



Stroke



Stroke is the third largest cause of mortality in the UK, and the largest cause of adult disability. It has a high clinical and societal burden, and can have a profound effect on people's lives. This POSTnote summarises the different types of stroke, and examines treatment, prevention strategies and recent service re-organisation.

Background

Stroke is the brain equivalent of a heart attack. There are approximately 152,000 strokes a year in the UK, resulting in 49,000 deaths.¹ Mortality rates attributable to stroke fell by 28% between 1999 and 2008, owing in part to improved acute care and better control of risk factors. However, it is projected that there will be an extra 22,000 stroke-related deaths per year by 2020 because of expected increases in population size, lifespan and the prevalence of lifestyle choices that increase the risk of a stroke. The most recent academic and National Audit Office analyses estimate that the direct care cost of stroke to the UK is £3-4.4 billion; this rises to £8-8.9 billion if informal care costs and those to the wider economy are included.² There is a growing evidence base for the most effective primary and secondary prevention regimes, and better recognition of people at higher risk of a stroke.

What is a Stroke?

The term 'stroke' refers to a range of cardiovascular events in which blood supply to the brain is disturbed. This causes a sudden decrease in brain function as brain cells die.

- **Ischaemic stroke** follows a blockage in an artery, resulting in a part of the brain being starved of blood. Blockages are caused by blood clots, which can form in various parts of the body as a result of irregular heart

Overview

- Perceptions of stroke have recently shifted from an inevitable consequence of old age to a potentially preventable and sometimes treatable disease.
- Modelling of future trends in stroke prevalence indicates that numbers will increase in the coming decades.
- New treatments have improved the care of some types of stroke, but not others.
- Services are being restructured nationwide, but provision is not uniform, and there are challenges to providing urgent specialist care in rural areas.
- Difficulties persist with the provision of long-term support and care for survivors, with many unable to re-engage with society and achieve a good quality of life.

rhythms and atherosclerosis (the hardening and thickening of arteries as the body ages) from aging, diabetes and high cholesterol levels. It is also often linked to harmful lifestyle choices (Box 1).

- **Haemorrhagic stroke** occurs when a similarly weakened blood vessel supplying the brain bursts, resulting in bleeding either within the brain (an intracerebral haemorrhage), or an aneurysm on the surface of the brain (a subarachnoid haemorrhage).
- **Transient ischaemic attacks (TIA)** have the same clinical features as a stroke but with effects that last only a few minutes or hours. Until recently these were considered relatively benign, but are now understood to be warning signs of a problem with blood supply to the brain and, like a major stroke, should be treated as a medical emergency. A TIA (sometimes referred to as a 'mini' stroke) is normally treated in a rapid review outpatient setting.

Treating Stroke in Emergency Care Diagnosis

Receiving rapid medical treatment is vital to help recovery. Stroke is treated as a medical emergency with 999 calls for suspected strokes assigned high priority. Health professionals make an immediate assessment of the most common symptoms of stroke by using the FAST test:

Box 1. Who is at Risk from Stroke?

The following factors have been implicated in increased risk of stroke:

- **Harmful lifestyle factors.** Smoking, excessive alcohol consumption, poor diet and lack of physical exercise increase risk.
- **Pre-existing conditions.** In an audit of people admitted to hospital with stroke between April and June 2013, 54% had high blood pressure (hypertension), 19% had diabetes and 20% had an irregular heartbeat (called atrial fibrillation or AF).
- **Age.** Three-quarters of strokes occur in people aged over 65, but other age groups are also affected. Every year in the UK 5 in 100,000 children (aged 0-18), and 3,200 people aged 35-64 have a stroke. Younger people are more likely to have subarachnoid haemorrhage strokes, associated with worse clinical outcomes.
- **Gender.** Men are 25% more susceptible than women of the same age.
- **Family history.** A parental history of stroke is associated with an increased risk of stroke in the offspring, but there is usually no direct hereditary link. This can be explained by lifestyle, a genetic tendency for risk factors (such as hypertension) or a mix of both.
- **Ethnicity.** African-Caribbean people and Indian men are twice as likely as white people to have a stroke, and at a younger age. South Asian communities are also at greater risk. These differences may reflect an increased prevalence of hypertension and diabetes, or be due to variations in the management of stroke in different ethnic communities.
- **Pregnancy.** Stroke causes 1 in 7 deaths during pregnancy, although the number of cases is small (347 UK deaths, 1979-2008).

- Facial weakness, resulting in the drooping of one side
- Arm weakness, leaving the person unable to lift an arm
- Speech problems
- Time to phone 999.

In 2009, the Department of Health (DH) commissioned the ActFAST campaign to raise awareness in those who might witness and report a stroke. Further details of the campaign are given in Box 2. A suspected stroke is confirmed by a specialist in hospital with a physical examination and detailed brain imaging tests.

Emergency Treatment

All patients who have had a stroke should be admitted urgently to a Stroke Unit (SU), which has specialist staff, rapid access to diagnostic tests and treatment, and clear protocols. This is the most important intervention for stroke, as patients treated on these wards are less likely to die and more likely to leave hospital earlier and live independently. The most recent figures from the Sentinel Stroke National Audit Programme (SSNAP) for England, Wales, and Northern Ireland show that three-quarters of patients were first admitted to a SU, and one-quarter to a clinically 'unacceptable' alternative, such as a Medical Assessment Unit.³ Once in hospital, different treatment pathways are followed, depending on the type of stroke diagnosed:

- **Ischaemic stroke.** Depending on a range of factors, the best treatment for 15-20% of cases is to dissolve the blood clot with a drug, alteplase. This treatment, thrombolysis, is in some cases the difference between severe disability and almost complete recovery. It is most effective if given as early as possible up until 4.5 hours of symptom onset. The most recent audit data (Q2, 2013) reported that 12% of all stroke patients (or 73% of those

Box 2. The Annual ActFAST Public Awareness Campaign

The time taken between the onset of symptoms and medical intervention is a key indicator of how well a patient will recover. Since 95% of all strokes occur outside of hospital, it is important that the public can identify symptoms and act quickly. Research shows that older adults, who are most at risk, have the poorest symptom awareness. The ActFAST campaign aims to raise awareness in those who might witness and report a stroke. FAST stands for 'Face, Arms, Speech, Time to Phone 999'. As a secondary effect, the campaign also raises the profile of stroke as a medical emergency among paramedics and hospital clinicians.

Evaluations of ActFAST and similar campaigns show that they are effective at raising symptom awareness. However, although people report that they consider stroke a medical emergency, research shows that they do not necessarily act accordingly. A study showed that patients with prior stroke, who were more likely to correctly interpret symptoms, were not more likely to present earlier in hospital. The reasons for this are complex, but include:⁴

- misinterpreting the symptoms of stroke
- ignoring symptoms because of anxiety about possible consequences and impact on future quality of life
- delay owing to wanting a friend or relative to confirm symptoms and take responsibility for contacting emergency services
- experienced symptoms not matching expected symptoms
- belief that emergency services are not needed.

eligible) were thrombolysed. Drugs are also prescribed to reduce the risk of further clots, and to lower blood pressure and cholesterol if necessary.

- **Intracerebral haemorrhage.** No drug or surgical treatment has been proven to be routinely beneficial. Any improved outcomes result from establishing Stroke Units with close monitoring and treatment of hypertension.
- **Subarachnoid haemorrhage.** Surgery can be used to clip or coil the aneurysm to prevent it re-bleeding, a complication leading to death or severe disability in 90% of cases. A drug is used to prevent another serious complication (affecting 20-40% of patients) whereby the blood supply to the brain is reduced.
- **TIA.** Patients should have urgent specialist assessment, and are usually prescribed drugs to lower their risk of another incident.

Preventing Further Stroke*Surgery*

TIA and other recovering stroke patients require rapid management to prevent further episodes. For those with moderate to severe artery blockage (5-10% of patients), a surgical de-furring technique, carotid endarterectomy, may reduce risks by 50%. Recent pressure to speed up access to this treatment has resulted in a fall in waiting times from 28 to 15 days between 2010 and 2012. Carotid stenting, a less invasive, but less effective procedure to insert a device (stent) to hold open the blocked artery, is sometimes used in patients where the former treatment is inappropriate.

Antithrombotic Drugs

TIA and stroke patients receive long-term treatment with antiplatelet drugs (such as aspirin), or with anticoagulants (such as warfarin) if they have an irregular heartbeat. An estimated 1% of the UK population and 8% of those aged

over 80 take warfarin. Older age groups are more likely to forget to take their medication regularly. The drug is also relatively difficult to administer as the therapeutic window (the balance between too much or too little blood thinning) is small and can be affected by minor changes in daily routine, such as a larger than normal meal. Consequently, patients require regular blood tests and their warfarin dosage altered if necessary. This commitment can be difficult for those in work, travelling or in education. Allowing patients to self-monitor with devices similar to those used by people with diabetes would be more convenient for some. A study showed that such self-monitoring led to a 17% increase in time spent in the therapeutic window. The National Institute for Health and Care Excellence (NICE) is analysing cost-effectiveness and safety, and will report in 2014.

Novel Oral Anti-Coagulants are new drugs which affect blood clotting but unlike warfarin do not need frequent blood monitoring. In selected cases these are comparable to warfarin. NICE has issued advice, but there is ongoing debate amongst clinicians about when to use them.

Research Developments for Treatment

UK research on stroke is significantly underfunded compared with diseases of similar economic burden.⁵ However, there are several areas of research and specific trials that may have a clinical impact in the next five years.

Long-term Impacts of Stroke

One third of stroke patients die within a year (17% during the first 30 days), but one third make an almost full recovery, enabling them to lead an independent life. For survivors, significant improvements tend to be made in the first six months, although recovery can continue for years. NICE recommends that while hospitalised, patients with relevant needs should receive at least 45 minutes of physiotherapy, occupational therapy, and speech and language therapy each day for a minimum of five days per week. SSNAP audit results indicate that patients receive less than half of this due to resource pressures.

Long-Term Support and Care

A third of stroke patients have a significant long-term disability. As such, stroke is the largest cause of adult disability in the UK with an estimated 1.1 million current survivors. Family and friends care for 1 in 5 of these. Common effects are loss of cognitive ability and mobility, communication and continence problems, which range in severity. The charity Connect estimates that 250,000 people in the UK have aphasia, an impaired ability to understand or produce language, which can lead to a loss of identity and feelings of isolation. Research shows that a third of survivors also have depression, but diagnosis rates are low. Modelling shows that investing in psychologist-led care would quickly deliver cost savings to the NHS and social care, partly by preventing spiralling levels of need.

Improvements in acute care have not been matched in post-hospital care, where clinicians and charities consider the

existing model struggles to cope with the profound disability experienced by many. For example, upon discharge from hospital, patients should receive a health and social care assessment, resulting in a care plan, which details what and how support services will be provided. However, a recent Stroke Association survey reported that 39% of respondents had not been offered an assessment, and of those who had, 60% had not received a care plan.⁶ Only a quarter of patients surveyed by the National Audit Office (NAO) were given information about welfare benefits upon leaving hospital. Further, although three-quarters of stroke survivors of working age want to return to work, there is little provision of appropriate vocational support, and a successful return to work is considerably less likely for patients from lower socio-economic groups. Clinicians are concerned that local authority provision is patchy, and rehabilitation is often not prioritised in decisions about resource allocation. Audits have proved useful in increasing standards in acute care, and the SSNAP audit, which is currently collecting longitudinal data, may help to indicate how improvements can be made further down the care pathway.

Preventing Stroke

Modelling predicts that without greater prevention the number of strokes will increase in line with the ageing population. Stroke can be preventable. Hypertension, diabetes, high cholesterol levels, smoking, obesity, poor diet and lack of physical activity account for 80% of risk. These are common to all cardiovascular disease. NICE issued guidance aimed at reducing these risks in 2010. An example of a national prevention strategy is reduction in salt consumption (Box 3). The Government's Change4Life social marketing campaign aims to encourage individuals to make modest lifestyle changes to improve overall health. Some have questioned its ability to achieve long-term effects.⁷

Primary Care Settings

Lifestyle and risk management

An NAO survey found that of stroke survivors surveyed, only half reported receiving information on further stroke prevention upon leaving hospital. Improved lifestyle choices help to prevent recurrent episodes. Once discharged from specialist hospital care most patients rely on GPs for ongoing care and preventive medicine. GPs are financially incentivised to improve clinical outcomes by meeting markers in the Quality Outcomes Framework (QOF). Indicators in the QOF relate specifically to stroke, AF and hypertension (Boxes 1 and 3). The NHS Health Check, which Local Authorities may commission GP practices or others to provide, is a risk identification programme for those aged 40-74. Take up of the programme varies considerably across the country. Though not everyone receives appropriate interventions, 1.1 million checks were carried out in 2012, and analysis shows that the benefits may be greater than anticipated. The NHS is researching how to extend the programme to hard to reach groups, who do not traditionally access primary care, but are more disposed to stroke as a result of harmful lifestyle choices.

Box 3. UK Salt Reduction Programme

Hypertension, which is the largest risk factor for stroke, is linked to excess salt intake. The UK recommended daily amount (RDA) for an adult is 6 g/day. However, in the UK in 2000-01, average salt consumption was 9.5 g/day. The action group Consensus Action on Salt and Health estimates that 80% of consumed salt is added by the food industry in processed food. It worked with the Food Standards Agency (FSA) to set targets for salt reduction. In 2011, average salt consumption had fallen to 8.1 g/day.⁸ In the same year, target setting responsibility was moved from the FSA to DH, and the Public Health Responsibility Deal was introduced. This is a series of voluntary pledges between government, industry and other stakeholders to improve public health; however, it has been widely criticised as ineffective. Momentum slowed, but salt targets are now being reset by DH. NICE estimates that if average daily intake could be reduced to RDA, it would save £350 million in healthcare costs.

Other Drugs

Statins are used to lower cholesterol both in those who are at risk of stroke and those who have had an ischaemic stroke. Aspirin and other drugs can prevent blood clots. Greater detection and management of patients with AF (who tend to have more severe and fatal strokes) could prevent 7,100 strokes per year. Standard treatments for AF are anticoagulants like warfarin, but the use of new anticoagulants is increasing. The NHS has produced a tool which allows GPs to screen their practice lists for those most at risk. NICE has issued guidance and recommended that GPs screen for AF while measuring blood pressure.

National policy and service organisation

The 2007 National Stroke Strategy (NSS) for England was accompanied by the Stroke Improvement Programme (SIP) to co-ordinate service improvement and implement policies through regional Stroke Networks. (See Box 4 for devolved administrations.) Overseen by a National Clinical Director for Stroke and running until 2017, the NSS aims to improve the care pathway. In 2013, DH published its Cardiovascular Disease Outcomes Strategy, including acute care targets for stroke set out in the NSS. This aims to move away from disease-specific management by treating stroke as a part of general cardiovascular disease. The Stroke Improvement Programme and regional Stroke Networks had funding withdrawn following NHS restructuring in 2013. There is concern amongst clinicians that there is now a lack of central co-ordination for stroke services and no national improvement mechanism. Additionally, it is feared that the greater focus on cardiovascular disease may lead to a loss of specialism for most stages of the stroke care pathway.

Stroke-specific guides are produced by the Royal College of Physicians to assist services and clinical commissioning groups, which oversee the provision of clinical service in a local area. NICE has published guidance on diagnosis and management of acute stroke and TIA and on rehabilitation.

Stroke service reorganisation

Since stroke needs rapid treatment at any time of day, the organisation of acute care is key. London stroke services were recently reorganised into a network of Hyper Acute

Box 4. Stroke Strategy in the Devolved Administrations

The Scottish Government published the Better Heart Disease and Stroke Care Action Plan in 2009, which is implemented by the National Advisory Committee for Stroke. The Northern Ireland Stroke Strategy was published in 2008. In 2012, the Welsh Government published a four-year stroke delivery plan. The National Assembly for Wales Health and Social Care Committee has also undertaken several inquiries into stroke risk reduction.

Stroke Units (HASUs). These receive patients directly based upon paramedics' judgement that stroke is the likely cause for their symptoms. After 48-72 hours, patients are transferred to a Stroke Unit nearer their home for ongoing treatment and rehabilitation; stroke patients are not necessarily taken to their nearest hospital. In urban areas, this service reconfiguration pools specialist resources and can improve access to urgent care, but additional initial investment is required. Rates of thrombolysis (use of clot-busting drugs), used as a barometer for the level of care, exceed national averages in HASU areas. This reflects research showing that hospitals with more thrombolysis activity have shorter delays, and better clinical outcomes.

Suitability of Service Models

Stroke Units (SU) and thrombolysis have rationalised services for wider patient benefit. The HASU model is being rolled out in some urban centres. Although moving patients does improve outcomes and can be cost-effective in certain situations, a balance is needed between ambulance travel times, and the size and efficiency of the receiving unit. No research exists on the psychological impact of moving stroke patients, who are often elderly. In rural areas, long travel times may offset some of the benefits of SUs, and rapid specialist review may rely upon a greater use of telemedicine, communication technology that allows specialists to diagnose and advise treatment of patients remotely ([POSTnote 456, Telehealth and Telecare](#)).

Early Supported Discharge (ESD)

ESD rehabilitation schemes accelerate patients' rehabilitation from the hospital to the home. They are appropriate for those with mild to moderate disability, and are provided as part of a wider community rehabilitation service. Patients receive the same level of intensity of therapy and expertise as they would in hospital. Research shows that ESD reduces patient disability and dependency, and saves money, owing in part to reduced hospital stays. As a result, NICE recommends that ESD schemes are offered to those who are eligible. Only 20% of patients are currently enrolled, but DH estimate that 43% of patients could benefit from such schemes.

Endnotes

- 1 Townsend, N. *et al* (2012), *Coronary Heart Disease Statistics*, British Heart Foundation, 20, 57
- 2 National Audit Office (2010), *Progress in Improving Stroke Care*, 4
- 3 Saka, O. *et al* (2009), *Age and Aging* 38: 27
- 4 [SSNAP Clinical Audit Royal College of Physicians](#)
- 5 Mackintosh, J. E. *et al* (2012), *PLoS ONE*, Volume 7, Issue 10, 2-5
- 6 [POSTbox, Research on New Stroke Treatments](#), (2014)
- 7 Stroke Association (2012), *Struggling to Recover: life after stroke*
- 8 Adams, J. *et al* (2012), *PLoS ONE* Volume 7 (6)
- 9 He, F. J. *et al* (2013), *Journal of Human Hypertension*: 1-8