NICE National Institute for Health and Care Excellence

Stroke

Diagnosis and initial management of acute stroke and transient ischaemic attack (TIA)

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Contents

Introduction

Stroke is a preventable and treatable disease. Over the past two decades a growing body of evidence has overturned the traditional perception that stroke is simply a consequence of aging that inevitably results in death or severe disability. Evidence is accumulating for more effective primary and secondary prevention strategies, better recognition of people at highest risk, and interventions that are effective soon after the onset of symptoms. Understanding of the care processes that contribute to a better outcome has improved, and there is now good evidence to support interventions and care processes in stroke rehabilitation.

In the UK, the National Sentinel Stroke Audits have documented changes in secondary care provision over the last 10 years, with increasing numbers of patients being treated in stroke units, more evidence-based practice, and reductions in mortality and length of hospital stay. In order for evidence from research studies to improve outcomes for patients, it needs to be put into practice. National guidelines provide clinicians, managers and service users with summaries of evidence and recommendations for clinical practice. Implementation of guidelines in practice, supported by regular audit, improves the processes of care and clinical outcome.

This guideline covers interventions in the acute stage of a stroke ('acute stroke') or transient ischaemic attack (TIA). Most of the evidence considered relates to interventions in the first 48 hours after onset of symptoms, although some interventions up to 2 weeks are covered. The Intercollegiate Stroke Working Party (ICSWP) National Clinical Guidelines for Stroke (published July 2008), which is an update of the 2004 edition, includes all of the recommendations from this NICE guideline.

This NICE guideline should also be read alongside the Department of Health National Stroke Strategy[1]. There are some differences between the recommendations made in the NICE guideline and those in the National Stroke Strategy. However, the NICE Guideline Development Group (GDG) feel that their recommendations are based on evidence derived from all of the relevant literature as identified by systematic methodology.

Stroke has a sudden and sometimes dramatic impact on the patient and their family, who need continuing information and support. Clinicians dealing with acute care need to be mindful of the rehabilitation and secondary care needs of people with stroke to ensure a smooth transition across the different phases of care. In addition, it should be borne in mind that some

recommendations in the guideline may not be appropriate for patients who are dying or who have severe comorbidities.

Incidence and prevalence

Stroke is a major health problem in the UK. It accounted for over 56,000 deaths in England and Wales in 1999, which represents 11% of all deaths[2]. Most people survive a first stroke, but often have significant morbidity. Each year in England, approximately 110,000 people have a first or recurrent stroke and a further 20,000 people have a TIA. More than 900,000 people in England are living with the effects of stroke, with half of these being dependent on other people for help with everyday activities[3].

Health and resource burden

In England, stroke is estimated to cost the economy around £7 billion per year. This comprises direct costs to the NHS of £2.8 billion, costs of informal care of £2.4 billion and costs because of lost productivity and disability of £1.8 billion[4]. Until recently, stroke was not perceived as a high priority within the NHS. However, a National Stroke Strategy was developed by the Department of Health in 2007. This outlines an ambition for the diagnosis, treatment and management of stroke, including all aspects of care from emergency response to life after stroke.

Drugs

The guideline assumes that prescribers will use a drug's summary of product characteristics to inform their decisions for individual patients.

Definitions

Symptoms of stroke include numbness, weakness or paralysis, slurred speech, blurred vision, confusion and severe headache. Stroke is defined by the World Health Organization[5] as a clinical syndrome consisting of 'rapidly developing clinical signs of focal (at times global) disturbance of cerebral function, lasting more than 24 h or leading to death with no apparent cause other than that of vascular origin'. A transient ischaemic attack (TIA) is defined as stroke symptoms and signs that resolve within 24 hours. However, there are limitations to these definitions. For example, they do not include retinal symptoms (sudden onset of monocular visual

loss), which should be considered as part of the definition of stroke and TIA. The symptoms of a TIA usually resolve within minutes or a few hours at most, and anyone with continuing neurological signs when first assessed should be assumed to have had a stroke. The term 'brain attack' is sometimes used to describe any neurovascular event and may be a clearer and less ambiguous term to use. A non-disabling stroke is defined as a stroke with symptoms that last for more than 24 hours but later resolve, leaving no permanent disability.

[1] Department of Health (2007) National Stroke Strategy. London: Department of Health.

[2] Mant J, Wade DT, Winner S (2004) Health care needs assessment: stroke. In: Stevens A, Raftery J, Mant J et al., editors, Health care needs assessment: the epidemiologically based needs assessment reviews, First series, 2nd edition. Oxford: Radcliffe Medical Press, p141–244.

[3] National Audit Office (2005) Reducing brain damage: faster access to better stroke care. (HC 452 Session 2005–2006). London: The Stationery Office.

[4] Mant J, Wade DT, Winner S (2004) Health care needs assessment: stroke. In: Stevens A, Raftery J, Mant J et al., editors, Health care needs assessment: the epidemiologically based needs assessment reviews, First series, 2nd edition. Oxford: Radcliffe Medical Press, p141–244.

[5] Hatano S (1976) Experience from a multicentre stroke register: a preliminary report. Bulletin of the World Health Organization 54: 541–53.

Patient-centred care

This guideline offers best practice advice on the care of adults with acute stroke or TIA.

Treatment and care should take into account peoples' needs and preferences. People with acute stroke or TIA should have the opportunity where possible to make informed decisions about their care and treatment, in partnership with their healthcare professionals. However, the person's consent may be difficult to obtain at the time of an acute episode, or where the stroke or TIA results in communication problems. If the person does not have the capacity to make decisions, healthcare professionals should follow the Department of Health's advice on consent and the code of practice that accompanies the Mental Capacity Act. In Wales, healthcare professionals should follow advice on consent from the Welsh Government.

Good communication between healthcare professionals and people with acute stroke or TIA, as well as their families and carers, is essential. It should be supported by evidence-based written information tailored to the person's needs. Treatment and care, and the information people are given about it, should be culturally appropriate. It should also be accessible to people with dysphasia or additional needs such as physical, sensory or learning disabilities, and to people who do not speak or read English.

Where appropriate, families and carers should have the opportunity to be involved in decisions about treatment and care.

Families and carers should also be given the information and support they need.

Key priorities for implementation

Rapid recognition of symptoms and diagnosis

- In people with sudden onset of neurological symptoms a validated tool, such as FAST (Face Arm Speech Test), should be used outside hospital to screen for a diagnosis of stroke or TIA.
- People who have had a suspected TIA who are at high risk of stroke (that is, with an ABCD^2 score of 4 or above) should have:
  - aspirin (300 mg daily) started immediately
  - specialist assessment[6] and investigation within 24 hours of onset of symptoms
  - measures for secondary prevention introduced as soon as the diagnosis is confirmed, including discussion of individual risk factors.
- People with crescendo TIA (two or more TIAs in a week) should be treated as being at high risk of stroke, even though they may have an ABCD^2 score of 3 or below.

Specialist care for people with acute stroke

- All people with suspected stroke should be admitted directly to a specialist acute stroke unit[7] following initial assessment, either from the community or from the A&E department.
- Brain imaging should be performed immediately[8] for people with acute stroke if any of the following apply:
  - indications for thrombolysis or early anticoagulation treatment
  - on anticoagulant treatment
  - a known bleeding tendency
  - a depressed level of consciousness (Glasgow Coma Score below 13)
  - unexplained progressive or fluctuating symptoms
  - papilloedema, neck stiffness or fever

- severe headache at onset of stroke symptoms.

Nutrition and hydration

- On admission, people with acute stroke should have their swallowing screened by an appropriately trained healthcare professional before being given any oral food, fluid or medication.

[6] Specialist assessment includes exclusion of stroke mimics, identification of vascular treatment, identification of likely causes, and appropriate investigation and treatment.

[7] An acute stroke unit is a discrete area in the hospital that is staffed by a specialist stroke multidisciplinary team. It has access to equipment for monitoring and rehabilitating patients. Regular multidisciplinary team meetings occur for goal setting.

[8] The GDG felt that 'immediately' is defined as 'ideally the next slot and definitely within 1 hour, whichever is sooner', in line with the National Stroke Strategy.

1 Guidance

The following guidance is based on the best available evidence. The full guideline gives details of the methods and the evidence used to develop the guidance.

1.1 Rapid recognition of symptoms and diagnosis

There is evidence that rapid treatment improves outcome after stroke or TIA. The recommendations in this section cover the rapid diagnosis of people who have had sudden onset of symptoms that are indicative of stroke and TIA. How to identify risk of subsequent stroke in people who have had a TIA is also covered.

1.1.1 Prompt recognition of symptoms of stroke and TIA

1.1.1.1 In people with sudden onset of neurological symptoms a validated tool, such as FAST (Face Arm Speech Test), should be used outside hospital to screen for a diagnosis of stroke or TIA.

1.1.1.2 In people with sudden onset of neurological symptoms, hypoglycaemia should be excluded as the cause of these symptoms.

1.1.1.3 People who are admitted to accident and emergency (A&E) with a suspected stroke or TIA should have the diagnosis established rapidly using a validated tool, such as ROSIER (Recognition of Stroke in the Emergency Room).

1.1.2 Assessment of people who have had a suspected TIA, and identifying those at high risk of stroke

1.1.2.1 People who have had a suspected TIA (that is, they have no neurological symptoms at the time of assessment [within 24 hours]) should be assessed as soon as possible for their risk of subsequent stroke using a validated scoring system[9], such as $ABCD^2$.

1.1.2.2 People who have had a suspected TIA who are at high risk of stroke (that is, with an $ABCD^2$ score of 4 or above) should have:

- aspirin (300 mg daily) started immediately
- specialist assessment[10] and investigation within 24 hours of onset of symptoms
- measures for secondary prevention introduced as soon as the diagnosis is confirmed, including discussion of individual risk factors.

1.1.2.3 People with crescendo TIA (two or more TIAs in a week) should be treated as being at high risk of stroke, even though they may have an $ABCD^2$ score of 3 or below.

1.1.2.4 People who have had a suspected TIA who are at lower risk of stroke (that is, an $ABCD^2$ score of 3 or below) should have:

- aspirin (300 mg daily) started immediately
- specialist assessment[10] and investigation as soon as possible, but definitely within 1 week of onset of symptoms
- measures for secondary prevention introduced as soon as the diagnosis is confirmed, including discussion of individual risk factors.

1.1.2.5 People who have had a TIA but who present late (more than 1 week after their last symptom has resolved) should be treated as though they are at lower risk of stroke.

1.2 Imaging in people who have had a suspected TIA or non-disabling stroke

While all people with symptoms of acute stroke need urgent brain scanning, there is less evidence to recommend brain scanning in those people whose symptoms have completely resolved by the time of assessment. This section contains recommendations about which people with suspected TIA need brain imaging and the type of imaging that is most helpful.

Some people who have had a stroke or TIA have narrowing of the carotid artery that may require surgical intervention. Carotid imaging is required to define the extent of carotid artery narrowing. Sections 1.2.3 and 1.2.4 cover the optimum timing of carotid imaging, and the selection of appropriate patients for, and timing of, carotid endarterectomy. The use of carotid stenting was

also reviewed by the GDG. However, no evidence for early carotid stenting was found on which the GDG felt they could base a recommendation. For more information, see chapter 6 of the full guideline.

1.2.1 Suspected TIA – referral for urgent brain imaging

1.2.1.1 People who have had a suspected TIA (that is, whose symptoms and signs have completely resolved within 24 hours) should be assessed by a specialist (within 1 week of symptom onset) before a decision on brain imaging is made.

1.2.1.2 People who have had a suspected TIA who are at high risk of stroke (for example, an $ABCD^2$ score of 4 or above, or with crescendo TIA) in whom the vascular territory or pathology is uncertain[11] should undergo urgent brain imaging[12] (preferably diffusion-weighted MRI [magnetic resonance imaging]).

1.2.1.3 People who have had a suspected TIA who are at lower risk of stroke (for example, an $ABCD^2$ score of less than 4) in whom the vascular territory or pathology is uncertain[11] should undergo brain imaging[13] (preferably diffusion-weighted MRI).

1.2.2 Type of brain imaging for people with suspected TIA

1.2.2.1 People who have had a suspected TIA who need brain imaging (that is, those in whom vascular territory or pathology is uncertain) should undergo diffusion-weighted MRI except where contraindicated[14], in which case CT (computed tomography) scanning should be used.

1.2.3 Early carotid imaging in people with acute non-disabling stroke or TIA

1.2.3.1 All people with suspected non-disabling stroke or TIA who after specialist assessment are considered as candidates for carotid endarterectomy should have carotid imaging within 1 week of onset of symptoms. People who present more than 1 week after their last symptom of TIA has resolved should be managed using the lower-risk pathway.

1.2.4 Urgent carotid endarterectomy and carotid stenting

1.2.4.1 People with stable neurological symptoms from acute non-disabling stroke or TIA who have symptomatic carotid stenosis of 50–99% according to the NASCET (North American Symptomatic Carotid Endarterectomy Trial) criteria, or 70–99% according to the ECST (European Carotid Surgery Trialists' Collaborative Group) criteria, should:

- be assessed and referred for carotid endarterectomy within 1 week of onset of stroke or TIA symptoms
- undergo surgery within a maximum of 2 weeks of onset of stroke or TIA symptoms
- receive best medical treatment (control of blood pressure, antiplatelet agents, cholesterol lowering through diet and drugs, lifestyle advice).

1.2.4.2 People with stable neurological symptoms from acute non-disabling stroke or TIA who have symptomatic carotid stenosis of less than 50% according to the NASCET criteria, or less than 70% according to the ECST criteria, should:

- not undergo surgery
- receive best medical treatment (control of blood pressure, antiplatelet agents, cholesterol lowering through diet and drugs, lifestyle advice).

1.2.4.3 Carotid imaging reports should clearly state which criteria (ECST or NASCET) were used when measuring the extent of carotid stenosis.

1.3 Specialist care for people with acute stroke

This section provides recommendations about the optimum care for people with acute stroke: where they should be cared for and how soon they should undergo brain imaging.

1.3.1 Specialist stroke units

1.3.1.1 All people with suspected stroke should be admitted directly to a specialist acute stroke unit[15] following initial assessment, either from the community or from the A&E department.

1.3.2 Brain imaging for the early assessment of people with acute stroke

1.3.2.1 Brain imaging should be performed immediately[16] for people with acute stroke if any of the following apply:

- indications for thrombolysis or early anticoagulation treatment
- on anticoagulant treatment
- a known bleeding tendency
- a depressed level of consciousness (Glasgow Coma Score below 13)
- unexplained progressive or fluctuating symptoms
- papilloedema, neck stiffness or fever
- severe headache at onset of stroke symptoms.

1.3.2.2 For all people with acute stroke without indications for immediate brain imaging, scanning should be performed as soon as possible[17].

1.4 Pharmacological treatments for people with acute stroke

Urgent treatment has been shown to improve outcome in stroke. This section contains recommendations about urgent pharmacological treatment in people with acute stroke.

1.4.1 Thrombolysis with alteplase

1.4.1.1 Alteplase is recommended for the treatment of acute ischaemic stroke when used by physicians trained and experienced in the management of acute stroke. It should only be administered in centres with facilities that enable it to be used in full accordance with its marketing authorisation[18].

1.4.1.2 Alteplase should be administered only within a well organised stroke service with:

- staff trained in delivering thrombolysis and in monitoring for any complications associated with thrombolysis

- level 1 and level 2 nursing care staff trained in acute stroke and thrombolysis[19]
- immediate access to imaging and re-imaging, and staff trained to interpret the images.

1.4.1.3 Staff in A&E departments, if appropriately trained and supported, can administer alteplase[20] for the treatment of acute ischaemic stroke provided that patients can be managed within an acute stroke service with appropriate neuroradiological and stroke physician support.

1.4.1.4 Protocols should be in place for the delivery and management of thrombolysis, including post-thrombolysis complications.

1.4.2 Aspirin and anticoagulant treatment

People with acute ischaemic stroke

1.4.2.1 All people presenting with acute stroke who have had a diagnosis of primary intracerebral haemorrhage excluded by brain imaging should, as soon as possible but certainly within 24 hours, be given:

- aspirin 300 mg orally if they are not dysphagic or
- aspirin 300 mg rectally or by enteral tube if they are dysphagic.

Thereafter, aspirin 300 mg should be continued until 2 weeks after the onset of stroke symptoms, at which time definitive long-term antithrombotic treatment should be initiated. People being discharged before 2 weeks can be started on long-term treatment earlier.

1.4.2.2 Any person with acute ischaemic stroke for whom previous dyspepsia associated with aspirin is reported should be given a proton pump inhibitor in addition to aspirin.

1.4.2.3 Any person with acute ischaemic stroke who is allergic to or genuinely intolerant of aspirin[21] should be given an alternative antiplatelet agent.

1.4.2.4 Anticoagulation treatment should not be used routinely[22] for the treatment of acute stroke.

People with acute venous stroke

1.4.2.5 People diagnosed with cerebral venous sinus thrombosis (including those with secondary cerebral haemorrhage) should be given full-dose anticoagulation treatment (initially full-dose heparin and then warfarin [INR 2–3]) unless there are comorbidities that preclude its use.

People with stroke associated with arterial dissection

1.4.2.6 People with stroke secondary to acute arterial dissection should be treated with either anticoagulants or antiplatelet agents, preferably as part of a randomised controlled trial to compare the effects of the two treatments.

People with acute ischaemic stroke associated with antiphospholipid syndrome

1.4.2.7 People with antiphospholipid syndrome who have an acute ischaemic stroke should be managed in same way as people with acute ischaemic stroke without antiphospholipid syndrome[23].

Reversal of anticoagulation treatment in people with haemorrhagic stroke

1.4.2.8 Clotting levels in people with a primary intracerebral haemorrhage who were receiving anticoagulation treatment before their stroke (and have elevated INR) should be returned to normal as soon as possible, by reversing the effects of the anticoagulation treatment using a combination of prothrombin complex concentrate and intravenous vitamin K.

1.4.3 Anticoagulation treatment for other comorbidities

1.4.3.1 People with disabling ischaemic stroke who are in atrial fibrillation should be treated with aspirin 300 mg for the first 2 weeks before considering anticoagulation treatment.

1.4.3.2 In people with prosthetic valves who have disabling cerebral infarction and who are at significant risk of haemorrhagic transformation, anticoagulation treatment should be stopped for 1 week and aspirin 300 mg substituted.

1.4.3.3 People with ischaemic stroke and symptomatic proximal deep vein thrombosis or pulmonary embolism should receive anticoagulation treatment in preference to treatment with aspirin unless there are other contraindications to anticoagulation.

1.4.3.4 People with haemorrhagic stroke and symptomatic deep vein thrombosis or pulmonary embolism should have treatment to prevent the development of further pulmonary emboli using either anticoagulation or a caval filter.

1.4.4 Statin treatment

1.4.4.1 Immediate initiation of statin treatment is not recommended in people with acute stroke[24].

1.4.4.2 People with acute stroke who are already receiving statins should continue their statin treatment.

1.5 Maintenance or restoration of homeostasis

A key element of care for people with acute stroke is the maintenance of cerebral blood flow and oxygenation to prevent further brain damage after stroke. This section contains recommendations on oxygen supplementation, maintenance of normoglycaemia, and acute blood pressure manipulation.

1.5.1 Supplemental oxygen therapy

1.5.1.1 People who have had a stroke should receive supplemental oxygen only if their oxygen saturation drops below 95%. The routine use of supplemental oxygen is not recommended in people with acute stroke who are not hypoxic.

1.5.2 Blood sugar control

1.5.2.1 People with acute stroke should be treated to maintain a blood glucose concentration between 4 and 11 mmol/litre.

1.5.2.2 Provide optimal insulin therapy, which can be achieved by the use of intravenous insulin and glucose, to all adults with type 1 diabetes with threatened or actual stroke. Critical care and emergency departments should have a protocol for such management[25].

1.5.3 Blood pressure control

1.5.3.1 Anti-hypertensive treatment in people with acute stroke is recommended only if there is a hypertensive emergency with one or more of the following serious concomitant medical issues:

- hypertensive encephalopathy
- hypertensive nephropathy
- hypertensive cardiac failure/myocardial infarction
- aortic dissection
- pre-eclampsia/eclampsia
- intracerebral haemorrhage with systolic blood pressure over 200 mmHg.

1.5.3.2 Blood pressure reduction to 185/110 mmHg or lower should be considered in people who are candidates for thrombolysis.

1.6 Nutrition and hydration

Many people with acute stroke are unable to swallow safely, and may require supplemental hydration and nutrition. This section provides recommendations on assessment of swallowing, hydration and nutrition.

1.6.1 Assessment of swallowing function

1.6.1.1 On admission, people with acute stroke should have their swallowing screened by an appropriately trained healthcare professional before being given any oral food, fluid or medication.

1.6.1.2 If the admission screen indicates problems with swallowing, the person should have a specialist assessment of swallowing, preferably within 24 hours of admission and not more than 72 hours afterwards.

1.6.1.3 People with suspected aspiration on specialist assessment, or who require tube feeding or dietary modification for 3 days, should be:

- re-assessed and considered for instrumental examination
- referred for dietary advice.

1.6.1.4 People with acute stroke who are unable to take adequate nutrition and fluids orally should:

- receive tube feeding with a nasogastric tube within 24 hours of admission
- be considered for a nasal bridle tube or gastrostomy if they are unable to tolerate a nasogastric tube
- be referred to an appropriately trained healthcare professional for detailed nutritional assessment, individualised advice and monitoring.

1.6.2 Oral nutritional supplementation

1.6.2.1 All hospital inpatients on admission should be screened for malnutrition and the risk of malnutrition. Screening should be repeated weekly for inpatients[26].

1.6.2.2 Screening should assess body mass index (BMI) and percentage unintentional weight loss and should also consider the time over which nutrient intake has been unintentionally reduced and/or the likelihood of future impaired nutrient intake. The Malnutrition Universal Screening Tool (MUST), for example, may be used to do this[26].

1.6.2.3 When screening for malnutrition and the risk of malnutrition, healthcare professionals should be aware that dysphagia, poor oral health and reduced ability to self-feed will affect nutrition in people with stroke.

1.6.2.4 Screening for malnutrition and the risk of malnutrition should be carried out by healthcare professionals with appropriate skills and training[26].

1.6.2.5 Routine nutritional supplementation is not recommended for people with acute stroke who are adequately nourished on admission.

1.6.2.6 Nutrition support should be initiated for people with stroke who are at risk of malnutrition. This may include oral nutritional supplements, specialist dietary advice and/or tube feeding.

1.6.2.7 All people with acute stroke should have their hydration assessed on admission, reviewed regularly and managed so that normal hydration is maintained.

1.7 Early mobilisation and optimum positioning of people with acute stroke

Early mobilisation is considered a key element of acute stroke care. Sitting up will help to maintain oxygen saturation and reduce the likelihood of hypostatic pneumonia.

1.7.1.1 People with acute stroke should be mobilised as soon as possible (when their clinical condition permits) as part of an active management programme in a specialist stroke unit.

1.7.1.2 People with acute stroke should be helped to sit up as soon as possible (when their clinical condition permits).

1.8 Avoidance of aspiration pneumonia

Aspiration pneumonia is a complication of stroke that is associated with increased mortality and poor outcomes.

1.8.1.1 In people with dysphagia, food and fluids should be given in a form that can be swallowed without aspiration, following specialist assessment of swallowing.

1.9 Surgery for people with acute stroke

There is evidence that neurosurgical treatment may be indicated for a very small number of carefully selected people with stroke. This section contains recommendations for surgical intervention in people with intracerebral haemorrhage or severe middle cerebral artery infarction.

1.9.1 Surgical referral for acute intracerebral haemorrhage

1.9.1.1 Stroke services should agree protocols for the monitoring, referral and transfer of people to regional neurosurgical centres for the management of symptomatic hydrocephalus.

1.9.1.2 People with intracranial haemorrhage should be monitored by specialists in neurosurgical or stroke care for deterioration in function and referred immediately for brain imaging when necessary.

1.9.1.3 Previously fit people should be considered for surgical intervention following primary intracranial haemorrhage if they have hydrocephalus.

1.9.1.4 People with any of the following rarely require surgical intervention and should receive medical treatment initially:

- small deep haemorrhages
- lobar haemorrhage without either hydrocephalus or rapid neurological deterioration
- a large haemorrhage and significant comorbidities before the stroke
- a score on the Glasgow Coma Scale of below 8 unless this is because of hydrocephalus
- posterior fossa haemorrhage.

1.9.2 Surgical referral for decompressive hemicraniectomy

1.9.2.1 People with middle cerebral artery infarction who meet all of the criteria below should be considered for decompressive hemicraniectomy. They should be referred within 24 hours of onset of symptoms and treated within a maximum of 48 hours.

- Aged 60 years or under.
- Clinical deficits suggestive of infarction in the territory of the middle cerebral artery, with a score on the National Institutes of Health Stroke Scale (NIHSS) of above 15.
- Decrease in the level of consciousness to give a score of 1 or more on item 1a of the NIHSS.
- Signs on CT of an infarct of at least 50% of the middle cerebral artery territory, with or without additional infarction in the territory of the anterior or posterior cerebral artery on the same side, or infarct volume greater than 145 cm^3 as shown on diffusion-weighted MRI.

1.9.2.2 People who are referred for decompressive hemicraniectomy should be monitored by appropriately trained professionals skilled in neurological assessment.

[9] These scoring systems exclude certain populations that may be at particularly high risk of stroke, such as those with recurrent TIAs and those on anticoagulation treatment, who also need urgent evaluation. They also may not be relevant to patients who present late.

[10] Specialist assessment includes exclusion of stroke mimics, identification of vascular treatment, identification of likely causes, and appropriate investigation and treatment.

[11] Examples where brain imaging is helpful in the management of TIA are: people being considered for carotid endarterectomy where it is uncertain whether the stroke is in the anterior or posterior circulation; people with TIA where haemorrhage needs to be excluded, for example long duration of symptoms or people on anticoagulants; where an alternative diagnosis (for example migraine, epilepsy or tumour) is being considered.

[12] The GDG felt that urgent brain imaging is defined as imaging that takes place 'within 24 hours of onset of symptoms'. This is in line with the National Stroke Strategy.

[13] The GDG felt that brain imaging in people with a lower risk of stroke should take place 'within 1 week of onset of symptoms'. This is in line with the National Stroke Strategy.

[14] Contraindications to MRI include people who have any of the following: a pacemaker, shrapnel, some brain aneurysm clips and heart valves, metal fragments in eyes, severe claustrophobia.

[15] An acute stroke unit is a discrete area in the hospital that is staffed by a specialist stroke multidisciplinary team. It has access to equipment for monitoring and rehabilitating patients. Regular multidisciplinary team meetings occur for goal setting.

[16] The GDG felt that 'immediately' is defined as 'ideally the next slot and definitely within 1 hour, whichever is sooner', in line with the National Stroke Strategy.

[17] The GDG felt that 'as soon as possible' is defined as 'within a maximum of 24 hours after onset of symptoms'.

[18] This recommendation is from 'Alteplase for the treatment of acute ischaemic stroke' (NICE technology appraisal guidance 122).

[19] See NHS Data Dictionary, 'Critical care level' [online].

[20] In accordance with its marketing authorisation.

[21] Aspirin intolerance is defined in NICE technology appraisal guidance 90 ('Clopidogrel and modified-release dipyridamole in the prevention of occlusive vascular events') as either of the following: proven hypersensitivity to aspirin-containing medicines; or history of severe dyspepsia induced by low-dose aspirin.

[22] There may be a subgroup of people for whom the risk of venous thromboembolism outweighs the risk of haemorrhagic transformation. People considered to be at particularly high risk of venous thromboembolism include anyone with complete paralysis of the leg, a previous history of venous thromboembolism, dehydration or comorbidities (such as malignant disease), or who

is a current or recent smoker. Such people should be kept under regular review if they are given prophylactic anticoagulation.

[23] There was insufficient evidence to support any recommendation on the safety and efficacy of anticoagulants versus antiplatelets for the treatment of people with acute ischaemic stroke associated with antiphospholipid syndrome.

[24] The consensus of the GDG is that it would be safe to start statins after 48 hours.

[25] This recommendation is from the NICE guideline on type 1 diabetes in adults.

[26] This recommendation is adapted from 'Nutrition support in adults: oral nutrition support, enteral tube feeding and parenteral nutrition' (NICE clinical guideline 32).

2 Notes on the scope of the guidance

NICE guidelines are developed in accordance with a scope that defines what the guideline will and will not cover. The scope of this guideline is available.

Groups that are covered

- People with transient ischaemic attacks (TIAs) or completed strokes; that is, an acute neurological event presumed to be vascular in origin and causing cerebral ischaemia, cerebral infarction or cerebral haemorrhage. This includes:
  - first and recurrent events
  - thrombotic and embolic events
  - primary intracerebral haemorrhage of any cause, including venous thrombosis.

Areas and groups that are not covered

- Specific issues relating to the general management of underlying conditions are not considered, but immediate management to reduce the extent of brain damage is included.
- People with subarachnoid haemorrhage.
- Children (aged 16 years and under).

How this guideline was developed

NICE commissioned the National Collaborating Centre for Chronic Conditions to develop this guideline. The Centre established a Guideline Development Group (see appendix A), which reviewed the evidence and developed the recommendations. An independent Guideline Review Panel oversaw the development of the guideline (see appendix B).

There is more information about how NICE clinical guidelines are developed on the NICE website. A booklet, 'How NICE clinical guidelines are developed: an overview for stakeholders, the public and the NHS' is available.

3 Implementation

The Healthcare Commission assesses the performance of NHS organisations in meeting core and developmental standards set by the Department of Health in 'Standards for better health'.

Implementation of clinical guidelines forms part of the developmental standard D2. Core standard C5 says that national agreed guidance should be taken into account when NHS organisations are planning and delivering care.

NICE has developed tools to help organisations implement this guidance (listed below). These are available on our website.

- Slides highlighting key messages for local discussion.
- Costing tools:
    - costing report to estimate the national savings and costs associated with implementation
    - costing template to estimate the local costs and savings involved.
- Audit support for monitoring local practice.

4 Research recommendations

The Guideline Development Group has made the following recommendations for research, based on its review of evidence, to improve NICE guidance and patient care in the future.

4.1 Avoidance of aspiration pneumonia

Does the withdrawal of oral liquids or the use of modified (thickened) oral fluids prevent the development of aspiration pneumonia after an acute stroke?

Why this is important

People with dysphagia after an acute stroke are at higher risk of aspiration pneumonia. The GDG considered how best to reduce the likelihood of people with acute stroke developing aspiration pneumonia, but there was insufficient evidence on which to base a recommendation. Current clinical practice dictates that those people with clinical evidence of aspiration are given 'nil by mouth' or are given modified (thickened) oral fluids. However, there is little evidence to suggest that withdrawal or modification of fluids reduces the incidence of pneumonia. Oral hygiene is impaired by the withdrawal of oral fluids, and aspirated saliva (up to 2 litres/day) may be infected as a result. Medications are not given orally, and patients may be distressed by the withholding of oral fluids. The research question is whether allowing people with evidence of aspiration free access to water predisposes them to the development of aspiration pneumonia compared with withdrawal of oral liquids or the use of modified (thickened) oral fluids.

4.2 Aspirin and anticoagulant treatment for acute ischaemic stroke

Does modified-release dipyridamole or clopidogrel with aspirin improve outcome compared with aspirin alone when administered early after acute ischaemic stroke?

Why this is important

Aspirin administered within 48 hours of acute ischaemic stroke improves outcome compared with no treatment or early anticoagulation. In the secondary prevention of stroke, the combination of modified-release dipyridamole with aspirin improves outcome compared with aspirin alone.

Clopidogrel, administered with aspirin, improves outcome after myocardial infarction. It is not known whether antiplatelet agents other than aspirin (alone or in combination) may be more effective than aspirin alone in the acute phase of ischaemic stroke. The research question to be addressed is whether modified-release dipyridamole or clopidogrel with aspirin improves outcome compared with aspirin alone when administered early after acute ischaemic stroke.

4.3 Aspirin treatment in acute ischaemic stroke

Should a person who has a stroke or a TIA and is already taking aspirin be prescribed the same or an increased dose of aspirin after the stroke?

Why this is important

Many people take aspirin routinely for the secondary or primary prevention of vascular disease. When a person who is taking 75 mg aspirin daily has a stroke or TIA, there is no evidence to guide clinicians on whether to maintain or increase the dose. The research question to be addressed is whether a person already on aspirin who has a stroke or TIA should be offered the same or an increased dose of aspirin.

4.4 Early mobilisation and optimum positioning of people with acute stroke

How safe and effective is very early mobilisation delivered by appropriately trained healthcare professionals after stroke?

Why this is important

Most people with stroke are nursed in bed for at least the first day after their admission to the stroke unit. The severity of limb weakness or incoordination and reduced awareness or an impaired level of consciousness may make mobilisation potentially hazardous. There are concerns about the effect of very early mobilisation on blood pressure and cerebral perfusion pressure. However, early mobilisation may have beneficial effects on oxygenation and lead to a reduction in complications such as venous thromboembolism and hypostatic pneumonia. There could be benefits for motor and sensory recovery, and patient motivation. The research question to be addressed is whether very early mobilisation with the aid of appropriately trained professionals is safe and improves outcome compared with standard care.

4.5 Blood pressure control

How safe and effective is the early manipulation of blood pressure after stroke?

Why this is important

Many people with stroke have pre-existing hypertension, for which they may be receiving treatment. After stroke, even apparently small changes in blood pressure may be associated with alterations in cerebral perfusion pressure, which may affect the ability of damaged neurones to survive. A sudden drop in blood pressure to an apparently 'normal' level may have very marked effects on the damaged brain in a person who had elevated blood pressure before the stroke. The effect of raised blood pressure may differ between people with ischaemic stroke and those with haemorrhagic stroke. It is not known whether a reduction in blood pressure after stroke is beneficial or harmful, and whether elevation of blood pressure under certain circumstances might be associated with better outcome. The research question to be addressed is whether early manipulation of blood pressure after stroke is safe and improves outcome compared with standard care.

4.6 Safety and efficacy of carotid stenting

What is the safety and efficacy of carotid stenting compared with carotid endarterectomy when these procedures are carried out within 2 weeks of TIA or recovered stroke?

Why this is important

Carotid stenting is less invasive than carotid endarterectomy and might be safer, particularly for patients very soon after a TIA or stroke, for whom the risks of general anaesthetic might be high. However, neither the risk of stroke nor long-term outcomes after early carotid stenting are known. A randomised controlled trial comparing these interventions early after stroke would determine which of them is associated with the best outcome, as well as comparing their relative safety and cost effectiveness.

5 Other versions of this guideline

5.1 Full guideline

The full guideline, Stroke: diagnosis and initial management of acute stroke and transient ischaemic attack (TIA), contains details of the methods and evidence used to develop the guideline. It is published by the National Collaborating Centre for Chronic Conditions.

5.2 Information for the public

NICE has produced information for the public explaining this guideline.

We encourage NHS and voluntary sector organisations to use text from this information in their own materials.

6 Related NICE guidance

Lipid modification: cardiovascular risk assessment and the modification of blood lipids for the primary and secondary prevention of cardiovascular disease (2008) NICE guideline CG67

Alteplase for the treatment of acute ischaemic stroke (2007) NICE technology appraisal 122

Hypertension: management of hypertension in adults in primary care (2006) NICE guideline CG34 [Replaced by NICE guideline CG127]

Nutrition support in adults: oral nutrition support, enteral tube feeding and parenteral nutrition (2006) NICE guideline CG32.

Clopidogrel and modified-release dipyridamole in the prevention of occlusive vascular events (2005) NICE technology appraisal 90 [Replaced by NICE technology appraisal 210]

Type 1 diabetes: diagnosis and management of type 1 diabetes in children, young people and adults (2004) NICE guideline CG15 [Replaced by NICE guidelines NG17, NG18 and NG19]

7 Updating the guideline

NICE clinical guidelines are updated as needed so that recommendations take into account important new information. We check for new evidence 2 and 4 years after publication, to decide whether all or part of the guideline should be updated. If important new evidence is published at other times, we may decide to do a more rapid update of some recommendations.

Appendix A: The Guideline Development Group

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Health Economist, National Collaborating Centre for Chronic Conditions (NCC-CC), and Research Fellow, Queen Mary University of London

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Mr David Wonderling
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The following experts were invited to attend specific meetings and to advise the Guideline Development Group:

Ms Rhoda Allison
Consultant Therapist in Stroke, Teignbridge PCT

Dr Neil Baldwin
Consultant in Stroke Medicine, North Bristol Healthcare Trust (attended one meeting as a deputy for Dr John Potter)

Mrs Julie Barker
Senior Dietitian, United Bristol Healthcare Trust

Mr Peter Kirkpatrick
Consultant Neurosurgeon, Addenbrooke's NHS Trust

Mr Peter Lamont
Consultant Vascular Surgeon, United Bristol Healthcare Trust

Ms Mariane Morse
Principal Speech and Language Therapist, Newcastle PCT

Professor Peter Rothwell
Consultant Neurologist, Oxford Radcliffe Hospitals NHS Trust

Mr Sam Willis
Paramedic Lecturer Practitioner, London Ambulance Service and Greenwich University (attended one meeting as a deputy for Mr Steve Hatton)

Appendix B: The Guideline Review Panel

The Guideline Review Panel is an independent panel that oversees the development of the guideline and takes responsibility for monitoring adherence to NICE guideline development processes. In particular, the panel ensures that stakeholder comments have been adequately considered and responded to. The panel includes members from the following perspectives: primary care, secondary care, lay, public health and industry.

Dr Robert Walker (Chair)
General Practitioner, Cumbria

Dr Mark Hill
Head of Medical Affairs, Novartis Pharmaceuticals UK

Dr John Harley
Clinical Governance and Prescribing Lead, North Tees PCT

Ailsa Donnelly
Lay member

Appendix C: The algorithms

The recommendations in the guideline have been incorporated into a NICE pathway. The full guideline also contains a care pathway overview and algorithms.

Appendix D: Glossary of tools and criteria

ABCD and ABCD^2	Prognostic score to identify people at high risk of stroke after a TIA. It is calculated based on: **A** – age (≥ 60 years, 1 point) **B** – blood pressure at presentation (≥ 140/90 mmHg, 1 point) **C** – clinical features (unilateral weakness, 2 points; speech disturbance without weakness, 1 point) **D** – Duration of symptoms (≥ 60 minutes, 2 points; 10–59 minutes, 1 point) The calculation of ABCD^2 also includes the presence of diabetes (1 point). Total scores range from 0 (low risk) to 7 (high risk).
FAST	Face Arm Speech Test. Used to screen for the diagnosis of stroke or TIA. **F**acial weakness – can the person smile? Has their mouth or eye drooped? **A**rm weakness – can the person raise both arms? **S**peech problems – can the person speak clearly and understand what you say? **T**est all three symptoms.
MUST	Malnutrition Universal Screening Tool. Used to identify adults who are malnourished or at risk of malnutrition. It incorporates current weight status (body mass index or an alternative measure), unintentional weight loss in the past 3–6 months, and the effect of acute disease on nutritional intake.
Northern American Symptomatic Carotid Endarterectomy Trial (NASCET) European Carotid Surgery Trial (ECST)	The NASCET and ECST methods both indicate the degree of stenosis as a percentage reduction in vessel diameter. The minimum diameter of the arteries caused by stenosis (which is the maximum point of blood constriction) is compared with another diameter that represents the normal diameter of the carotid arteries when the patient is healthy. NASCET includes a measurement taken along a point of the internal carotid artery in a healthy area well beyond an area of the bulb that was caused by stenosis. The ECST formula uses the estimated normal lumen diameter at the site of the lesion, based on a visual impression of where the normal artery wall was before development of the stenosis.

ROSIER	Recognition of Stroke in the Emergency Room. Scale used to establish the diagnosis of stroke or TIA. Factors assessed include: demographic details, blood pressure and blood glucose concentration; items on loss of consciousness and seizure activity; and physical assessment including facial weakness, arm weakness, leg weakness, speech disturbance and visual field defects.

Changes after publication

September 2015: minor maintenance

August 2015: Recommendation 1.5.2.2 and footnote 25 amended to refer to the recommendation in the updated NICE guideline on type 1 diabetes in adults rather than in the previous guideline (CG15). Note added to Related NICE guidance section to say that CG15 has been replaced.

July 2014: minor maintenance

October 2013: minor maintenance

January 2012: minor maintenance

About this guideline

NICE clinical guidelines are recommendations about the treatment and care of people with specific diseases and conditions in the NHS in England and Wales.

The guideline was developed by the National Collaborating Centre for Chronic Conditions. The Collaborating Centre worked with a group of healthcare professionals (including consultants, GPs and nurses), patients and carers, and technical staff, who reviewed the evidence and drafted the recommendations. The recommendations were finalised after public consultation.

The methods and processes for developing NICE clinical guidelines are described in The guidelines manual.

The recommendations from this guideline have been incorporated into a NICE pathway. We have produced information for the public explaining this guideline. Tools to help you put the guideline into practice and information about the evidence it is based on are also available.

Your responsibility

This guidance represents the view of NICE, which was arrived at after careful consideration of the evidence available. Healthcare professionals are expected to take it fully into account when exercising their clinical judgement. However, the guidance does not override the individual responsibility of healthcare professionals to make decisions appropriate to the circumstances of the individual patient, in consultation with the patient and/or guardian or carer, and informed by the summary of product characteristics of any drugs they are considering.

Implementation of this guidance is the responsibility of local commissioners and/or providers. Commissioners and providers are reminded that it is their responsibility to implement the guidance, in their local context, in light of their duties to avoid unlawful discrimination and to have regard to promoting equality of opportunity. Nothing in this guidance should be interpreted in a way that would be inconsistent with compliance with those duties.

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