



GUIDELINES FOR INVESTIGATION AND MANAGEMENT OF TRANSIENT ISCHAEMIC ATTACK

October 2006

These guidelines have been published by the Clinical Resource Efficiency Support Team (CREST), which is a small team of health care professionals established under the auspices of the Central Medical Advisory Committee in 1988. The aims of CREST are to promote clinical efficiency in the Health Service in Northern Ireland, while ensuring the highest possible standard of clinical practice is maintained.

The guidelines have been produced by a sub-group of health care professionals from varied backgrounds including medical (primary and secondary care), management and public health, chaired by Dr Michael Power. CREST wishes to thank them and all those who contributed in any way to the development of these guidelines.

Further copies of this booklet may be obtained from:

**CREST Secretariat
Room D1
Castle Buildings
Stormont
BELFAST
BT4 3SQ**

Telephone 028 9052 2028

Fax 028 9052 3206

E-mail: christine.smith@dhsspsni.gov.uk

Or you can visit the CREST website at: www.crestni.org.uk

ISBN 1-903982-25-1

CONTENTS

Page no

Foreword	3
Members of the Transient Ischaemic Attack Sub-Group.....	4
Executive Summary	5
1. Introduction	7
2. Definition.....	7
3. Causes of TIA.....	7
4. How Common is TIA?.....	8
5. Making the Clinical Diagnosis of TIA.....	8
5.1 Symptoms of TIA in the Carotid Circulation	
5.2 Symptoms of TIA in the Vertebrobasilar Circulation (Posterior Territory)	
5.3 Signs of TIA	
6. How likely is the Diagnosis of TIA?	10
6.1 Symptoms of Probable TIA	
6.2 Symptoms of Possible TIA	
6.3 Symptoms that do not Suggest TIA	
7. What other Conditions can Mimic TIA?.....	11
7.1 Conditions which cause Focal Neurological Symptoms or Signs	
7.2 Conditions which cause Visual Disturbance	
7.3 Conditions which cause Dizziness or Syncope	
7.4 Structural Intracranial Abnormalities	
7.5 Conditions which cause Transient Amnesia	
8. How to Refer?.....	11
9. Prognosis Following TIA.....	12
10. Long Term Cardiovascular Risk.....	13
11. Initial Investigation of TIA (Primary or Secondary Care).....	13

12.	Further Investigations of TIA (Secondary Care).....	13
12.1	Echocardiography	
12.2	24 Hour Ambulatory ECG	
12.3	Other Investigations	
13.	Carotid and Brain Imaging.....	14
13.1	Carotid Imaging	
13.2	Brian Imaging	
14.	Immediate Management of TIA.....	15
14.1	Anti-Platelet Therapy	
14.2	Anticoagulation	
14.3	Statin Therapy	
14.4	Blood Pressure Reduction	
15.	The Role of Carotid Re-Vascularisation in Stroke Prevention.....	17
15.1	Pre-Operative Conditions	
15.2	Surgery	
15.3	Post-Operative Conditions	
15.4	Other Surgical Techniques	
16.	Secondary Prevention.....	19
16.1	Anti-Platelet Therapy	
16.2	Hypertension	
16.3	Hypercholesterolaemia	
16.4	Diabetes	
16.5	Carotid Stenosis	
16.6	Anticoagulation	
16.7	Lifestyle	
	References	21
	Appendices	25

FOREWORD

In a standardised cohort of 500,000 patients 490 Transient Ischaemic Attacks (TIA) or minor strokes will occur per annum. This equates to 1666 per annum in Northern Ireland.

A TIA is the only warning we have that a stroke may be imminent and precedes ischaemic stroke in 15-26% of patients. It allows us an opportunity to intervene to help prevent a more damaging ischaemic stroke. The window of opportunity to do this effectively is small and requires such patients to have stroke specialist assessment rapidly. This guideline outlines the key actions required, both medically and surgically, to manage such patients and reduce the risk of cerebrovascular and cardiovascular disease both in the short and long term. Much of this guideline equally applies to patients with non-disabling ischaemic stroke who are also at high risk of recurrence.

Under the auspices of CREST, an expert panel was convened to review the evidence for TIA. The panel included health care professionals from varied backgrounds including medical (primary and secondary care), nursing, management and public health and was chaired by Dr Michael Power.

CREST would like to thank Dr Power, the members of the sub-group and all those who contributed in any way to the production of these guidelines.



DAVID GT STEWART
Chair of CREST

MEMBERS OF THE TRANSIENT ISCHAEMIC ATTACK SUB-GROUP

Dr Michael Power
Consultant Geriatrician/Stroke Physician
Ulster Hospital

Dr Paul Blair
Consultant Vascular Surgeon
Royal Group of Hospitals

Dr Peter Flynn
Consultant Neuroradiologist
Royal Group of Hospitals

Anne Marie Hunter
Neurovascular Nurse Specialist
Royal Group of Hospitals

Dr Mark McCarron
Consultant Neurologist
Altnagelvin Hospital

Dr Clive Russell
Consultant Physician
Tyrone County Hospital

Dr Ivan Wiggam
Consultant Geriatrician/Stroke Physician
Belfast City Hospital

Paul Brannigan
Clinical Scientist
NI Regional Medical Physics Agency
Royal Group of Hospitals

Dr Paul Kerr
Consultant A&E
Criagavon Area Hospital

Dr Gerry Burns
Duncairn Medical Practice

Dr Michael Herron
Carrickmore Health Centre

CREST Secretariat
Christine Smith

GUIDELINES FOR INVESTIGATION AND MANAGEMENT OF TRANSIENT ISCHAEMIC ATTACK

EXECUTIVE SUMMARY

- Transient Ischaemic Attack (TIA) is a medical emergency, indicating unstable brain ischaemia and requires immediate assessment by a stroke physician with specialist stroke training.
- TIA arises because of a transient interruption to the blood supply of the brain or eye, usually lasting less than 30 minutes.
- A General Practitioner with a list size of 2000 patients will see approximately 4 suspected TIA and 4-5 new stroke cases each year.
- The following symptoms DO NOT suggest TIA:

Isolated confusion	General weakness
Isolated dizziness	Falls
Isolated amnesia	Fainting
Isolated tinnitus	Scintillating scotoma
- All suspected TIA patients should be referred immediately to a fast track TIA Clinic for specialist assessment. Patients should be seen within 1 week of the event and where access is limited those at highest risk given priority using the ABCD score. Those with >1 TIA in 1 week, those patients on warfarin, or whose ABCD risk score is high should be admitted to the stroke unit immediately. ***TIA indicates unstable brain ischaemia with a high risk of imminent stroke.*** A flowchart outlining early TIA management decisions is available at Appendix 1.
- Delays in TIA patients being assessed and treated means that significant opportunities to prevent subsequent strokes are being missed. Patients requiring vascular and/or brain imaging should have this done rapidly.
- Patients with suspected TIA should be given aspirin 300mg as a loading dose and commenced on a statin pending the results of lipid profile.

- Patients' risk factors (diabetes mellitus, hypertension, hyperlipidaemia, ischaemic heart disease, etc) should be identified and appropriate action taken to reduce the patient's overall vascular risk.
- Patients should be provided with their own risk factor profile and targets for any intervention.
- Patients with symptomatic carotid stenosis >70% carotid endarterectomy within 2 weeks reduces the risk of stroke with the benefit decreasing the longer the delay to surgery.
- Patients should be given appropriate lifestyle advice, including smoking cessation, diet, exercise, alcohol and resumption of driving.

1. INTRODUCTION

TIA is the only warning we have that a stroke may be imminent and precedes ischaemic stroke in 15-26% of patients¹. Based on the Oxford Vascular Study² the annual incidence per 1000 population (95% confidence intervals) for definite first-ever-in-a-lifetime TIA definite was 0.51(0.43-0.6). However the rate of any first or recurrent probable or definite TIA was double this rate and the overall rate of presentation of any suspected TIA to clinical services was over four times higher at 2.25 (2.08-2.43)³. This equates to approximately 1800 definite or probable TIAs and 3800 suspected TIAs per annum in Northern Ireland. Recognition of a TIA offers an opportunity to intervene which may help prevent a damaging ischaemic stroke. The window of opportunity to do this effectively is small and requires such patients to have a rapid stroke specialist assessment. This guideline highlights the key actions required, both medically and surgically, to manage such patients and reduce the risk of cerebrovascular and cardiovascular disease both in the short and long term. Much of this guideline applies equally to patients with non-disabling ischaemic stroke who are also at high risk of recurrence⁴.

2. DEFINITION

TIA is a medical emergency, indicating unstable brain ischaemia and requires immediate assessment by a physician with specialist stroke training.

For the purpose of this guideline we use the traditional definition of TIA based on symptom duration and not on the presence of brain infarction on brain imaging⁵. TIA is a clinical syndrome characterised by an acute loss of focal cerebral or ocular function with symptoms lasting less than 24 hours⁶. The cut-off time of 24 hours is arbitrary and most TIAs resolve within 30 minutes. Onset of symptoms is rapid, with symptoms peaking in less than 1 minute.

3. CAUSES OF TIA

TIA arises because of a transient interruption to the blood supply of the brain or eye, usually lasting less than 30 minutes.

TIAs are due to inadequate cerebral or ocular blood supply as a result of thrombosis, embolism or low blood flow associated with diseases of the blood, blood vessels or heart. 70% of TIAs occur in the territory of the carotid arteries (anterior circulation) with the remaining 30% occurring in the territory of the vertebrobasilar arteries (posterior circulation)⁷. TIA can be further sub-divided as indicated in table 1.

Table 1: Aetiology of TIA

Cause	Patients (%)
1. Arterial disease (embolism/low flow)	75-80%
2. Large artery atherothromboembolism	50%
- Aortic arch	10-15%
- Extracranial Internal Carotid Artery (ICA)	35%
- Intracranial ICA/External Carotid Artery (ECA)	<5%
3. Small artery disease	25%
4. Non-atheromatous arterial disease	<5%
5. Embolism from heart	20%
6. Blood disease (Thrombophilia)	<5%

- Although by definition TIAs cause no residual disability, they indicate an imminent high risk of a more serious cerebrovascular or cardiovascular event⁴.
- Common risk factors increasing the likelihood of TIA include increasing age, persistent or paroxysmal atrial fibrillation, hypertension, ischaemic heart disease, diabetes mellitus, carotid stenosis, hyperlipidaemia and being a current smoker⁸.
- Less common causes are carotid or vertebral artery dissection, patent foramen ovale (PFO), cerebral vasculitis and thrombophilia.

4. HOW COMMON IS TIA?

- The incidence of TIA is thought to be around 66 per 100,000 of the general population each year⁹. The true incidence however may be higher, as many episodes of TIA do not come to medical attention¹⁰.
- A General Practitioner with a list size of 2000 patients will see approximately 4 new patients with suspected TIA and 4-5 new stroke cases each year.
- About 23% of those who present with an ischaemic stroke give a history of a prior TIA¹.

5. MAKING THE CLINICAL DIAGNOSIS OF TIA

A witnessed account of the event can help in reaching an accurate diagnosis.

As most TIAs last minutes rather than hours, the initial diagnosis is usually made on the patient's history. However, as the patient's history may not always be

accurate it is important to get an accurate history from a witness. Diagnosis may depend on such a witnessed account of events.

TIA's cause focal neurological symptoms i.e. those that arise from a disturbance of function in an identifiable and localised area of the brain.

5.1 Symptoms of TIA in the Carotid Circulation

- Weakness or sensory loss affecting the contra-lateral arm, leg or one side of face. (In the absence of other symptoms it is not possible to distinguish carotid from vertebrobasilar TIA).
- Dysphasia (difficulty in expressive speech or comprehension) or dysarthria (difficulty with articulation) are both common with carotid territory TIA. Dysphasia usually indicates left sided cerebral hemisphere ischaemia.
- Monocular visual loss (amaurosis fugax) usually lasting a few minutes only. It should be noted that a patient may report loss of vision in one eye when what they actually mean is loss of vision in one half of the visual field i.e. homonymous hemianopia.

5.2 Symptoms of TIA in the Vertebrobasilar Circulation (Posterior Territory)

- Bilateral motor and/or sensory deficits or motor and sensory symptoms changing sides between attacks
- Isolated homonymous hemianopia or quadrantanopia
- Cortical blindness
- Diplopia
- Vertigo (although not usually in isolation)
- Ataxia, dysarthria or unilateral weakness/sensory loss can occur with either anterior or posterior TIA¹¹

5.3 Signs of TIA

- Focal neurological signs have usually resolved by the time the patient presents
- Cardiovascular examination may be helpful to identify known risk factors:-
 - Neck bruits - it should be noted that a bruit might be absent even when there is severe carotid stenosis
 - Atrial fibrillation
 - Raised blood pressure
 - Reduced or absent peripheral pulses
 - Heart murmurs

6. HOW LIKELY IS THE DIAGNOSIS OF TIA?

6.1 *Symptoms of Probable TIA*¹²

6.1.1 Symptoms suggesting carotid TIA

- Monocular blindness
- Speech deficit (aphasia)
- Unilateral motor and/or
- Sensory symptoms affecting face and limbs

6.1.2 Symptoms suggesting vertebrobasilar TIA

- Bilateral motor and/or sensory symptoms affecting face and/or limbs
- Isolated homonymous hemianopia or quadrantanopia
- Cortical blindness

6.2 *Symptoms of Possible TIA*¹²

- Vertigo
- Diplopia
- Dysarthria
- Dysphasia
- Loss of balance
- Isolated sensory symptoms affecting face or limbs on one side
- Drop attack

6.3 *Symptoms that do not Suggest TIA*¹²

- Isolated confusion
- Isolated dizziness
- Isolated amnesia
- General weakness
- Fainting
- Scintillating scotoma
- Isolated tinnitus
- Stepwise progression of symptoms (usually sensory) involving several parts of the body
- Acute behavioural disturbance

7. WHAT OTHER CONDITIONS CAN MIMIC TIA? (Appendix 2)

7.1 *Conditions which cause Focal Neurological Symptoms or Signs*

- Partial seizure
- Migraine with aura (or aura without headache)
- Multiple sclerosis
- Peripheral nerve or nerve root compression
- Hypoglycaemia
- Hysteria

7.2 *Conditions which cause Visual Disturbance*

- Migraine with aura
- Retinal or vitreous haemorrhage
- Acute glaucoma
- Central retinal vein or branch occlusion
- Giant cell (temporal) arteritis

7.3 *Conditions which cause Dizziness or Syncope*

- Labyrinthine disorders (benign paroxysmal positional vertigo, vestibular neuronitis, Ménière's disease)
- Reduced global cerebral perfusion
- Carotid sinus syndrome
- Vasovagal syncope
- Hyperventilation

7.4 *Structural Intracranial Abnormalities*

- Brain tumour
- Subdural haematoma
- Brain abscess

7.5 *Conditions which cause Transient Amnesia*

- Transient global amnesia

8. HOW TO REFER?

- A specific referral form has been included with this guidance at Appendix 3. This could be faxed or emailed directly to personnel administering the TIA Clinic. Clear protocols should be established in each locality so that there is no

delay in the referral process and that patients are seen as quickly as possible. A summary of this guidance for use in primary care is outlined at Appendix 3a.

- All suspected TIA patients should be referred immediately to a fast track TIA Clinic except for those requiring immediate admission (see section 14). Patients should be seen as soon as possible at the clinic and *no later than 7 days post-event*. Potential sources of delays are outlined at Appendix 4.
- Such patients should not normally be referred to local Accident and Emergency Departments unless hospital admission is required or access to the TIA clinic is restricted or unavailable.
- Regular audit of service provision against agreed standards should take place as suggested at Appendix 5.

9. PROGNOSIS FOLLOWING TIA

TIA indicates unstable brain ischaemia with a high risk of imminent stroke.

- TIA is an unstable condition with a much higher and early risk of stroke than previously thought⁴.
- The risk of stroke in the first 48 hours is 5% and in the first 7 days after a TIA is approximately 8%³. This is higher than the risk of myocardial infarction in patients presenting with acute chest pain¹³.
- The 7 day risk of stroke after a TIA can be predicted using a simple score based on age, blood pressure, clinical features, and duration of symptoms, the so called ABCD score¹⁴(table 2).
- Those with an ABCD score of 6 have the highest risk of stroke, with approximately 1/3 of such patients suffering a stroke at 7 days post-TIA.
- TIA of the eye has a relatively good prognosis compared with hemispheric TIA¹⁵.

Table 2: Risk of stroke following TIA (ABCD Score)*

		Score
A	Age >60 years	1
B	BP >140 systolic and/or >90 diastolic	1
C	Clinical features: Unilateral weakness	2
	Speech disturbance without weakness	1
	Other	0
D	Duration of symptoms: > 60 minutes	2
	10 – 59 minutes	1
	<10 minutes	0

*ABCD score is the sum of the individual categories

10. LONG TERM CARDIOVASCULAR RISK

Non-stroke vascular events such as coronary artery disease are more likely than stroke as a cause of death in the long term.

The annual risk of a major cardiovascular event (stroke, myocardial infarction or vascular death) after a TIA is about 9% per year¹⁶. The relative risk of stroke, coronary events and non-vascular events changes over time after a TIA. Up to 1 year post-TIA the risk of stroke is greatest whereas after 1 year coronary events and non-vascular events exceed the number of strokes. Of those who die after TIA 40% are due to heart disease, 25% due to stroke, 5% due to other vascular disorders and 30% due to non-vascular disorders¹⁶. 10 years after a TIA or minor ischaemic stroke approximately 60% have died and 54% have experienced another vascular event¹⁷.

11. INITIAL INVESTIGATION OF TIA (PRIMARY OR SECONDARY CARE)

- Full blood count
- Erythrocyte Sedimentation Rate (ESR) or C-reactive protein (depending on local circumstances)
- Urea and Electrolytes (U&E)
- Random plasma glucose
- Lipid profile
- International Normalisation Ratio (INR) if on warfarin
- Electrocardiograph (ECG)
- Chest X Ray where indicated

12. FURTHER INVESTIGATION OF TIA (SECONDARY CARE)

12.1 Echocardiography

Echocardiography should be undertaken where cardiogenic embolism is suspected e.g. atrial fibrillation, PFO, left atrial or left ventricular thrombus. Transthoracic echocardiography (TTE), usually with contrast, is recommended as the initial approach but transoesophageal echocardiography (TOE) is more sensitive for patients with thrombus in the left atrial appendage, PFO, aortic atherosclerosis and some mitral valve lesions. TOE should therefore be considered where TTE is negative and the index of suspicion remains high for a cardiac source of embolism.

12.2 24 Hour Ambulatory ECG

For further investigation of cardiac arrhythmia particularly paroxysmal atrial fibrillation.

12.3 Other Investigations

Thrombophilia screen, anti-cardiolipin antibody, coagulation screen, vasculitis and auto-antibody screen, plasma homocysteine, genetic studies (e.g. for Cerebral Autosomal Dominant Arteriopathy with Subcortical Infarcts and Leukoencephalopathy (CADASIL) may be required in some patients where risk factors are absent and/or there is a strong family history of arterial or venous thrombosis.

13. CAROTID AND BRAIN IMAGING

TIA clinics should ensure that key investigations, such as vascular and brain imaging are performed rapidly and preferably on the day of the patient's clinic attendance to enable treatment choices to be made as quickly as possible.

13.1 Carotid Imaging

The most cost effective diagnostic strategies for carotid stenosis are those which offer surgery to a larger proportion of patients quickly after the warning TIA/minor stroke. Surgical treatment is of proven benefit to patients with 70-99% stenosis as measured by The North American Symptomatic Carotid Endarterectomy Trial (NASCET) criteria¹⁸. There is also evidence to support treatment of 50-69% stenosis, though the benefits are less pronounced¹⁹.

Although the gold standard test is intra-arterial angiography (IAA), non-invasive imaging in the majority of patients is sufficiently accurate, quick to obtain, safe and cost effective as an alternative to IAA. Most of the evidence relates to carotid duplex scanning. There is less data available to support the routine use of CT angiography (CTA). As carotid duplex is the most widely accessible, it is reasonable to use this as first line but only if performed by specialist radiologists or ultrasonographers in quality controlled and audited practices. Further imaging may be performed at the discretion of the specialist centre. This may include repeat duplex scan, CTA, contrast enhanced magnetic resonance angiography (CEMRA) and rarely IAA.

13.2 Brain Imaging

CT brain scan should be performed as soon as possible after a suspected hemispheric TIA or after recurrent events; this should not delay surgical referral. All patients on warfarin should have an immediate CT brain scan to exclude haemorrhage. Where anticoagulation is planned e.g. for atrial fibrillation, prior CT is mandatory to rule out intracranial haemorrhage. For patients presenting later than 8 days after the event appropriate magnetic resonance imaging (MRI) techniques should be considered, where available, as blood breakdown products are more readily detected compared to CT after such a delay²⁰. This may help differentiate spontaneous intracerebral haemorrhage from cerebral infarction. Specialised units may wish, under certain circumstances, to perform more detailed studies such as diffusion and/or perfusion MRI studies.

14. IMMEDIATE MANAGEMENT OF TIA

TIA once diagnosed requires immediate investigation and management by a physician with appropriate skills and training.

- All patients with a suspected TIA require urgent specialist assessment and investigation.
- Patients with >1 TIA in 1 week, those with an ABCD score of 6, and those on warfarin should be admitted immediately to the stroke unit for urgent assessment, investigation and management. Patients with atrial fibrillation and a TIA benefit more from anticoagulation than anti-platelet therapy²¹.
- All suspected TIA patients with an ABCD score of <6 should be referred to a Neurovascular Clinic and be seen within 7 days of the event.

14.1 Anti-Platelet Therapy

Patients with a suspected TIA should be prescribed a loading dose of an anti-platelet agent immediately, unless already on warfarin or there is a contraindication. Aspirin 300mg should be the preferred choice, unless the patient is genuinely intolerant of aspirin.

Table 3: Possible approaches to various clinical scenarios

Clinical scenario	Suggested initial anti-platelet therapy
Not on aspirin, no contraindication	Aspirin 300mg stat followed by 75mg daily + Dipyridamole MR 200mg BD where tolerated ^{22,23} . If persistent side effects of dipyridamole (headache, diarrhoea) are experienced aspirin 75mg daily alone should be given instead. Doses of aspirin >75mg do not confer additional protection.
Aspirin intolerant	Aspirin as above + proton pump inhibitor ²⁴ . Clopidrogel 75mg daily ²⁵ or dipyridamole MR 200mg twice daily (if intolerant of both Aspirin and clopidrogel) ²³ .
Event occurred while taking aspirin	Check compliance. If non-compliant treat as above ²⁶ . If compliant, consider adding dipyridamole MR 200mg BD ²³ or switching to clopidrogel 75mg daily ²⁵ .
Event occurred while taking clopidrogel	Continue clopidrogel. Check compliance. Combination therapy of aspirin + clopidrogel should not be routinely used, ^{27,28} though ongoing trials are examining this combination in the acute phase of TIA.
Patient with multiple vascular pathology	Consider using clopidrogel as first line agent ^{25,29} .

14.2 Anticoagulation

There are several potential indications for immediate anticoagulation after TIA as outlined below. Brain imaging is **mandatory** before doing so to exclude haemorrhage or non-vascular pathology.

14.2.1 Atrial fibrillation

All patients with TIA should have an immediate ECG. If atrial fibrillation is present and brain imaging excludes haemorrhage then anticoagulation is recommended as soon as possible, unless there are specific contraindications³⁰. For patients in atrial fibrillation who have a TIA despite therapeutic anticoagulation urgent brain imaging is required (see section 13) to exclude haemorrhage. There is no evidence to support addition of an anti-platelet agent or increasing the intensity of anticoagulation. Target INR for those patients on oral anticoagulation should be 2.5³¹.

14.2.2 Crescendo TIA

Patients with 2 or more TIAs within 1 week should be admitted to hospital for urgent specialist investigation and treatment. It is recommended that such patients have their diagnosis reviewed as recurrent neurological events may be due to other conditions e.g. partial seizures. Early advice from a stroke physician or neurologist is recommended.

14.2.3 TIA due to suspected carotid or vertebral dissection

Anticoagulation in this situation is commonly advised after appropriate imaging although there are no randomised trials to support this practice.

14.2.4 Oral anticoagulation

Oral anticoagulation may be considered in patients with a TIA caused by acute myocardial infarction in which left ventricular mural thrombus is identified.

14.3 Statin Therapy

Statin therapy should be commenced immediately in all TIA patients pending result of lipid profile³². Patients with total cholesterol of greater than 3.5 mmol/L should continue on a statin long term³³.

14.4 Blood Pressure Reduction

Blood pressure reduction after TIA is highly effective in the long term secondary prevention of further vascular events. However, if signs and symptoms have not fully resolved at the time of assessment, immediate blood pressure lowering should not normally be undertaken. In addition caution should be exercised in those with significant bilateral carotid stenosis³⁴.

15. THE ROLE OF CAROTID RE-VASCULARISATION IN STROKE PREVENTION

Carotid endarterectomy is now well established as an appropriate means of stroke prevention in symptomatic patients with severe ipsilateral ICA stenosis^{19,35}.

15.1 Pre-Operative Considerations

Patients with a severe carotid artery stenosis and recent ipsilateral TIA should undergo surgical intervention as soon as possible. Vascular surgeons will aim to perform surgery on symptomatic patients within 2 weeks of their first TIA. It is important that patients stay on all their medication until the time of surgery. This is particularly important if they are on anti-hypertensive agents and/or anti-platelet agents. One exception is Clopidrogel (Plavix) which should be

stopped 7 days prior to surgical intervention and an alternative anti-platelet agent given. In patients with crescendo TIAs additional strategies may be employed prior to surgical intervention.

15.2 Surgery

Carotid endarterectomy can be performed under general or local anaesthesia. The advantages of local anaesthetic technique include the immediate detection of neurological sequelae during the procedure, with avoidance of a temporary intraluminal cerebral protective shunt. Local anaesthetic techniques are becoming increasingly popular as they may be associated with a reduced risk of some post-operative complications³⁶.

The surgical procedure takes 1-2 hours to perform and the patient is usually discharged within 48-72 hours. Where an asymptomatic carotid stenosis (60-99%) is discovered during a carotid duplex examination, carotid endarterectomy may be considered in patients aged less than 75 years. If, in the same patient, surgery for symptomatic stenosis is required, this should be carried out first³⁷.

15.3 Post-Operative Conditions

The most significant complication following carotid endarterectomy is stroke. This can occur as a result of atherothromboembolism or may be due to cerebral haemorrhage associated with hypertension. Additional complications include wound haematoma and cranial nerve injury. Cranial nerve injury can be associated with facial numbness, hoarseness and swallowing difficulties. The majority of cranial nerve injuries are temporary. A small number of patients may develop headache and nausea, with or without hypertension, after carotid surgery and these patients may be at risk from hyper-perfusion syndrome. In general, any patient with complications following carotid surgery should be referred immediately to the Unit that performed the procedure.

The benefits of carotid endarterectomy in stroke prevention are only maintained if post-operative cerebral events are kept to a minimum. Units performing carotid endarterectomy should aim to have their service regularly audited and have an overall stroke and/or death rate following surgery below 5%. In certain high risk patients the risk of post-operative stroke may be slightly higher and this should be explained to the patient. Carotid endarterectomy should therefore only be performed by surgeons with appropriate training in units with adequate facilities and patient numbers.

15.4 Other Surgical Techniques

Carotid angioplasty and stenting continues to evolve. The SAPPHERE study³⁸ suggested that stenting with the use of an emboli-protection device is not inferior to carotid endarterectomy. However, its precise role remains to be defined and therefore it should be restricted to specialist vascular units with appropriate experience.

16. SECONDARY PREVENTION

Guidelines for management of risk factors in stroke patients.

16.1 Anti-Platelet Therapy

All patients not on anticoagulation should be prescribed anti-platelet treatment long term after a TIA to prevent further stroke or vascular events³⁹. The choice of agent should follow the guidance outlined in section 14.

16.2 Hypertension

- Initiate drug therapy in **All** TIA patients with sustained Systolic BP >140mmHg or Diastolic BP >90mmHg despite non-pharmacological measures⁴⁰.
- Treatment targets should be those suggested by the British Hypertension Society guidelines⁴⁰.
- Caution should be exercised in lowering blood pressure in those with bilateral carotid artery stenosis >70%³⁴.

	No diabetes	Diabetes
Optimal BP target	<140/85	<130/80
Audit standard	<150/90	<140/80

The audit standard reflects the minimum recommended level of BP control.

- **For normotensive patients who have suffered a TIA, treatment with a combination of angiotensin converting enzyme inhibitor and thiazide diuretic should be considered⁴¹. Lowest tolerated blood pressure should be target of treatment except for patients with significant bilateral carotid stenosis. Patients should be started on a single drug with the aim of achieving combination therapy. This should be in addition to existing therapy.**

16.3 Hypercholesterolaemia

- Long term therapy with a statin (e.g. simvastatin 40mg OD) should be considered for all patients who have suffered a TIA whose total cholesterol is >3.5 mmol/L³³.
- Dietary advice to help lower cholesterol should be given to all patients.

16.4 Diabetes

Ensure meticulous control of blood glucose and blood pressure (see above) in patients with diabetes.

16.5 Carotid Stenosis

Patients with an ipsilateral carotid artery stenosis of 70-99% should be considered for vascular surgery within 2 weeks of the vascular event (see section 13 and 15).

16.6 Anticoagulation

- Should be started in every TIA patient in atrial fibrillation (valvular or non- valvular) unless contraindicated²¹. Provided brain imaging has ruled out intracranial haemorrhage as outlined in section 14. Patient should be maintained on long term warfarin.
- An INR of 2.5 +/- 0.5 is considered optimal.
- Warfarin is no more effective than aspirin for patients in sinus rhythm who have had a TIA and is more likely to cause haemorrhage⁴².
- The risk of major bleeding is 2.8% per year³⁰.

16.7 Lifestyle

- **All** patients should be offered information and personalised advice about how they can reduce their modifiable risk factors⁸.
- **Smoking:** All smokers should be offered advice on how to stop smoking, including advice on the use of nicotine replacement therapy, other medical treatment and use of support groups. Smoking doubles the risk of stroke and chronic heart disease (CHD). After smoking cessation, the risk of stroke and CHD gradually returns to that of people who have never smoked⁴³.
- **Diet:** Patients should be advised to: -
 - Reduce weight, if appropriate
 - Reduce total and saturated fat intake, replace with some increase in polyunsaturated and monounsaturated fat and oily fish consumption
 - Reduce salt intake (max 5 grams per day)
 - Increase fruit and vegetable consumption (5 portions per day)⁴⁴
- **Exercise:** If appropriate, patients should be advised to take regular exercise e.g. a graded programme to increase levels to 30 minutes once daily.
- **Alcohol:** Patients should be advised to limit alcohol consumption (e.g. <21units per week for men and <14units per week for women).
- **Driving:** Patients should be advised not to drive for one month after a single TIA and should inform their insurance company. Patients with multiple TIAs over a short period of time need to inform the Driver and Vehicle Licensing Northern Ireland (DVLNI) and their insurance company. Such patients may not be able to drive for three months (guidance available on www.dvla.gov.uk).

REFERENCES

1. Rothwell PM, Warlow CP. Timing of TIAs preceding stroke: time window for prevention is very short. *Neurology* 2005; **64**:817-820.
2. Rothwell PM, Coull AJ, Giles MF, et al. Change in stroke incidence, mortality, case-fatality, severity, and risk factors in Oxfordshire, UK from 1981 to 2004 (Oxford Vascular Study). *Lancet* 2004; **363**:1925-933.
3. Rothwell PM. Personal communication 2006.
4. Coull AJ, Lovett JK, Rothwell PM, Oxford VS. Population based study of early risk of stroke after transient ischaemic attack or minor stroke: implications for public education and organisation of services. *BMJ* 2004; **328**:326.
5. Albers GW, Caplan LR, Easton JD, et al. Transient ischaemic attack - proposal for a new definition. *New England Journal of Medicine* 2002; **347**:1713-716.
6. Hatano S. Experience from a multicentre stroke register: a preliminary report. *Bulletin of the World Health Organization* 1976; **54**:541-553.
7. Correia M, Silva MR, Magalhaes R, Guimaraes L, Silva MC. Transient ischemic attacks in rural and urban northern Portugal: incidence and short-term prognosis. *Stroke* 2006; **37**:50-55.
8. Sacco RL. Risk factors for TIA and TIA as a risk factor for stroke. *Neurology* 2004; **62**:S7-11.
9. Rothwell PM, Coull AJ, Silver LE, et al. Population-based study of event-rate, incidence, case fatality, and mortality for all acute vascular events in all arterial territories (Oxford Vascular Study). *Lancet* 2005; **366**:1773-1783.
10. Johnston SC. Clinical practice. Transient ischemic attack. *New England Journal of Medicine* 2002; **347**:1687-1692.
11. Warlow CP, Dennis MS, van Gijn J, et al. Which arterial territory is involved? Developing a clinically based method of subclassification. In: Warlow CP, et al. *Stroke: a practical guide to management (2nd edition)*. Oxford: Blackwell Science Ltd, **2001**:106-150.
12. Albucher JF, Martel P, Mas JL. Clinical practice guidelines: diagnosis and immediate management of transient ischemic attacks in adults. *Cerebrovascular Diseases* 2005; **20**:220-225.
13. Johnston SC, Gress DR, Browner WS, Sidney S. Short-term prognosis after emergency department diagnosis of TIA. *JAMA* 2000; **284**:2901-2906.
14. Rothwell PM, Giles MF, Flossmann E, et al. A simple score (ABCD) to identify individuals at high early risk of stroke after transient ischaemic attack. *Lancet* 2005; **366**:29-36.
15. Benavente O, Eliasziw M, Streifler JY, et al. Prognosis after transient monocular blindness associated with carotid-artery stenosis. *New England Journal of Medicine* 2001; **345**:1084-1090.

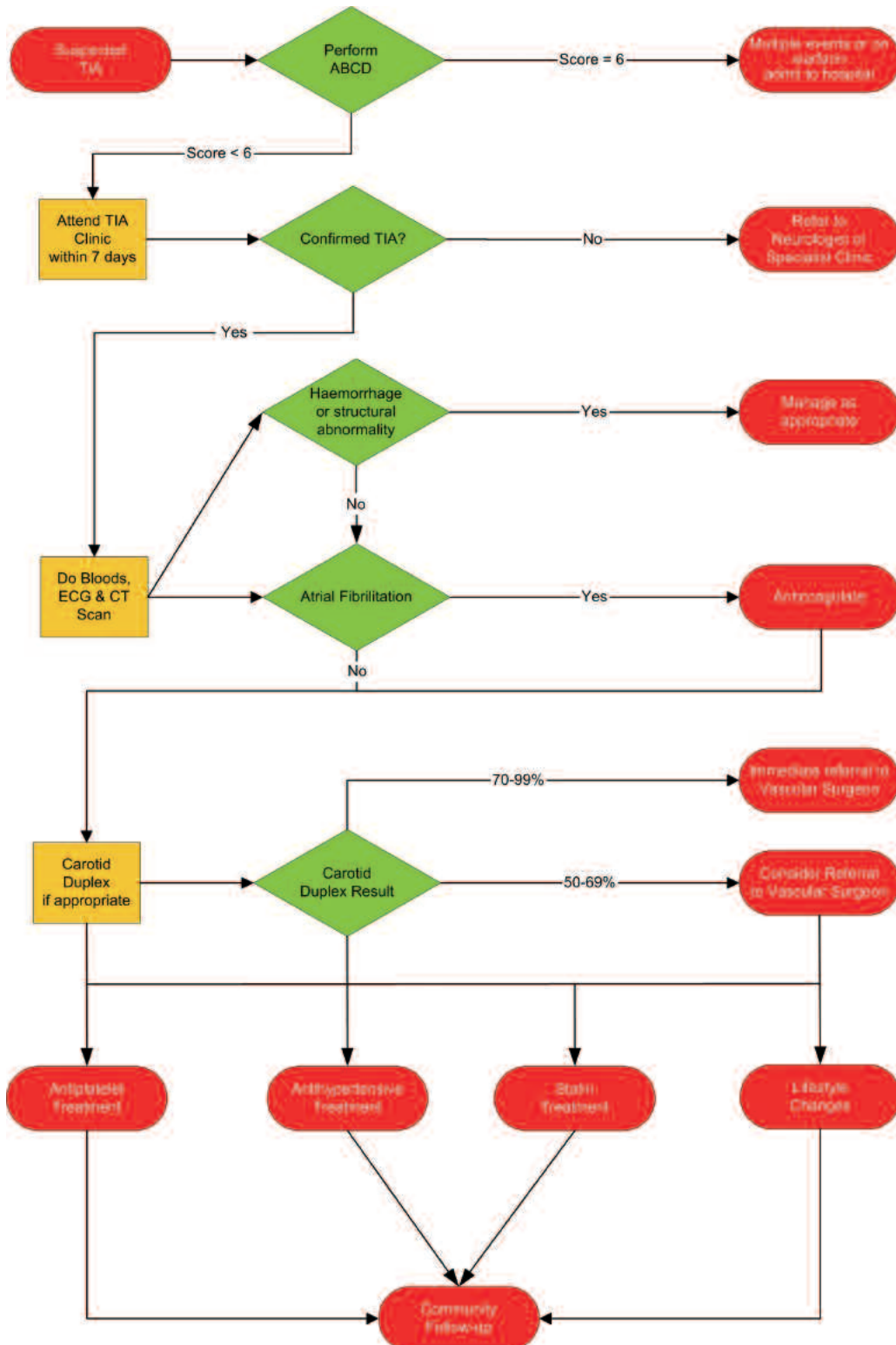
16. Hankey GJ, Warlow CP. *Transient ischaemic attacks of the brain and retina*. WB Saunders, 1994.
17. Van Wijk I, Kappelle LJ, van Gijn J, et al. Long-term survival and vascular event risk after transient ischaemic attack or minor ischaemic stroke: a cohort study. *Lancet* 2005; **365:2098-2104**.
18. North American Symptomatic Carotid Endarterectomy Trial Collaborators. Beneficial effect of carotid endarterectomy in symptomatic patients with high-grade carotid stenosis. *New England Journal of Medicine* 1991; **325:445-453**.
19. Barnett HJ, Taylor DW, Eliasziw M, et al. Benefit of carotid endarterectomy in patients with symptomatic moderate or severe stenosis. North American Symptomatic Carotid Endarterectomy Trial Collaborators. *New England Journal of Medicine* 1998; **339:1415-1425**.
20. Wardlaw JM, Keir SL, Dennis MS. The impact of delays in computed tomography of the brain on the accuracy of diagnosis and subsequent management in patients with minor stroke. *J. Neurol. Neurosurg. Psychiatry* 2003; **74:77-81**.
21. Saxena R, Koudstaal PJ. Anticoagulants for preventing stroke in patients with nonrheumatic atrial fibrillation and a history of stroke or transient ischaemic attack.[update of Cochrane Database Syst Rev. 2000;(2):CD000185; PMID: 10796313]. *Cochrane Database of Systematic Reviews* 2004; CD000185.
22. The ESPRIT study group. Aspirin plus dipyridamole versus aspirin alone after cerebral ischaemia of arterial origin (ESPRIT): randomised controlled trial. *Lancet* 2006; **367:1665-1673**.
23. Diener HC, Cunha L, Forbes C, Sivenius J, Smets P, Lowenthal A. European Stroke Prevention Study. 2. Dipyridamole and acetylsalicylic acid in the secondary prevention of stroke. *Journal of the Neurological Sciences* 1996; **143:1-13**.
24. Chan FK, Ching JY, Hung LC, et al. Clopidogrel versus aspirin and esomeprazole to prevent recurrent ulcer bleeding. *New England Journal of Medicine* 2005; **352:238-244**.
25. CAPRIE Steering Committee. A randomised, blinded, trial of clopidogrel versus aspirin in patients at risk of ischaemic events (CAPRIE). *Lancet* 1996; **348:1329-1339**.
26. Schwartz KA, Schwartz DE, Ghosheh K, Reeves MJ, Barber K, DeFranco A. Compliance as a critical consideration in patients who appear to be resistant to aspirin after healing of myocardial infarction. *American Journal of Cardiology* 2005; **95:973-975**.
27. Diener HC, Bogousslavsky J, Brass LM, et al. Aspirin and clopidogrel compared with clopidogrel alone after recent ischaemic stroke or transient

- ischaemic attack in high-risk patients (MATCH): randomised, double-blind, placebo-controlled trial. *Lancet* 2004; **364:331-337**.
28. Bhatt DL, Fox KA, Hacke W, et al. Clopidogrel and Aspirin versus Aspirin Alone for the Prevention of Atherothrombotic Events. *New England Journal of Medicine* 2006; **354:1706-1717**.
 29. Caro JJ, Migliaccio-Walle K. Generalizing the results of clinical trials to actual practice: the example of clopidogrel therapy for the prevention of vascular events. CAPRA (CAPRIE Actual Practice Rates Analysis) Study Group. Clopidogrel versus Aspirin in Patients at Risk of Ischaemic Events. *American Journal of Medicine* 1999; **107:568-572**.
 30. EAFT (European Atrial Fibrillation Trial) Study Group. Secondary prevention in non-rheumatic atrial fibrillation after transient ischaemic attack or minor stroke. *Lancet* 1993; **342:1255-1262**.
 31. Baglin TP, Keeling DM, Watson HG, British Committee for Standards in Haematology. Guidelines on oral anticoagulation (warfarin): third edition--2005 update. *British Journal of Haematology* 2006; **132:277-285**.
 32. The Stroke Prevention by Aggressive Reduction in Cholesterol Levels (SPARCL) Investigators. High dose atorvastatin after stroke or Transient ischaemic attack. *New England Journal of Medicine* 2006; **355:549-559**.
 33. Heart Protection Study Collaborative Group. MRC/BHF Heart Protection Study of cholesterol lowering with simvastatin in 20,536 high-risk individuals: a randomised placebo-controlled trial. *Lancet* 2002; **360:7-22**.
 34. Rothwell PM, Howard SC, Spence JD, Carotid Endarterectomy Trialists' Collaboration. Relationship between blood pressure and stroke risk in patients with symptomatic carotid occlusive disease. *Stroke* 2003; **34:2583-2590**.
 35. European Carotid Surgery Trialists' Collaborative Group. Randomised trial of endarterectomy for recently symptomatic carotid stenosis: final results of the MRC European Carotid Surgery Trial (ECST). *Lancet* 1998; **351:1379-1387**.
 36. Rerkasem K, Bond R, Rothwell PM. Local versus general anaesthesia for carotid endarterectomy.[update of Cochrane Database Syst Rev. 2000;(2):CD000126; PMID: 10796302]. *Cochrane Database of Systematic Reviews* 2004;CD000126.
 37. Halliday A, Mansfield A, Marro J, et al. Prevention of disabling and fatal strokes by successful carotid endarterectomy in patients without recent neurological symptoms: randomised controlled trial.[erratum appears in *Lancet*. 2004 Jul 31;364(9432):416]. *Lancet* 2004; **363:1491-1502**.
 38. Yadav JS, Wholey MH, Kuntz RE, et al. Protected carotid-artery stenting versus endarterectomy in high-risk patients. *New England Journal of Medicine* 2004; **351:1493-1501**.

39. Antiplatelet Trialists' Collaboration. Collaborative overview of randomised trials of antiplatelet therapy--I: Prevention of death, myocardial infarction, and stroke by prolonged antiplatelet therapy in various categories of patients [erratum appears in *BMJ* 1994 Jun 11;308(6943):1540]. *BMJ* 1994; **308**:81-106.
40. Williams B, Poulter NR, Brown MJ, et al. Guidelines for management of hypertension: report of the fourth working party of the British Hypertension Society, 2004-BHS IV. *Journal of Human Hypertension* 2004; **18**:139-185.
41. PROGRESS Collaborative Group. Randomised trial of a perindopril-based blood-pressure-lowering regimen among 6,105 individuals with previous stroke or transient ischaemic attack.[erratum appears in *Lancet* 2001 Nov 3;358(9292):1556]. *Lancet* 2001;**358**:1033-1041.
42. Mohr JP, Thompson JL, Lazar RM, et al. A comparison of warfarin and aspirin for the prevention of recurrent ischemic stroke. *New England Journal of Medicine* 2001; **345**:1444-1451.
43. Wolf PA, D'Agostino RB, Kannel WB, Bonita R, Belanger AJ. Cigarette smoking as a risk factor for stroke. The Framingham Study. *JAMA* 1988; **259**:1025-1029.
44. He FJ, Nowson CA, McGregor GA. Fruit and vegetable consumption and stroke: meta-analysis of cohort studies. *Lancet* 2006; **367**:320-26.

APPENDIX 1

FLOWCHART OUTLINING EARLY TIA MANAGEMENT



APPENDIX 2

CASE VIGNETTES: MANAGEMENT OF TIA AND TIA MIMICS

Case 1

A 58 year old man (lorry driver) developed four episodes over 1 week of weakness and numbness of his left arm and hand, lasting 5 to 10 minutes. He smoked 20 cigarettes per day for 35 years and had no known history of diabetes or hypertension. He drank no alcohol. His father had died from a stroke at the age of 65 years. He had a normal examination except BP 160/90mmHg.

Management:

ABCD score 1

GP gave 300mg aspirin with a statin and arranged an urgent referral to the local TIA clinic. There the patient had a CT brain scan and carotid duplex investigations. The right ICA was 80% stenosed. The patient was referred to a vascular surgeon and had a right carotid endarterectomy within 2 weeks. He re-attended the TIA clinic and had a thiazide diuretic and ACE inhibitor added to his secondary prevention regime.

Case 2

A 65 year old diabetic woman had a single episode of right face, arm and leg weakness with difficulty speaking for 90 minutes. Examination demonstrated bilateral carotid bruits and a BP 180/100mmHg, but she had no neurological deficits.

Management:

ABCD score 6

The patient was admitted and had a CT brain scan which showed confluent white matter low density changes. She received aspirin 300mg on day one followed by a combination of aspirin 75mg + dipyridamole MR 200mg BD and a statin (cholesterol 6.7 with LDL 3.9). Carotid Duplex showed 70% stenosis in the left proximal ICA and 90% in the right ICA. She was referred for left carotid endarterectomy. She recovered well post-operatively and was given anti-hypertensive medication and maintained on aspirin 75mg, dipyridamole MR 200mg BD and statin therapy. 3 months later she underwent a successful right carotid endarterectomy.

Case 3

A 75 year old woman whose only medication was aspirin presented to her GP because of an episode of right arm weakness and numbness for 15 minutes on the previous night. She was otherwise well with no previous cardiovascular history. Examination demonstrated no neurological deficit, BP 170/90mmHg and her pulse was irregularly irregular and an ECG confirmed atrial fibrillation.

Management:

ABCD score 5

CT brain scan showed no haemorrhage. She was anticoagulated and aspirin was stopped. Carotid duplex scan revealed non-stenotic plaque in both ICAs.

Echocardiograph showed mild enlargement of left atrium. Total cholesterol was 3.5 mmol/L and a statin was prescribed. She was unable to tolerate an ACE inhibitor or angiotensin receptor blocker. Her blood pressure was treated with a thiazide diuretic + calcium channel blocker.

Case 4

A 68 year old man was persuaded by his family to attend his GP following a 10 minute episode of left arm and leg weakness. He had smoked 10 cigarettes per day for 40 years and had had an inferior myocardial infarction 15 years previously. He was taking aspirin 75mg per day, bisoprolol 10mg per day and simvastatin 40mg per day. He had been diagnosed with diet controlled diabetes for 12 months. His father had died from ischaemic heart disease and his mother had a stroke in her 70s. Examination showed no abnormality and BP 130/80mmHg.

Management:

ABCD score 4

He was seen at the TIA clinic within 5 days. CT brain scan revealed multiple bilateral lacunar infarcts. Duplex scan of carotids revealed 40% stenosis bilaterally. His anti-platelet treatment was changed to a combination of aspirin + dipyridamole MR but he developed diarrhoea (due to the dipyridamole) and was switched to clopidogrel. His total cholesterol was 6.0 mmol/L and his statin was changed to atorvastatin (titrated to reduce cholesterol to <3.5 mmol/L). He was commenced on indapamide + perindopril although normotensive, he tolerated this well.

Case 5

A 38 year old woman gradually lost peripheral vision on her right side. 15 minutes later she developed pins and needles which radiated up her right arm, weakness in her right arm and had difficulty holding a telephone conversation, consistent with a non-fluent motor dysphasia. Her symptoms resolved within 30 minutes and left her feeling very tired with a dull right sided headache. She had no vascular risk factors except for a family history of stroke (grandfather) and migraine (in her mother and sister).

Management:

This lady was diagnosed as migraine with aura. As she had few further attacks she did not require any migraine prophylaxis. Brain imaging was not undertaken as her history was considered typical. 6 months later she had no further attacks.

Case 6

A previously fit 66 year old man presented with recurrent episodes of interruption in speech accompanied by paraesthesia of the right face and arm lasting 2 minutes. Although unaware himself, his son observed some 'facial spasm' during the episodes. It first occurred while working with his car, but also when he was lying in bed. He had a history of well controlled hypertension but no other vascular risk factors.

Management:

He was seen at the TIA clinic and had no focal neurology signs. CT brain scan with contrast revealed periventricular white matter low density in keeping with chronic ischaemia. He was diagnosed with left hemisphere partial seizures and treated successfully with carbamazepine.

APPENDIX 3

TIA CLINIC REFERRAL FORM

<p>Date of referral:</p> <p>Referred from: G.P. <input type="checkbox"/> A&E <input type="checkbox"/> Other <input type="checkbox"/></p> <p>G.P. details: Name: Address: Tel:</p> <p>Patient details: Title: D.O.B: Hosp No: Name: Address: Postcode: Tel:</p> <p>Current Drugs:</p> <p>Aspirin intolerance: Y <input type="checkbox"/> N <input type="checkbox"/></p> <p>Brief History/Other Relevant Information:</p>	<table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">What were the clinical features?</th> <th style="text-align: center;">R</th> <th style="text-align: center;">L</th> </tr> </thead> <tbody> <tr><td>Hemiparesis/arm weakness</td><td style="text-align: center;"><input type="checkbox"/></td><td style="text-align: center;"><input type="checkbox"/></td></tr> <tr><td>Hemi-sensory disturbance</td><td style="text-align: center;"><input type="checkbox"/></td><td style="text-align: center;"><input type="checkbox"/></td></tr> <tr><td>Loss of vision one eye</td><td style="text-align: center;"><input type="checkbox"/></td><td style="text-align: center;"><input type="checkbox"/></td></tr> <tr><td>Loss visual field on one side</td><td style="text-align: center;"><input type="checkbox"/></td><td style="text-align: center;"><input type="checkbox"/></td></tr> <tr><td>Dysphasia/any speech disturbance</td><td style="text-align: center;"><input type="checkbox"/></td><td style="text-align: center;"><input type="checkbox"/></td></tr> <tr><td>True vertigo</td><td style="text-align: center;"><input type="checkbox"/></td><td style="text-align: center;"><input type="checkbox"/></td></tr> <tr><td>Double vision</td><td style="text-align: center;"><input type="checkbox"/></td><td style="text-align: center;"><input type="checkbox"/></td></tr> <tr><td>Bilateral limb disturbances</td><td style="text-align: center;"><input type="checkbox"/></td><td style="text-align: center;"><input type="checkbox"/></td></tr> </tbody> </table> <p>Relevant past medical history</p> <table style="width: 100%; border-collapse: collapse;"> <tr><td>Hypertension</td><td style="text-align: center;"><input type="checkbox"/></td><td>AF</td><td style="text-align: center;"><input type="checkbox"/></td></tr> <tr><td>Angina</td><td style="text-align: center;"><input type="checkbox"/></td><td>Periph.Vasc.Dis.</td><td style="text-align: center;"><input type="checkbox"/></td></tr> <tr><td>MI</td><td style="text-align: center;"><input type="checkbox"/></td><td>Diabetes</td><td style="text-align: center;"><input type="checkbox"/></td></tr> <tr><td>CABG</td><td style="text-align: center;"><input type="checkbox"/></td><td>Hyperlipidaemia</td><td style="text-align: center;"><input type="checkbox"/></td></tr> <tr><td>Heart failure</td><td style="text-align: center;"><input type="checkbox"/></td><td>Current smoker</td><td style="text-align: center;"><input type="checkbox"/></td></tr> </table> <p>Previous cerebrovascular event <input type="checkbox"/> (if yes please give details)</p> <p>CT or MRI brain scan done <input type="checkbox"/> Date..... Hospital.....</p> <p>Blood pressure <input style="width: 50px; height: 20px; border: 1px solid black;" type="text"/> Duration of symptoms(mins) <input style="width: 50px; height: 20px; border: 1px solid black;" type="text"/></p> <p>ABCD Score</p> <table style="width: 100%; border-collapse: collapse;"> <tr><td>A Age >60 years</td><td style="text-align: right;">Score</td><td style="text-align: right;">1</td></tr> <tr><td>B BP >140 systolic and/or >90 diastolic</td><td></td><td style="text-align: right;">1</td></tr> <tr><td>C Clinical features:</td><td></td><td></td></tr> <tr><td> Unilateral weakness</td><td></td><td style="text-align: right;">2</td></tr> <tr><td> Speech disturbance without weakness</td><td></td><td style="text-align: right;">1</td></tr> <tr><td> Other</td><td></td><td style="text-align: right;">0</td></tr> <tr><td>D Duration of symptoms:</td><td></td><td></td></tr> <tr><td> > 60 minutes</td><td></td><td style="text-align: right;">2</td></tr> <tr><td> 10 – 59 minutes</td><td></td><td style="text-align: right;">1</td></tr> <tr><td> <10 minutes</td><td></td><td style="text-align: right;">0</td></tr> <tr><td colspan="2" style="text-align: right;">Total ABCD score =</td><td style="text-align: right;"><input style="width: 40px; height: 20px; border: 1px solid black;" type="text"/></td></tr> </table> <p>Arrange urgent admission, rather than TIA clinic referral, if any of the following are present: ABCD score of 6 Patient on warfarin Recurrent TIAs (e.g. 2 or more events in a week)</p>	What were the clinical features?	R	L	Hemiparesis/arm weakness	<input type="checkbox"/>	<input type="checkbox"/>	Hemi-sensory disturbance	<input type="checkbox"/>	<input type="checkbox"/>	Loss of vision one eye	<input type="checkbox"/>	<input type="checkbox"/>	Loss visual field on one side	<input type="checkbox"/>	<input type="checkbox"/>	Dysphasia/any speech disturbance	<input type="checkbox"/>	<input type="checkbox"/>	True vertigo	<input type="checkbox"/>	<input type="checkbox"/>	Double vision	<input type="checkbox"/>	<input type="checkbox"/>	Bilateral limb disturbances	<input type="checkbox"/>	<input type="checkbox"/>	Hypertension	<input type="checkbox"/>	AF	<input type="checkbox"/>	Angina	<input type="checkbox"/>	Periph.Vasc.Dis.	<input type="checkbox"/>	MI	<input type="checkbox"/>	Diabetes	<input type="checkbox"/>	CABG	<input type="checkbox"/>	Hyperlipidaemia	<input type="checkbox"/>	Heart failure	<input type="checkbox"/>	Current smoker	<input type="checkbox"/>	A Age >60 years	Score	1	B BP >140 systolic and/or >90 diastolic		1	C Clinical features:			Unilateral weakness		2	Speech disturbance without weakness		1	Other		0	D Duration of symptoms:			> 60 minutes		2	10 – 59 minutes		1	<10 minutes		0	Total ABCD score =		<input style="width: 40px; height: 20px; border: 1px solid black;" type="text"/>
What were the clinical features?	R	L																																																																															
Hemiparesis/arm weakness	<input type="checkbox"/>	<input type="checkbox"/>																																																																															
Hemi-sensory disturbance	<input type="checkbox"/>	<input type="checkbox"/>																																																																															
Loss of vision one eye	<input type="checkbox"/>	<input type="checkbox"/>																																																																															
Loss visual field on one side	<input type="checkbox"/>	<input type="checkbox"/>																																																																															
Dysphasia/any speech disturbance	<input type="checkbox"/>	<input type="checkbox"/>																																																																															
True vertigo	<input type="checkbox"/>	<input type="checkbox"/>																																																																															
Double vision	<input type="checkbox"/>	<input type="checkbox"/>																																																																															
Bilateral limb disturbances	<input type="checkbox"/>	<input type="checkbox"/>																																																																															
Hypertension	<input type="checkbox"/>	AF	<input type="checkbox"/>																																																																														
Angina	<input type="checkbox"/>	Periph.Vasc.Dis.	<input type="checkbox"/>																																																																														
MI	<input type="checkbox"/>	Diabetes	<input type="checkbox"/>																																																																														
CABG	<input type="checkbox"/>	Hyperlipidaemia	<input type="checkbox"/>																																																																														
Heart failure	<input type="checkbox"/>	Current smoker	<input type="checkbox"/>																																																																														
A Age >60 years	Score	1																																																																															
B BP >140 systolic and/or >90 diastolic		1																																																																															
C Clinical features:																																																																																	
Unilateral weakness		2																																																																															
Speech disturbance without weakness		1																																																																															
Other		0																																																																															
D Duration of symptoms:																																																																																	
> 60 minutes		2																																																																															
10 – 59 minutes		1																																																																															
<10 minutes		0																																																																															
Total ABCD score =		<input style="width: 40px; height: 20px; border: 1px solid black;" type="text"/>																																																																															
<p>Unless contraindicated and provided the patients symptoms have fully resolved please start aspirin 300 mg stat and fax or email form immediately to TIA clinic of your choice.</p>																																																																																	
<p>Have you told the patient?</p> <p>1. He/she should not drive until assessed at the clinic. <input type="checkbox"/></p> <p>2. If anyone witnessed the event, that person should accompany patient to the clinic. <input type="checkbox"/></p> <p>3. If he/she experiences a further event within 7 days admit to stroke unit. <input type="checkbox"/></p> <p style="text-align: center;"><i>Incomplete forms may be returned and no appointment issued</i></p>																																																																																	

APPENDIX 3A

CREST SUMMARY OF MANAGEMENT OF TRANSIENT ISCHAEMIC ATTACK (TIA) IN PRIMARY CARE*

Definition

A transient ischaemic attack is a clinical syndrome characterised by an acute loss of focal cerebral or monocular function with symptoms usually lasting less than 30 minutes and attributable to inadequate blood supply.

Risk of Stroke after TIA

8% of patients with TIA will have a stroke within 7 days of event, half of these occur within the first 48 hours.

Urgent intervention is necessary to reduce the risk.

THE HISTORY OF THE EVENT IS CRUCIAL IN MAKING THE DIAGNOSIS

IDENTIFY

TIA more likely if the following are present

- Limb weakness as a presenting symptom
- Speech difficulty as a presenting symptom
- Transient monocular blindness
- Risk factors for vascular disease

TIA unlikely if the patient presents with

- Loss of consciousness
- Isolated dizziness or vertigo
- Isolated confusion
- Symptoms still present 3 hours after onset (more likely to be stroke)
- Headache

TREAT

Start Aspirin 300mg stat and then aspirin 75mg + dipyridamole MR 200mg BD thereafter, provided no contraindications and symptoms are fully resolved.

Commence statin immediately. For confirmed TIA target cholesterol is below 3.5 mmol/L.

BP Reduction in acute phase is not recommended

Consider alternative diagnoses

Some examples include:
stroke; epilepsy; migraine; syncope; cranial arteritis i.e. loss of sight and headache

REFER TO TIA CLINIC

Patients with TIA who are otherwise well should be referred **immediately** to a TIA clinic via fax or email for expert opinion, investigations and appropriate management.

REFER TO ACUTE STROKE UNIT FOR ADMISSION

The following patients should be admitted to stroke unit:

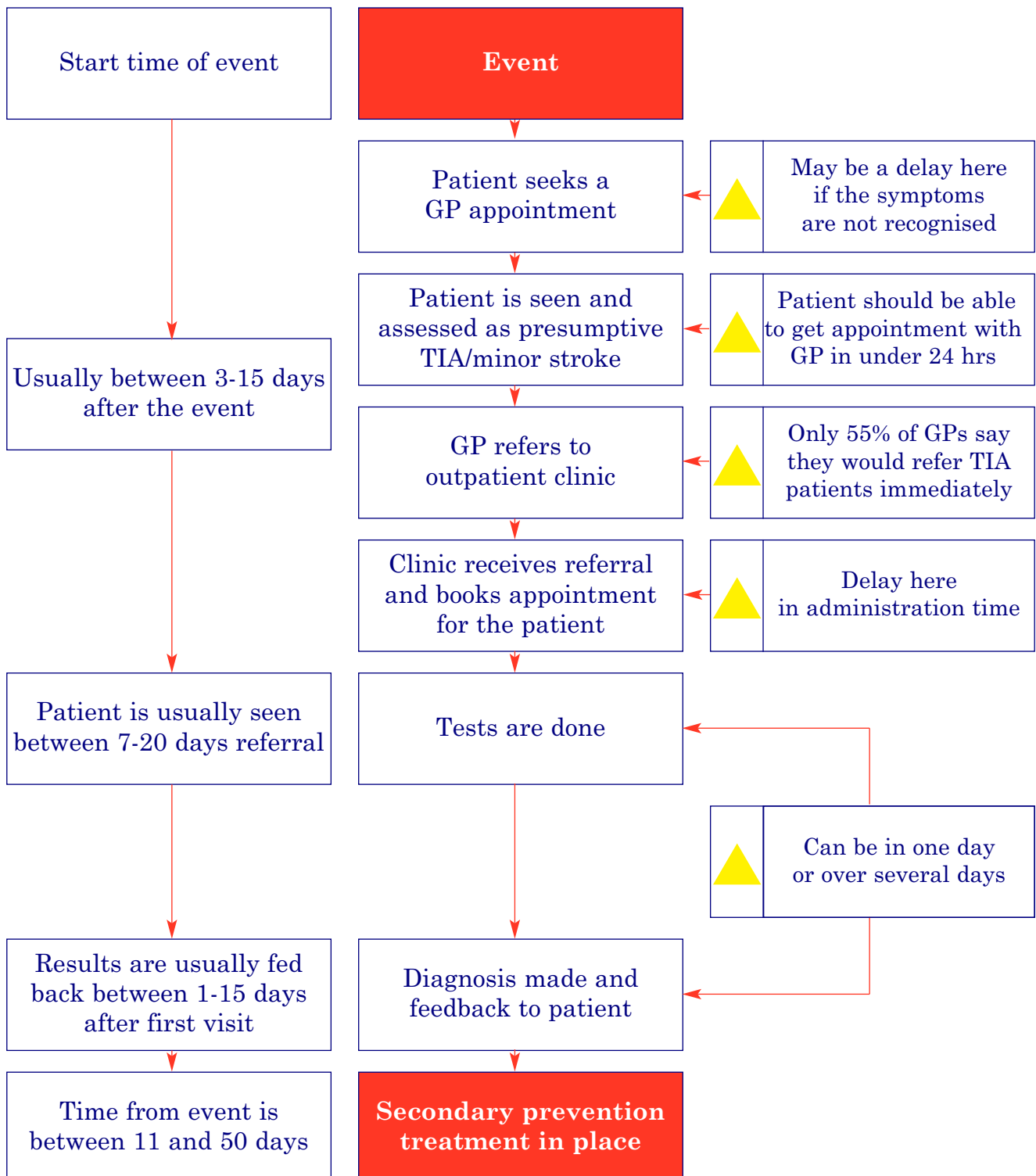
- Patients on warfarin
- Patients with > 1 TIA in 1 week
- Patients with ABCD score of 6 (see section 9 of CREST doc)

OR

*Adapted from EHSSB stroke strategy implementation project guidance

APPENDIX 4

THERE ARE SEVERAL AREAS WHERE DELAYS AFTER SUSPECTED TIA CAN HAMPER EFFECTIVE AND EFFICIENT STROKE PREVENTION*



* Courtesy of National Audit Office.

APPENDIX 5

SUGGESTIONS FOR AUDIT OF CREST TIA GUIDELINES

Timeframe for assessment

- | | | | |
|---|---|-----|----|
| 1 | Are referrals faxed/e-mailed? | YES | NO |
| 2 | What are the delays from TIA to TIA clinic assessment? | | |
| 3 | What are the delays from referral receipt to assessing the patient? | | |

Investigations

- | | | | |
|---|---|-----|----|
| 4 | Was an ECG performed? | YES | NO |
| 5 | Were blood investigations performed (FBP, Electrolyte profile)? | YES | NO |
| 6 | For hemispheric TIA was a CT brain scan performed? | YES | NO |
| 7 | For anterior circulation TIA was Carotid Duplex performed? | YES | NO |

Medical management of TIA (Use PROTECT¹⁻² 5-8)

Has the patient been commenced on:-

- | | | | |
|----|---|-----|----|
| 8 | Anti-platelet or anticoagulant medication? | YES | NO |
| 9 | Statin therapy? | YES | NO |
| 10 | Is the patient on an angiotensin-converting enzyme inhibitor or angiotensin receptor blocker? | YES | NO |
| 11 | Is the patient on a thiazide diuretic? | YES | NO |

Surgical management

- | | | | |
|----|--|-----|----|
| 12 | If carotid surgical intervention was required, was this performed within 2 weeks of the event? | YES | NO |
|----|--|-----|----|

Lifestyle issues

- | | | | |
|----|---|-----|----|
| 13 | For smokers, was smoking cessation advice/program provided and documented in the patient's notes? | YES | NO |
| 14 | For car drivers, was the patient informed of DVLNI regulations relating to driving after TIA? (After a single TIA insurance company should be informed and a driving ban of 1 month observed. After multiple TIAs both DVLNI and insurance company should be informed as a 3 month ban is usual). | YES | NO |
| 15 | Was the advice given to the patient relating to driving documented in the patients notes? | YES | NO |

References

- 1 *Neurology* 2004;63:1217-1222.
- 2 *Stroke* 2004;35:2879-2883.

ISBN 1-903982-25-1