Factsheet
Stroke

CPPE
CENTRE FOR PHARMACY POSTGRADUATE EDUCATION

Contents

NHS England

MANCHESTER 1824
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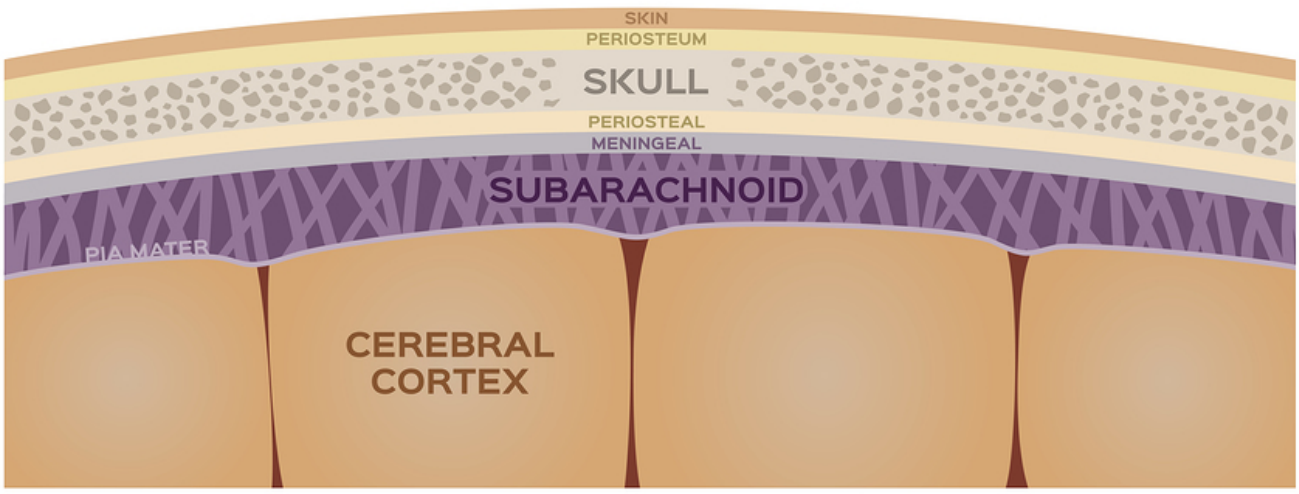
Definition

Stroke is a clinical syndrome characterised by sudden onset of rapidly developing neurological disturbance. The neurological disturbance that occurs as a result of a stroke lasts more than 24 hours or leads to death.[1]

Stroke may be classified as follows:

- **Ischaemic stroke** – where neurological dysfunction is due to ischaemia (restriction of blood supply and, therefore, shortage of oxygen), and death of brain, spinal cord, or retinal tissue following vascular occlusion (blockage) or stenosis (narrowing of blood vessels).
- **Haemorrhagic stroke** – where neurological dysfunction is caused by a collection of blood from the rupture of a blood vessel in the brain (intracerebral haemorrhagic stroke), or between the surface of the brain and the arachnoid tissues covering the brain (subarachnoid haemorrhagic [SAH] stroke). The subarachnoid space is shown in the diagram below.
- **Silent stroke** – where there is evidence of infarction (tissue death) without a history of acute neurological dysfunction.[1]
- **Carotid artery dissection** – a less common but important type of stroke, which is more prevalent in younger people and may be preceded by neck trauma.[1]



A **transient ischaemic attack (TIA)** is sometimes referred to as a 'mini stroke'. In 2009, the American Heart Association and the American Stroke Association (AHA/ASA) revised the definition of TIAs to '*a transient episode of neurological dysfunction caused by focal brain, spinal cord, or retinal ischemia, without acute infarction'.* Prior to this revised definition, TIA was defined based on symptom duration lasting less than 24 hours, with typical episodes lasting less than one hour. The de-emphasis on duration was due to multiple studies demonstrating that up to 50 percent of classically defined TIAs showed brain injury on magnetic resonance imaging (MRI).[2]

Another rarer form of stroke, **cerebral venous sinus thrombus (CSVT)** or intracranial venous thrombosis, accounts for between 0.5 and 3 percent of strokes. It is more common in young people, especially young

women.[3] For more information, access the Patient article ***Intracranial venous thrombosis*** (2021), which is aimed at medical professionals.

The Northern Ireland Centre for Pharmacy Learning and Development (NICPLD) ***Cardiovascular disease: stroke*** e-learning programme can be used to complement your learning on this page. The programme outlines the risk factors of stroke, pharmacological management of acute stroke and secondary prevention. It equips learners to provide a comprehensive service to stroke patients and to patients who may be at risk of stroke.

The NHS page ***Stroke*** contains a video that explains how a stroke happens, the different types of stroke and how lifestyle changes may help to reduce the risks. This is a useful tool for explaining stroke in person-centred language.

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Prevalence and incidence

Around one in six men and one in five women will have a stroke in their lifetime.[4]

In the UK, there are around 100,000 strokes every year. Stroke is a leading cause of death and disability, causing around 38,000 deaths each year in the UK.[4] There are over 1.3 million stroke survivors in the UK.[6]

Ischaemic strokes account for 85 percent of strokes, and 15 percent are haemorrhagic. Of the haemorrhagic strokes, three quarters are intracerebral, with the remaining being SAH.[4] SAH affects 6 to 12 people per 100,000 population per year in the UK.[4]

Ischaemic stroke is more common in older people, people with lower levels of education and African American or Hispanic people.[8] The incidence of intracerebral haemorrhage also rises with age; however, rates are higher in men and Asian people.

The incidence of first-ever TIA in the UK is approximately 50 per 100,000 people per year in the UK.[4] TIAs are associated with a high risk of stroke in the following month and up to one year afterwards[9] – more than one in 12 people will have a stroke within a week of having a TIA.[10]

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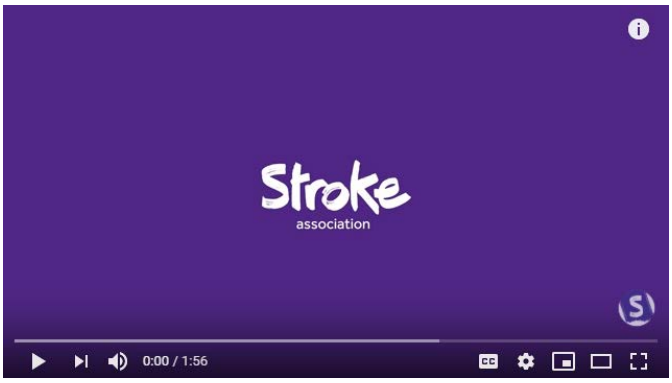
Signs and symptoms

Rapid assessment and treatment are essential in reduction of stroke-related disability and mortality.[11]

The NHS campaign ***ACT F.A.S.T.*** highlights that a stroke is a medical emergency, and the public are urged to take the below symptoms seriously and call 999 immediately if they notice any single one of them in themselves or others.[12] The messages in the campaign also apply to a suspected TIA.

The following Stroke Association video, ***How to do the FAST test,*** highlights three of the main symptoms related to stroke and TIA which affect the face, arms and speech.



Other signs and symptoms of stroke and TIA may include:

- complete paralysis of one side of the body
- sudden loss or blurring of vision
- dizziness
- confusion
- difficulty understanding what others are saying (receptive aphasia)
- problems with balance and co-ordination
- difficulty swallowing (***dysphagia***).[13,14]

With the additional symptoms relating to stroke:

- a sudden and very severe headache resulting in a blinding pain unlike anything experienced before
- loss of consciousness.[14]

For more information on the clinical features of stroke and TIA, visit the National Institute for Health and Care Excellence (NICE) clinical knowledge summary (CKS) ***Stroke and TIA, Clinical features*****.**

Those who have had a stroke may experience long-term physical effects such as swallowing problems (dysphagia), continence problems, pain and headaches and sensory problems, communication problems, and tiredness and fatigue. Stroke survivors can also experience a range of emotional changes after stroke including anxiety, depression and anger.[6]

In the following ***Stroke Association*** video, people who have experienced a stroke, and their loved ones, speak about the long-term and often hidden effects of stroke.

UK Stroke Assembly – The hidden effects of stroke

The Stroke Association's ***Effects of stroke*** page explores the longer-term effects of stroke in more detail.

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Causes/risk factors

Causes – Ischaemic stroke

Ischaemic strokes occur when large arteries (such as the major arteries in the neck), intracranial arteries (larger arteries inside the brain), or small arteries which penetrate into the brain tissue are occluded by:

- thrombus (blood clot formed in the area which becomes occluded) often as a complication of atherosclerosis (for more information about atherosclerosis, visit the ***coronary heart disease fact sheet***)
- embolus (a clot which has travelled from another part of the body) of fatty material from an atherosclerotic plaque or a clot in a larger artery, or the heart. This is often as a complication of atrial fibrillation or atherosclerosis of the carotid arteries.[15]

TOAST classification system

In practice, the Trial of Org 10172 in Acute Stroke Treatment (TOAST) classification system is the most widely used system for establishing the cause of ischaemic stroke. This includes:

1. large-vessel atherothrombosis
2. cardioembolism
3. small-vessel disease
4. other determined causes
5. undetermined causes.[17]

For more information about the TOAST classification system, and further information on stroke types and causes, access the following *Clinical Pharmacist* article, **Stroke: classification and diagnosis**.

Causes – Haemorrhagic stroke

As discussed, haemorrhagic strokes can be split into two main types:

- intracerebral haemorrhage – bleeding within the functional brain tissue (brain parenchyma) or ventricular system (cavities within the brain filled with cerebrospinal fluid), the main cause of intracerebral haemorrhage is high blood pressure
- subarachnoid haemorrhage – bleeding into the subarachnoid space from a cerebral blood vessel, aneurysm (weakened, bulging vessel) or vascular malformation (abnormal blood vessel structure).[15]

Rarer causes of stroke include cerebral venous thrombus (a thrombus in the cerebral veins) or a carotid artery dissection (a split in a carotid artery).[15]

Risk factors

Aging naturally causes the arteries to narrow, although other factors increase stroke and TIA risk.[17] Cardiovascular disease (including ***hypertension***, ***atrial fibrillation***, ***heart failure***, and carotid artery disease), lifestyle factors associated with cardiovascular disease, gender and several health conditions also affect stroke risk.[17]

The NICE CKS ***Stroke and TIA, Risk factors*** lists risk factors for stroke and TIA.

The British Heart Foundation's ***Focus on: Stroke and carotid artery disease*** article explores the link between carotid artery disease and stroke.

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Pathophysiology (mechanism of disease)

Ischaemic stroke

Ischaemic stroke occurs when blood supply to an area of the brain is critically reduced due to occlusion or critical stenosis of a cerebral artery.

In terms of pathophysiology, ischaemic stroke can be broadly classified by the points laid out below.

- **Primary vascular pathologies**
  This includes atherosclerosis, aortic arch atherosclerosis, arterial dissection, migraine or vasculitis (inflammation of the blood vessels). These pathologies directly reduce cerebral perfusion (blood flow) and/or result in artery-to-artery embolism. Artery-to-artery embolism describes the occlusion or stenosis of a distal artery (smaller artery) due to an embolus that originated in a proximal (larger) artery.
- **Cardiac pathologies**
  This includes atrial fibrillation, ***myocardial ischaemia or infarction***, and patent foramen ovale (also known as atrial septal defect – a hole in the heart between the atria which usually closes shortly after birth).
  These pathologies lead to cerebral arterial occlusion due to embolism.
- **Haematological pathologies**
  This includes prothrombotic states, which means a person has an increased risk of forming a thrombus due to abnormalities in their coagulation system.

These pathologies directly cause cerebrovascular thrombosis (particularly venous), or facilitate systemic venous or intracardiac thrombus formation and cardioembolism – the formation of clots in the veins outside of the brain or inside the heart that travel to the cerebral arteries.[18]

Haemorrhagic stroke

Haemorrhagic stroke is the result of blood vessel rupture and bleeding into the brain parenchyma. Primary intracerebral haemorrhages can be due to a number of factors listed below.

- Long-standing hypertension which can lead to cerebrovascular changes and accounts for the large majority of primary intracerebral haemorrhages.
- Cerebral amyloid angiopathy (the build-up of amyloid proteins in the vessel walls) can also increase the risk of blood vessel rupture and accounts for a significant number of primary haemorrhagic strokes in older people.[19]
- An aneurysm which is an area of thin weak artery wall that can burst, especially in a person with hypertension.[20]
- Anticoagulation treatments, which can increase the risk of haemorrhage and may also lead to an extended period of intracranial bleeding.[19]

Secondary intracerebral haemorrhages arise from vascular malformations, or as a complication of other medical or neurological diseases that either impair coagulation or promote vascular rupture.[19]

Bleeding into the brain causes a haematoma (collection of blood), which if left untreated will continue to expand until the bleeding is either stopped through homeostasis or due to increased pressure. Haematoma growth may cause the haemorrhage to rupture into the subarachnoid or intraventricular space. Intraventricular haemorrhage is linked to increased mortality.[19]

TIA

TIAs are usually a result of occlusion of the intracerebral blood vessel occlusion. The balance between the degree of obstruction, area and function of the tissue supplied by the blood vessel, the length of time the vessel is occluded and the ability for alternative blood vessels to supply the area affect the degree of neurological impairment.[21]

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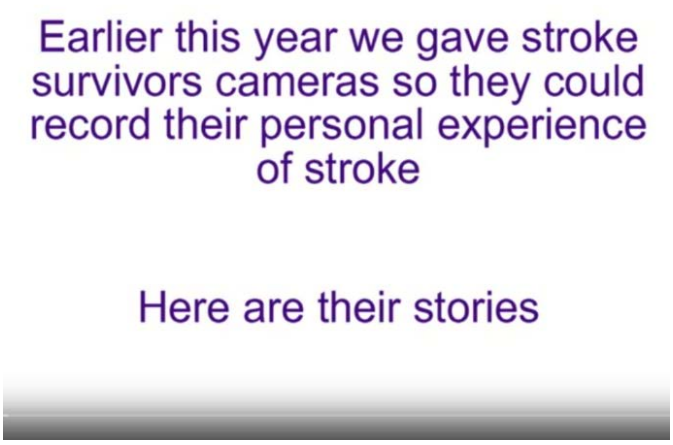
Prognosis and complications

Stroke mortality rises rapidly with age. This is due to both the fact that there is an increased incidence of stroke in older people and that in older people it is more likely to be fatal.[22] Although stroke mortality rates improved between 1990 and 2010, stroke is still the fourth single cause of death in the UK. It is also linked to significant disability.[9]

Visit the NICE CKS ***Stroke and TIA, Prognosis*** and ***Complications*** pages for information about this.

The Stroke Association has produced the following video which looks at the emotional impact of stroke.

Stroke Association – Feeling overwhelmed: The emotional impact of stroke



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Diagnosis/detection

After initial detection of stroke and TIA by using the F.A.S.T. test, assessment and diagnosis is undertaken in secondary care.

NICE clinical guideline ***Stroke and transient ischaemic attack in over 16s: diagnosis and initial management*** **[NG128]** covers interventions in the acute stage of a stroke or transient ischaemic attack (TIA). It offers the best clinical advice on the diagnosis and acute management of stroke and TIA in the 48 hours after onset of symptoms, although some interventions of up to two weeks are covered as well.[23]

TIA clinics

A person's risk of stroke following a TIA can be significantly reduced if they receive appropriate investigations and treatment within 24 hours of presentation.[24] Specialist TIA clinics were set up nationally following the publication of the ***National Stroke Strategy (archived)*** and NICE clinical guideline ***Stroke and transient ischaemic attack in over 16s: diagnosis and initial management*** **[NG128].**

As per the NICE CKS ***Stroke and TIA, Scenario: Suspected transient ischaemic attack****:*
'Urgent assessment in a specialist clinic ensures timely and appropriate investigation (such as brain imaging) and rapid intervention (such as antiplatelet therapy, blood pressure-lowering medication, statins, anticoagulation and carotid endarterectomy or stenting where appropriate)'.[24]

Differential diagnosis

There are many conditions that may present with similar clinical features to stroke and TIA. These are listed in the NICE CKS ***Stroke and TIA, Differential diagnosis****.*

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Treatment

The initial management of stroke and secondary prevention is explored in the NICPLD ***Cardiovascular disease: stroke*** e-learning programme, available via CPPE's website. Section 1, pages 10 to 12 look at *Initial management of TIA,* pages 13 to 16 look at *Initial management of stroke* and pages 17 to 22 look at *Secondary prevention* including antiplatelet/anticoagulants, management of hypertension and cholesterol, surgery and lifestyle.

The *British National Formulary* (BNF) offers a treatment summary ***Management of stroke.*** It covers the management of TIA, and the initial and long-term management of ischaemic and haemorrhagic stroke with links to the individual monographs for each treatment.

Rehabilitation and management of complications

NICE clinical guideline ***Stroke rehabilitation in adults*** **[CG162]** covers stroke rehabilitation for adults and young people aged 16 and over who have had a stroke with continuing impairment, activity limitation or participation restriction. It aims to improve rehabilitation for people who have had a stroke by specifying how stroke units and multidisciplinary stroke teams should be organised. It makes detailed recommendations on assessments and interventions for the functional difficulties caused by stroke.[25]

Secondary prevention

In addition to optimising secondary prevention medicines and medicines used in comorbid conditions, pharmacy professionals can help with secondary prevention of stroke by discussing lifestyle changes. This includes:

- discussing smoking cessation
- supporting the recommendation of an exercise plan tailored to a person's needs – this should be recommended by a person's multidisciplinary stroke rehabilitation team
- discussing the benefits of healthy diet in reducing cardiovascular risk, ie, eating at least five portions of fruit and vegetables (from a variety of sources) per day and two portions of oily fish per week, reducing intake of saturated fats, and keeping salt intake low
- discussing alcohol intake and that it should be limited to 14 units a week, spread over at least three days.[26]

Pharmacy professionals have a key role in supporting stroke survivors to successfully manage their secondary prevention medicines – including antiplatelets, antihypertensives and lipid lowering agents. Consideration must be given to the particular challenges that these patients face, which may include their ability to open packaging, understand labelling and remember their medication regimen.

The NICE CKS ***Stroke and TIA, Scenario: Secondary prevention following stroke and TIA*** covers lifestyle advice, optimisation of medicines used in secondary prevention, and optimisation of management of comorbidities (such as type 1 and type 2 diabetes mellitus and heart failure).

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Patient support

The **Stroke Association** are the UK's leading stroke charity. They deliver stroke services across the UK, campaign for better stroke care, invest in research and fundraise to expand their reach to as many stroke survivors as possible. Their ***Finding support*** page links to a range of support services and groups, an online stroke support tool, and a dedicated helpline.

The NHS has pages dedicated to ***transient ischaemic attack (TIA)*** and ***stroke***.

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Further resources

The Royal College of Physicians has produced the ***National clinical guideline for stroke 2016***, a comprehensive examination of stroke care, encompassing the whole of the stroke pathway from acute care through to longer-term rehabilitation, including secondary prevention. The edition also informs healthcare professionals about what should be delivered to stroke patients and how this should be organised, with the aim of improving the quality of care for everyone who has a stroke, regardless of age, gender, type of stroke or location.[7]

Interesting Literature

The Lancet. Zerna, C., et al. *Current practice and future directions in the diagnosis and acute treatment of ischaemic stroke*. 2018.

The Lancet. Pandian, J., et al. *Prevention of stroke: a global perspective*. 2018.

Stroke Classification and Diagnosis

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External websites

CPPE is not responsible for the content of any non-CPPE websites mentioned on this page or for the accuracy of any information to be found there.

All web links were accessed on 6 March 2023.

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