid endarterectomy by an experienced surgeon. (pg 18)

Grade A, Level Ia & Ib

A Blood pressure lowering should be considered for patients after the acute phase of stroke. (pg 19)

Grade A, Level Ia

A Cholesterol lowering should be considered for patients after the acute phase of stroke. (pg 19)

Grade A, Level Ib

C The control of risk factors such as diabetes mellitus and cigarette smoking, should be initiated once the initial event has stabilised. (pg 19)

Grade C, Level IV

Rehabilitation

A All stroke patients should be assessed for rehabilitation potential, and rehabilitation therapy started as soon as the patient's condition permits. (pg 21)

Grade A, Level Ib

A Stroke patients should be rehabilitated in a stroke rehabilitation unit. Where this is not available, rehabilitation should be provided in a generic rehabilitation ward. (pg 22)

Grade A, Level Ia

Key outcome indicators

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Core dataset for audit

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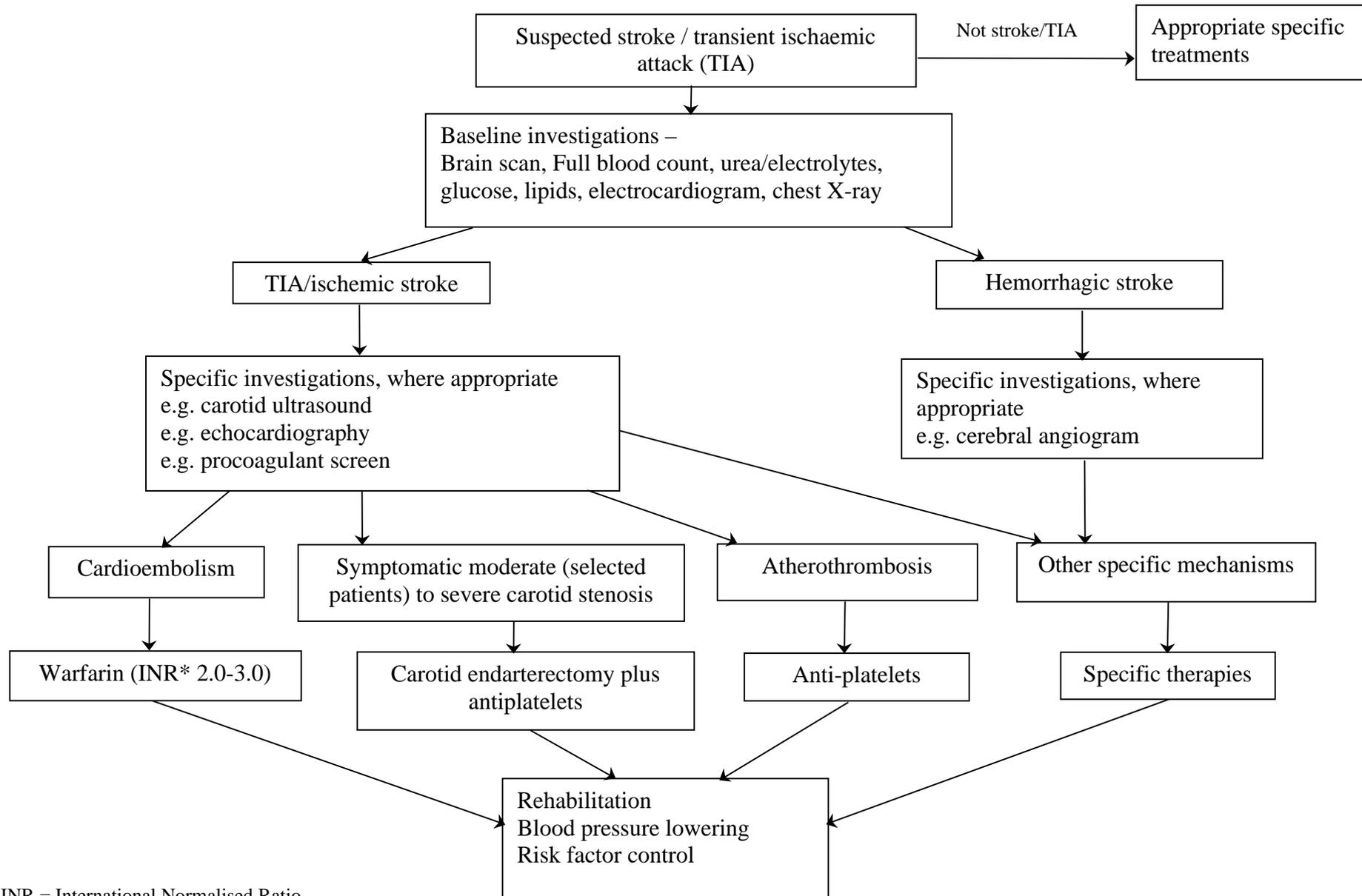
- brain scan results
- ECG
- baseline investigations
- other specific investigations

Secondary prevention

- use of antiplatelets
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Surgical intervention

Management of Suspected Stroke/TIA



* INR = International Normalised Ratio