Public Health Module

Venue

Duration - Date

....

Unit: Public Health Aspects of Stroke

Workbook

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COURSE: ....

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Contents

Workbook: Public Health Aspects of Stroke

HealthKnowledge

Introduction

This unit of study aims to:

- Explore how common strokes are, as both primary condition and related ill-health, and the evidence of its impact on quality and length of life

- Familiarise students with the major risk factors /determinants for stroke

- Explore the efficacy and ethics of interventions for the prevention and management of strokes

The unit will take you on a journey that will explore the concept of stroke, describing in simple terms what it is, what happens to a person who experiences a stroke and what the outcomes may be for that person.

The focus of the unit is on the public health aspects of stroke rather than the therapeutic or clinical management aspects of stroke.

You will explore the health determinants of stroke, issues around predisposition, incidence and prevalence data, population trends and how they differ for different socio-economic and ethnic groups. You will also explore issues around prevention and risk management, looking at the efficacy of these strategies.

A further aspect of exploration will be the relationship between stroke and quality of life. Not just the more obvious issues of the impact of surviving a stroke on the individual's quality of life and that of all affected by stroke, but the constructs of quality of life and how these impact upon acceptance of healthy lifestyle messages and adherence to these in both populations, individuals and cultures.

For clarity, a glossary of terms is appended to the unit, as is a list of useful sites and organisations. The text itself is referenced and these are included as endnotes.

To help with your learning a series of short questions are asked occasionally throughout the text. These are posed to help you consider what you have just read and to contextualize your learning and understanding within your own environment.

An introduction to what is public health is presented at the beginning of the unit. This introduction is common to all four units in the public health module (Child Health, Stroke, Coronary Heart Disease and Diabetes) and can be skipped if required. Each unit is indicative of around six hours of tutor supported study.

The times allocated to the learning objectives are indicative and may be altered to suit need or the background knowledge of the learner.
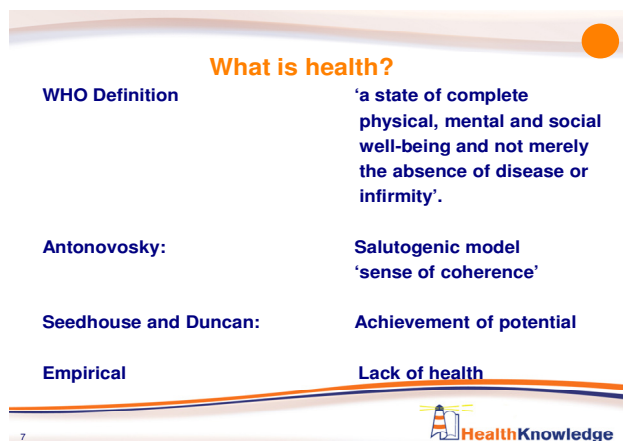
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The objectives for the Unit are:

By the end of this unit participants will:

- Be familiar with the occurrence of different types of stroke (in different populations) including how data are collected and its limitations

- Be familiar with major determinants / risk factors for stroke, and its effect on the individual's quality of life

- Be able to identify common co-morbidities, or related ill health associated with stroke and of its impact on care and management

- Be able to identify, interpret and challenge the evidence for efficacy of screening provision for stroke (e.g. screening for risk factors and disease)

- Be able to find, interpret and challenge the evidence for efficacy and ethical basis for stroke preventative interventions (primary, sector and tertiary) at a population, community and individual level (e.g. rapid response provision, public information campaigns, lifestyle/behaviour change programmes)

- Be able to find, interpret and challenge the evidence for interventions for effective management of stroke

Introduction to public health

To understand public health it is worthwhile taking some time to consider the concept of health and its determinants[i].

What is health?

WHO Definition	'a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity'.
Antonovosky:	Salutogenic model 'sense of coherence'
Seedhouse and Duncan:	Achievement of potential
Empirical	Lack of health

What is health?

This is a difficult question and one that should be frequently pondered not least because there is no definitive answer but, we each have a way of defining it. From a biomedical perspective, health is defined as the absence of disease - the health of a society can be measured by the incidence and prevalence of disease. However the World Health Organisation (WHO) takes a more social perspective, defining health as a dynamic "state of complete physical, mental and social well-being and not merely the absence of disease or infirmity[ii]. Each have their strengths and limitations.

The question of 'what is health' has been a challenge for contemporary philosophers[1,2,3]. Perhaps it is Antonovsky's Salutogenic model of health that poses the key questions and tries to explain using "the sense of coherence" framework. But Seedhouse and Duncan also suggest health is a value and concept, enabling us to achieve our potential. More empirical and objective ways of addressing what is health is associated with lack of health, being ill. For further information on issues around defining health see the sociological perspective of health and illness chapter in the Health Knowledge Textbook.

Subjective measures of health

Census data in 2001 asked those to respond if they were not in good health. About 9% of UK defined themselves as not in good health but this was as high as 18% of the population in one of the most deprived areas of UK and only 4% in one of the most affluent. Though subjective, this type of data informs planning and needs and ties in well with other epidemiological data

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[i] The section is common to all units in the public health module and can be skipped if needed

[ii] Preamble to the Constitution of the World Health Organization as adopted by the International Health Conference, New York, 19-22 June, 1946; signed on 22 July 1946 by the representatives of 61 States (Official Records of the World Health Organization, no. 2, p. 100) and entered into force on 7 April 1948.

demonstrating how life expectancy at birth varies within nations and between nations, with the poor, more deprived populations usually having a shorter life expectancy[iii].

What is public health?

Public health is defined as 'the science and art of preventing disease, prolonging life and promoting health through the organized efforts of society[iv]. It therefore deals with preventive rather than curative aspects of health and with population-level, rather than individual level health issues. It does this by using public health methodology of surveillance of disease cases and through promoting healthy behavior. Public health focuses on health's wider determinants and social inequalities:

The wider determinants of health
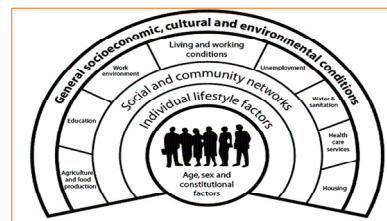
Source: Dahlgreen and Whitehead, G and Whitehead M (1991)

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…and faces some difficult challenges – particularly around health behaviour:
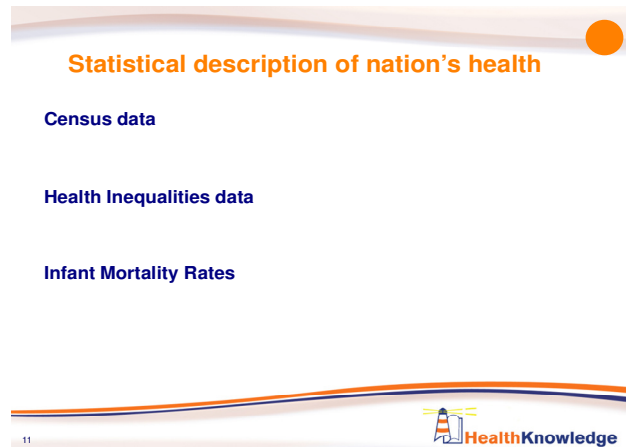
The challenge for public health

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[iii] http://www.statistics.gov.uk/census2001/profiles/commentaries/health.asp.

[iv] C.E. A. Winslow, "The Untilled Fields of Public Health," Science, n.s. 51 (1920), p. 23

How is health measured?

Statistical description of nation's health

Census data

Health Inequalities data

Infant Mortality Rates

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Gradient of inequalities in health

Health can only be understood within the wider context in which it is shaped. Poverty is a key indicator of health outcomes but it should not be viewed as singularly causal. Social determinants play an important part in understanding the gradient of inequalities, as Michael Marmot points out: "It shows that, among other things, the nature of children's upbringing, adults' workings lives, or older people's experiences of ageing are critically shaped by the quality of social relationships, access to particular material resources and services, and the nature of our neighborhoods and wider environments. It may be uncomfortable and complicated and suggest a lack of magic bullets (or pills) to cure all ills but reflects a complex reality in which many of our health risks reflect lifetime exposure to a range of tolerated hazards[v].
For further information on the Social Determinants of Health look at the World Health Organisation[vi] and for world inequality statistics see Gapminder[vii].

What is a stroke?

A stroke is the sudden death of some brain cells due to a lack of oxygen when blood flow to the brain is impaired by blockage or rupture of an artery.

Although the brain constitutes only 2% of the total body weight in adult humans, it receives 15-20% of the body's blood supply. Because brain cells are extremely vulnerable and may die if their blood supply is reduced, the body attempts to supply the brain with a constant flow of blood, even at the expense of other organs.

A stroke is caused by the interruption of the blood supply to the brain, usually because a vessel has either ruptured or been blocked by a blood clot. The result of this reduction in blood supply is a cut in the brain's oxygen and nutrient supply, causing damage to the brain tissue.

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[v] http://www.hsj.co.uk/comment/opinion/michael-marmot-on-why-health-inequalities-matter/5000345.article

[vi] http://www.who.int/social_determinants/en/index.html

[vii] http://www.gapminder.org/

Someone in the UK has a stroke every 5 minutes and 48% are either dead or disabled at 6 months[4]. Stroke is a major cause of disability in adults, resulting in much morbidity and mortality in the western world. It is estimated that around 111,000 people will have their first stroke each year in the UK (heartstats 2009) and the prevalence rate is between two and three percent of the population. The prevalence rises with age, affecting 13% of men and 11% of women over the age of 75 (heartstats 2009).

Major types of stroke

There are 2 main types of stroke:

1. Ischaemic – caused by a blockage in the blood supply to the brain
2. Haemorrhagic – caused by a bleed into the brain tissue

Ischaemic Stroke
80% of strokes result from an obstruction, such as a clot, blocking an artery that carries blood to the brain. Brain tissue may be permanently damaged if its blood supply is reduced, by a process known as ischaemia. Blockages may be the result of:

- Cerebral thrombosis, when a blood clot (thrombus) forms in a main artery to the brain
- Cerebral embolism, when an obstruction caused by a blood clot, air bubble or globule of fat forms in a blood vessel somewhere else in the body and is carried in the bloodstream to the brain
- A piece of atherosclerotic plaque breaking away from the wall of a blood vessel in another area of the body and lodging within the brain

The risk of a blockage, such as a clot, lodging in the brain may be increased if there is a build-up of fatty atherosclerotic plaque in the inner layer of the wall of an artery, leading to narrowing and irregularity.

A transient ischaemic attack (TIA) is often called a 'mini-stroke' and happens when the brain's blood supply is interrupted but only for a brief time. The symptoms are very similar to a stroke, for example weakness on one side of the body, but they are temporary, usually lasting a few minutes or hours, and by definition resolve completely within 24 hours. Patients who experience a TIA are at risk of a more serious stroke in the future and therefore should be treated as an emergency.

Haemorrhagic stroke
Accounting for most of the remaining 20%, this type of stroke happens when a blood vessel bursts, causing bleeding into the brain.

Haemorrhagic stroke may result from:
- Intra-cerebral haemorrhage where a blood vessel bursts within the brain
  Sub-arachnoid haemorrhage when a blood vessel on the surface of the brain bleeds into the sub-arachnoid space between the brain and the skull

Other rare causes of stroke

Ischaemia and thrombosis cause the vast majority of strokes. However, other causes include

- Cerebral venous thrombosis (0.5% of strokes) – often associated with underlying blood disorders such as thromobophilia[5]
- Extra-cerebral vessel dissection (2.5% of strokes)

Epidemiology of stroke

Why is stroke an important public health issue?

Epidemiology of Stroke

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- Around 111,000 people have a stroke each year in the UK
- Second most common cause single cause of death in UK
- Significant numbers left with moderate or severe disabilities
- Stroke consumes 5% of all NHS costs
- Incidence has fallen by 40% over the past 20 years

Mortality and morbidity statistics, along with analysis of risk factors show that stroke, in the UK, is a significant but largely preventable disease which not only contributes to the economic burden of disease in the UK, but also as marker of health inequalities.

Mortality

Strokes cause around 53,000 deaths each year in the UK, including those who die at a later date as a result of the effects of their stroke. In 2004, strokes caused 8% of deaths in men and 12% of deaths in women in the UK. In those aged under 75, strokes caused 5% of deaths in men and 6% of deaths in women in the UK[6]. Stroke mortality and incidence has declined over recent years, but the chance of dying in those who suffer a stroke has remained constant[7].

Morbidity

UK statistics show that of all people who suffer from a stroke, about a third are likely to die within the first 10 days, around a third will recover within a month and a third are likely to be left disabled and needing rehabilitation[8]. The main burden of disease is survival with disability, dementia, depression, epilepsy, falls, and other complications[9]. There are more than one million people who have had a stroke living in the UK (heartstats 2009). Stroke causes a greater range of disabilities than any other condition[10]. After a stroke, approximately one third of people have dysphasia (loss of speech) with 50% of stroke patients losing the ability to swallow on admission to hospital [7].

One year survival after a stroke, approximately:
- 80% of people are at home
- 12% live in a residential or nursing home
- 66% regain the ability to walk
- 45–60% are independent
- 5–9% are totally dependent[11, 12]

Burden of disease

Strokes are the second most common singular cause of death in the UK and a major cause of disability (heartstats 2009). Strokes affect between two and three percent of the population in the UK with differences in rates for age, sex, occupation and ethnic groups. Annually an estimated 111,000 people in the UK have a stroke, with nearly half of these dying and a significant number left with moderate or severe disabilities, requiring dependence on others to help carry out daily living activities. A recent estimate suggests that in the UK the total societal costs of stroke are £8.9 billion a year and represent 5% of NHS costs[13].

The burden of stroke is predicted to increase because of the rapid rise in the number of elderly people who are living longer. However, one study showed that the incidence of major stroke has in fact fallen by 40% over the past 20 years, in association with increased use of preventive treatments and subsequent reductions in risk factors[14].

Inequalities in health

Regional
As mentioned above, variation of stroke mortality exists between different groups and regions in the UK. At the turn of the 21st century, death from stroke rates were highest in Scotland, followed by the North of England, Wales and Northern Ireland. The lowest rates were in the South of England. This trend was also demonstrated by local authority statistics, with higher mortality observed in urban areas.

Socioeconomic
Though stroke mortality trends have fallen consistently in the last thirty years among the under 65's, the downward gradient has been more acute for the higher socio-economic classes, thereby increasing health inequalities among social classes. This is also observed by area of deprivation with the most deprived areas of England and Wales showing stroke mortality rates for under 65's as three and a half times higher for men and over two and a half times higher for women, compared to the general population rates[15].

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Risk factors for stroke

There are several factors that increase the likelihood of having a stroke. Patients with more than one risk factor have an even greater risk. Some are modifiable, others are not.

Modifiable risk factors

Diet: A diet high in saturated fat can raise blood cholesterol levels. High sodium (salt) intake is also related to high blood pressure. High cholesterol and high blood pressure contribute to development of atherosclerosis[16] and so increases the risk of stroke. In addition high sodium may also have a direct effect on stroke risk. A recent meta-analysis found a direct relationship between high sodium intake and stroke and heart disease, suggesting that salt intake in adults could be as high as 10g per day and, by reducing to the WHO recommendations of 5g per day, the risk of stroke could be reduced by 23%[17]. In the UK, recommended levels are 6g per day.

Eating fruit and vegetables reduces the risk of stroke. For each extra portion eaten on average per day, the risk of ischaemic stroke reduces by 6%. Just 13% of men and 15% of women eat the recommended five or more portions each day - most eat fewer than three portions. Eating more wholegrain foods is also associated with a lower risk of stroke among women [18].

Obesity: Obesity increases the risk of high blood pressure, high blood cholesterol, diabetes and stroke. Obesity rates in England vary by sex, ethnicity and socio-economic differences[19] and trends show levels are increasing rapidly: four in ten of the adult population in England in 2006 were overweight and a further quarter were obese (with a BMI over 30kg/m²), representing a 50% increase in prevalence since 2004[20].

Raised cholesterol: Cholesterol levels above 5 mmol/l increase a person's relative stroke risk to three times the average level. Around 66% of men and women have cholesterol levels above this recommended threshold[21].

Lack of Exercise: Even moderate physical activity can reduce the risk of stroke by up to 27%[22]. However only 37% of men and 25% of women meet the current guidelines for exercise whilst over a third of adults are inactive, doing less than one 30 minute session of exercise a week[6.]

Alcohol: There is a strong relationship between heavy drinking and stroke: male drinkers of over 35 units a week have double the risk of mortality from stroke than non-drinkers[23]. In 2005 in England, 24% of men and 13% of women consumed more than the recommended weekly limits of alcohol (21 units for men and 14 units for women)[24].

High blood pressure: High blood pressure is the most important risk factor for stroke as it weakens the artery wall. People with hypertension are four times more likely to have a stroke than those with normal blood pressure[25]. In England, in 2006, 31% of men and 28% of women had high blood pressure (over 140/90mmHg). However, half of people with high blood pressure were not receiving treatment[26].

Smoking: In the UK, 22% of men and 19% of women smoke cigarettes. It is estimated that nearly one in five deaths in England for adults aged 35 and over is attributable to smoking[27] Risk of stroke in tobacco smokers is approximately two to four times the risk in non-smokers[28].

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Five years after stopping smoking, the risk of stroke is reduced to that of non-smokers, regardless of age at starting to smoke and the number of cigarettes smoked per day.

Diabetes: People with diabetes are two to three times more likely to have a stroke compared to those without the condition. Over 4% of men and 3% of women in England have been diagnosed with diabetes [29].

Atrial fibrillation: This is a type of irregular heart rhythm and represents an important risk factor for stroke, found in 15% of all stroke patients[30]. Because the heart does not beat properly, there is a risk of blood clots forming in a chamber of the heart, which may subsequently break up. Fragments of clot may then lodge in the brain, causing stroke. Not only does atrial fibrillation (AF) increase the risk of stroke, it is also apparent that strokes in patients with AF are more severe than those in patients with a normal heart rhythm. They are more likely to be severe or fatal, have higher 30 day and one year mortality, and have higher stroke recurrence rates at one year (23% vs. 8%)[31]. The overall prevalence of AF in adults over 65 is 4.7%, rising to 10% in men 75 and over[32].

History of Transient Ischemic Attacks: Patients who have had 'mini-strokes' are nearly 10 times more likely to have a stroke than someone of the same age and sex who has not had a TIA. Similarly, someone who has had a stroke is at higher risk of having another one. 10–20% of those who have had a TIA will go on to have a stroke within a month. The greatest risk is within the first 72 hours[33].

Sleep apnoea: The cessation of breathing during sleep, or sleep apnoea, may cause high blood pressure, which may lead to a stroke or heart attack. Diagnosing sleep apnoea early may be an important stroke prevention tool.

Non-modifiable risk factors

Increasing age: Two-thirds of all strokes occur in people older than 65. People aged 75 years or older have a nine-fold higher risk of stroke and from recurrent stroke when compared to people aged 45 to 64 years. However, 25% of strokes occur in people aged less than 65 years[34].

Gender: Epidemiological data indicate that the incidence of stroke is greater in men than in women throughout the world. Oestrogen has been implicated as a vasoprotective hormone. Some studies have also suggested that cardiovascular morbidity and mortality are reduced in women receiving hormone replacement therapy[34].

Ethnicity: Studies have shown that, in the UK, people from African-Caribbean ethnic background are twice as likely to have a stroke compared with Caucasian people and tend to have their first stroke at a younger age. Men born in Bangladesh have a stroke mortality rate three times the rate of those born in England and Wales and the stroke mortality rate is nearly double for men and women born in Jamaica and two and a half times for men born in West Africa[35]. This is not explained by differences in age, sex, and social class, although differences in the frequency of cerebrovascular risk factors may be responsible. The incidence of high blood pressure is also higher in minority ethnic groups: the African-Caribbean and South Asian communities have particularly high rates of hypertension[36, 37]. Other studies have also shown that ethnic minority groups have higher rates of diabetes, predisposing them to cardiovascular disease. Prevalence of severe obesity is also particularly high among women of African descent. Preventive and treatment strategies therefore need to consider both underlying differences in risk factors and susceptibility to different vascular diseases amongst minority groups[38].

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The following exercise would require access to the Internet so might best be attempted as preparation unless access available within the learning session.

Exercise I: Find out the statistics on stroke in your local region (e.g. London or a part of London). Discuss the trends – does it reflect national statistics? If different, give some suggestions why you think this might be.

For London a good source might be the London Health Observatory www.lho.org.uk. You also might try www.heartstats.org or look up your 'local stroke registry (the South London Stroke Registry is a good source).

Stroke prevention

In order to be able to prevent stroke, we need to:

(i)   Understand the risk factors associated with the incidence of stroke and their contribution as causal factors

(ii)   Know the extent of the contribution of individual causal factors and any interactions that may exist

(iii)   Understand these issues at both an individual and population level.

From a public health perspective, we also need to understand which risk factors contribute most to the population burden of stroke (i.e. the population attributable risk) as this knowledge will help us to plan health policy aimed at reducing the burden of the disease.

- Primary Prevention is the term used for measures that avoid the development of a disease, in this case stroke or coronary heart disease. Most population-based health promotion activities are primary preventive measures

- Secondary prevention involves identifying patients at high risk of having a stroke, and acting to reduce the relevant risk factors in order to prevent them having an event in the future

- Tertiary prevention, reducing the risk of recurrence in patients who have already had a stroke or TIA, is equally important because of their continuing risk

The risk factors listed above include some conditions that can be changed by lifestyle modification or medical treatment, and some, such as hereditary factors, that cannot be changed. However, there are many positive steps that can reduce risk of stroke.

As you will have noticed, many of the risk factors for stroke are the same as those for coronary heart disease, such as diet, blood pressure and smoking. Most of the controllable risk factors therefore relate to cardiovascular fitness, and include changing risk factors by medical treatment as well as positive lifestyle modifications.

Methods include:

- Given its importance as a risk factor, controlling high blood pressure is crucial. In general, blood pressure should be below 120/80. Methods for controlling this include a low-sodium diet, weight control, and/or medication
- Monitoring risk factors such as elevated blood cholesterol and controlling them via diet and lifestyle modifications or medical treatment, where appropriate
- Prescribing anti-clotting and antiplatelet drugs to thin the blood and lower the risk of blood clots forming
- Stopping smoking
- Dietary improvements including avoiding excess fat, particularly saturated fat, avoiding excess sodium and avoiding excess alcohol intake
- Maintaining a healthy weight
- Exercising regularly - the recommendation is at least 20 to 30 minutes of aerobic exercise at least five times a week in order to achieve and maintain an improved level of fitness
- In patients with diabetes, it is important to maintain good control blood sugar levels, as this group of patients is at particular risk of cardiovascular disease
- Treat for sleep apnoea – advice on diet (losing weight) and alcohol, special pillows or devises to avoid sleeping on back etc
- Treat for atrial fibrillation if necessary

Risk factors that cannot be changed:

- Age
- Gender
- Ethnicity
- Family or Individual History

Using epidemiological data in prevention

Ultimately, effective prevention of stroke is fundamentally dependent upon the availability of high quality data from epidemiological and intervention studies, informing both the development of health policy and better clinical decisions. It is important to know not only who experiences stroke, but also what impact it has on those who survive.

Research has demonstrated that better control of the risk factors associated with stroke and increased use of preventative medicines have together resulted in a 40% reduction in major stroke over the past 20 years[39]. The Oxfordshire Vascular Study (OXVASC) is community-based incidence study of both acute stroke and acute myocardial infarction, in a mainly urban population of 200,000 in Oxfordshire. The same study has also provided insights into the subsequent risk of stroke in patients who have had a TIA[40].

The development of stroke registries has also led to the accumulation of a wealth of data on the descriptive epidemiology of stroke. For example, the South London Stroke Register holds data on a multi-ethnic population of almost 250,000 stroke patients. Patients are notified to the register from a variety of sources, including accident and emergency records, hospital wards, brain imaging requests and death certificates. Patients are followed up 3 months after their stroke by a register team field worker and then yearly by postal questionnaire. A huge range of information is collected on each patient including socio-demographic characteristics, risk factor history, disability and quality of life assessment, providing a valuable resource about both the natural course of stroke and its impact[41].

However, the same issues apply to stroke data as any large dataset. For the data to be useful, every effort must be made to ensure that it is complete, and the method of data collection does not inadvertently exclude any important groups. For example, the South London register receives stroke notifications from a wide range of sources. This is crucial to ensure that all patients who experience a stroke are captured and there is complete coverage of the stroke population, including those who may have died before reaching the hospital. The accuracy of the data is also important, and staff training may be required to ensure that rigorous methods of data collection and recording are used, in order to facilitate accurate comparisons between patients.

Risk factor screening

The NHS Health Check programme offers preventative checks to all those aged 40-74 to assess their risk of vascular disease, including stroke, followed by appropriate management and interventions[42]. The programme involves a series of risk assessments, for example age and weight, as well as self-reporting of lifestyle characteristics, which can be carried out by GPs or other trained professionals such as pharmacists. An individual's risk of developing cardiovascular disease is then calculated; steps to reduce this might include lifestyle modifications, drug treatment and effective management of any underlying medical condition such as diabetes. NHS Health Check is a new initiative and is intended to be implemented in every PCT within the next few years. It is supported by a website aimed at the general public as an initial self assessment of risk and for information on the Health Check. See http://www.nhs.uk/planners/nhshealthcheck for further information on this intervention.

Whilst this represents a proactive move away from treatment-based medicine, encouraging patients to take charge of their own health, there is evidence that multiple risk factor interventions such as this have no effect on mortality and result only in relatively modest changes in behaviour[43].

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In addition screening programmes may inadvertently widen health inequalities, because such interventions generally reach fewer individuals in deprived areas, but those in deprived areas are the most likely to be at risk of cardiovascular disease, including stroke[44].

Exercise 2: Discuss why stroke mortality is decreasing in Western Countries.

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Behaviour change

Data on the burden of stroke provide an argument for encouraging lifestyle change across populations to reduce the incidence of both primary and secondary strokes. However, for prevention to be effective and for positive health practices to be sustained, behavioral and lifestyle change is required.

Individuals often have several risk factors for stroke, so reducing the risk of recurrent stroke may require them to make significant lifestyle changes. As stated above, there is limited evidence that interventions to change health behaviours are successful. People find it challenging to change their lifestyle, especially if they are trying to change more than one risk factor at a time, and may therefore not only need advice about lifestyle changes but support from healthcare professionals to make changes.

Research would suggest that most success is achieved when people choose which risk factor to focus on, when milestones are set and when one change is made at a time. One such model to support behavioural change is the FRAMES[45] model (Figure 1). This model gives a structure for facilitating successful engagement with healthy lifestyle change.

Figure 1: The FRAMES model of behavioural change

Feedback	Individual receives information about current status
Responsibility	Individual assumes responsibility for change
Advice	Individual receives suggestions that will help in the change process
Menu	Individual receives a number of alternative strategies for modifying their problem behaviour
Empathy	Individual receives warm support and respect
Self efficacy	Individual develops a 'can do' attitude

Exercise 3: Violet, a 55 year old widow comes to the surgery for a health check to determine her risk of CVD/stroke. She has no family history of stroke, though her mother had high blood pressure. Her recent BP was 140/95 though she has never had any problems in the past with raised blood pressure. She currently weighs 88.5 KG and her height is 5ft 7ins. She has been trying to lose weight for a number of years but since her husband's death two years ago she has been feeling low and not wanting to exercise.   She smokes 10-15 cigarettes a day and has the occasional glass of wine to cheer her up.

From the available evidence, and assuming no change in health behaviour:

- a) What risk would you say Violet had of developing cardiovascular disease or stroke within the next few years (high – medium – low?)
- b) How would you calculate this total risk?
- c) What further information might help with this assessment?
- d) What advice (including treatment) would you give?
- e) What other aspects should be considered when advising/guiding on health behaviour change (consider the evidence)?

Use the FRAMES model above (fig 1) to help.

Symptoms of stroke

As discussed previously, a stroke is usually the result of either a blood clot lodging in the brain's blood vessels, or a leak in one of the vessels causing a haemorrhage into the brain tissue. The specific motor and sensory symptoms experienced by the patient, which may include altered movement or sensation, correspond closely to the function of the brain region that is injured.

Additionally, it is also important to know how the patient's symptoms developed. The symptoms may be severe at the beginning of a stroke, they may progress gradually, or fluctuate initially (known as a 'stroke in evolution'). Depending on the site of the lesion, a stroke may cause any of the following symptoms:

- Disturbance of speech
- Weakness or sensory change on one side of the body
- Dizziness, nausea, balance and coordination problems
- Visual problems: loss or double vision

Diagnosis of stroke

Investigative tests are performed to determine the type, location, and cause of the stroke and to rule out other disorders that may be responsible for the symptoms. These tests include:

- Head CT or head MRI - used to a) determine if the stroke was caused by bleeding (haemorrhage) or another lesion and b) define the location and extent of the stroke
- ECG (electrocardiogram) - used to diagnose underlying heart disorders such as atrial fibrillation
- Echocardiogram - used to determine whether the cause might be fragments of blood clot breaking off an embolus in the chambers of the heart
- Carotid duplex - an ultrasound procedure used to examine blood flow in the major blood vessels to the brain, to determine if the cause is be due to a narrowing in an artery caused by a build up of atherosclerotic plaque
- Blood tests may be carried out to investigate for immune conditions or abnormal clotting that may predispose a patient to clot formation

Figure 2: Angiogram showing a severe narrowing (stenosis) of the internal carotid artery

Prompt emergency treatment of stroke can reduce the risk of death and disability. The Department of Health 'Stroke: Act F.A.S.T.' awareness campaign aims to educate the public about the signs of stroke. It encourages people to recognise the signs and feel confident to phone 999 for an ambulance on detecting any single one of them.

The following tool is used as a memory aide:

> **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**ime to call 999 for an ambulance if you spot any one of these signs[46]

The campaign was only launched in February 2009, so a formal evaluation of its impact is awaited. However, preliminary data suggest that the advertising has led to a 55.5% increase in the number of 999 calls reporting possible strokes. Additionally 84% of the public remember the campaign and its graphic depiction of stroke spreading like fire in the brain[47].

Emergency management of stroke

Effective emergency management of stroke can impact on the outcome of the stroke survivor. Recent NICE guidelines suggest that rapid interventions improve patient outcomes[48]. In many regions, emergency medical services are able to transport patients directly to specialist stroke services as a 'blue light' priority. Such services include rapid triage, immediate access to specialist clinicians and rapid brain imaging. At the very least, the SIGN Guidelines in Scotland and the Stroke Strategy in England advise that patients should be admitted to a stroke unit staffed by a co-ordinated multi-disciplinary team with a specialist interest in stroke care[49, 50].

Brain imaging is an immediate priority in those with a suspected stroke or TIA and, where an ischaemic stroke is identified, individuals admitted within three hours of symptom onset should be considered for thrombolysis.

Prevention of recurrent stroke should begin as soon as possible and may be achieved with the use of anti-platelet therapy. Statins should also be prescribed to patients who have an ischaemic stroke, irrespective of their cholesterol level.

The long-term outcome from a stroke depends on the extent of damage to the brain, the presence of any associated medical problems, and the likelihood of recurring strokes. As well as problems due to loss of mobility, complications of stroke include reduced social interaction, reduced ability to function or care for self, side effects of medications and swallowing problems (aspiration) which can lead to respiratory tract infections.

The economic cost of stroke

Health care costs

Stroke care costs the NHS approximately[51].
- Around £7 billion per year, including £2.9 billion in direct care costs
- It is predicted that by 2010, the total cost of stroke will have risen by 30% since 1991
- One in five acute hospital beds and a quarter of long-term beds are occupied by stroke patients.
- For every patient who has a stroke, the cost to the NHS in the UK is around £15,000 over five years. This rises to £29,000 when including informal care costs

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Non-health care costs

Looking only at the health care costs grossly underestimates the total cost of stroke in the UK. A recent study estimated the cost of stroke from a societal perspective[52]. Data from the South London Stroke Register and a number of other national sources were used. The study determined that the treatment of and productivity loss arising from stroke result in total societal costs of £8.9 billion a year, with treatment costs accounting for approximately 5% of total UK NHS costs. Direct care accounts for approximately 50% of the total, informal care costs 27% and indirect costs 24%. Stroke therefore incurs considerable societal costs as well as huge human, personal cost to stroke survivors and to all those otherwise affected by stroke.

It is also worth considering the cost to the economy of various cardiovascular risk factors such as physical inactivity, which predispose patients to stroke. A recent publication by the British Heart Foundation examined both the costs to the NHS of cardiovascular diseases related to physical inactivity, as well as the costs of lost productivity. Of the £2.9 million spent on direct treatment costs for stroke, £0.35 million is thought to be due to physical inactivity. The World Health Report 2002 estimated that 10% of stroke in developed countries is due to physical inactivity. Lack of physical activity is a modifiable risk factor for stroke and moderately intense activity is often sufficient to achieve risk reduction.

In addition, rising levels of obesity place an enormous financial burden on the economy. The cost of overweight and obesity in England may run to £6.6-7.4 billion per year according to recent estimates, whilst the costs of treating the consequences of obesity, including stroke, run to approximately £945-£1,075 million per year.

Quality of life after stroke

The World Health Organization (WHO) defines quality of life as an individual's perception of his or her position in life in a specific cultural, social, and environmental context. Quality of life is influenced by the patient's assessment of their physical, material, social, and emotional well-being, personal development, and purposeful activity[53]. Health-related quality of life (HRQoL) refers to those aspects of quality of life affected by disease.

As discussed previously, a third of patients who suffer a stroke will be left with significant disabilities that may include problems with speech or mobility, as well as difficulties with activities of daily living. This impairment may therefore negatively affect their perceived quality of life, and a measurement of health status must not only include a measure of disease severity, but also an estimation of well being.

One Australian study showed that quality of life is impaired for most survivors of stroke, who represent a group of patients that are heavily reliant on medications, medical aids, and health professionals. Important factors included physical impairment, disability, depression, age and social support. Factors at stroke onset that predicted subsequent quality of life included age, sex, and low socioeconomic status[54]. Quality of life has also been shown to be lower in female stroke patients, compared to males[55].

Depression is a common consequence of stroke. It is known to be associated with deterioration of quality of life and may also interfere with a patient's recovery. A Scandinavian study demonstrated that more than half of stroke patients suffer from depression and the frequency of major depression seems to increase over time[56].

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As it is increasingly recognised that an evaluation of treatment should include quality as well as quantity of survival, a number of tools have been proposed specifically aimed at assessing quality of life after stroke. These include the Stroke-Specific Quality of Life Scale (SS-QoL)[57]. Such instruments are useful in establishing the true impact of stroke on all those affected by a stroke, not just the stroke survivor.[58] Quality of life is a multi-factorial concept, and assessment will consider several domains including mobility, communication, relationships, and plans for the future.

Government objectives for stroke

Stroke targets set by the Government in England at the turn of the 21st century, that of reducing the death rate from stroke, CHD and related diseases in people under 75 by at least 40 percent by 2010 was met well before this date. However, stroke is still a major killer in the UK, killing more women than breast cancer. It also carries a high morbidity cost, often leaving a devastating effect on the individual and those involved in their care, as well as being a major burden on the country's economy.   Many strokes are preventable, particularly if the risk factors are identified in time, and treatable. Much can be done to improve the lives of those affected directly or indirectly by stroke. In 2007 the Government (English) launched its National Stroke Strategy, which set out a ten point plan of action for those planning services for stroke including delivering the newest interventions and treatments:

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National Stroke Strategy

Ten-point plan for action

1. **Awareness:** what action is your local area taking to improve public and professional awareness of stroke symptoms?

2. **Preventing stroke**: how effectively is your area supporting healthier lifestyles and taking action to tackle vascular risk, for example hypertension, atrial fibrillation and high cholesterol?

3. **Involvement:** are people with stroke informed partners in their care planning? How effectively are those who have had a stroke – including those with communication and/or physical disabilities – involved in planning and evaluating local services?

4. **Acting on the warnings:** TIAs are a clear warning sign that a further stroke may occur and the time window for action is very short – in about half of cases this is a matter of days. Has your local area put in place a system that responds quickly to people who have had a TIA (meaning within 24 hours for the group most at risk of stroke)?

5. **Stroke as a medical emergency:** getting people to the right hospital quickly – where there are specialists who can deliver acute treatments including thrombolysis – will save lives. Is your local stroke network planning to ensure that everyone who could benefit from urgent care is transferred to an acute stroke centre that provides 24-hour access to scans and specialist stroke care?

6. **Stroke unit quality:** stroke unit care is the single biggest factor that can improve a person's outcomes following a stroke. Successful stroke units are built around a stroke-skilled multidisciplinary team that is able to meet the needs of the individuals. How does your local unit rate on the Royal College of Physicians' National Sentinel Stroke Audit?

7. **Rehabilitation and community support:** intensive rehabilitation immediately after stroke, operating across the seven-day week, can limit disability and improve recovery. Specialised rehabilitation needs to continue across the transition to home or care home, ensuring that health, social care and voluntary services together provide the long-term support people need, as well as access to advocacy, care navigation, practical and peer support. Is commissioning and planning integrated across the whole care pathway in your area?

8. **Participation:** assistance to overcome physical, communication and psychological barriers to engage and participate in community activities helps people to lead more autonomous lives and move on after stroke. This will be across the range of community services – housing, education, leisure, transport, employment – that can help people to participate in community life again. Does your local area consider the needs of people who have had a stroke in accessibility planning?

9. **Workforce:** people with stroke need to be treated by a skilled and competent workforce. Resources to assist services in planning their workforce requirements are signposted in this strategy. Has your local area undertaken a local needs assessment and developed a workforce action plan?

10. **Service improvement:** this new vision for stroke care demands services working together in networks, looking across all aspects of the care pathway. Regular local and national audit and increased participation in clinical trials will also drive improvements in stroke care. What are your stroke network's plans for improving stroke care?

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Exercise 4
Either individually or in pairs, thinking about the unit as a whole and looking at the stroke strategy above, describe what you feel you can do, in your role as a health professional, to prevent strokes at the primary and secondary level.

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Summary

- Stroke is a major killer in the UK today, accounting for a large proportion of premature deaths. Stroke mortality has been declining in recent years but socio-economic, gender and ethnic inequalities persist

- Reliable good quality data collection is important for public health use – to identify risk factors and trends

- Stroke is a largely disabling condition and a major societal burden

- Stroke is largely preventable through healthy diet and exercise.

- Awareness of modifiable risk factors is important. Those working in health can play a large part in preventing this disease

- Many clinicians do not address all the factors, only looking at the symptoms presented

- The public health role of the health professional is key to early prevention and treatment

- Evidence for interventions such as rapid treatment following stroke or TIA improves patient outcomes

This unit has provided a brief overview of the public health aspects of stroke in the UK. Every clinician's responsibility is to identify those presenting with high risk factors, particularly life-style ones, and to support people to change their lifestyle behaviour so that their stroke risks are reduced,   By exploring the epidemiology, risk factors and evidence for prevention and treatment measures, students of health can ensure that they understand better their role in public health, specifically from a prevention perspective.

Acknowledgements

Glossary

aneurysm: a permanent abnormal bulging of a blood vessel caused by abnormality of the vessel wall. The bursting of an aneurysm in a brain blood vessel causes a hemorrhagic stroke. Aneurysms are usually present at birth and develop over a number of years, undetected until they break.

angina pectoris: chest pain caused by impairment in blood flow through the coronary arteries that feed the heart.

anticoagulant agents: drugs used in stroke prevention therapy to prevent blood clots from forming or growing. Anticoagulants interfere with certain blood components necessary for clot formation.

anti-platelet agents: (e.g. aspirin) also act on the blood to reduce its ability for form clots.

aphasia: loss of the ability to speak or understand, due to dysfunction of brain centres.

apoplexy: Latin word for stroke, derived from the Greek word plesso. Apoplexy was defined as "a stroke of God's hands."

arrhythmias: changes in the normal rhythm of the heartbeats. Some can be quite serious.

atherosclerosis: a hardening or build-up of cholesterol plaque and other fatty deposits in the arteries.

attributable risk: is the difference in rate of a condition between an exposed population and an unexposed population.

Body Mass Index: a measurement which compares weight and height, defines adults as overweight (pre-obese) when their BMI is between 25 kg/m^2 and 30 kg/m^2, and obese when it is greater than . BMI is calculated as weight in kilograms divided by height in metres^2.

blood cholesterol: Cholesterol that circulates throughout the bloodstream. High levels of blood cholesterol can lead to atherosclerosis and a higher risk of heart disease.

cardiovascular disease(s): Disease affecting the heart or blood vessels.

cardiovascular fitness: also called cardiorespiratory fitness, is the ability of the lungs to provide oxygen to the blood and the heart to transport the oxygenated blood to the cells of the body. It is also the ability of the body to sustain an activity for an extended period of time.

cardiovascular health: a combination of favourable health habits and conditions that protects against development of cardiovascular diseases.

carotid stenosis: narrowing of the carotid arteries caused by a build-up of plaque.

cholesterol is a fatty substance that occurs naturally in the body and which is necessary for hormone production, cell metabolism, and other vital processes.

coronary heart disease: heart disease caused by impaired circulation in one or more coronary arteries; often manifests as chest pain (angina pectoris) or heart attack. Also referred to as coronary artery disease, Ischaemic heart disease, or heart disease.

CT and MRI: Computed Tomography and Magnetic Resonance Imaging are medical imaging techniques used to visualise detailed internal structure of the body. In the head they are used to detect stroke as well as other brain abnormalities.

diabetes (or diabetes mellitus): a metabolic disorder resulting from insufficient production or utilisation of insulin, causing high blood sugar levels and commonly leading to vascular complications.

dysphagia: inability to or difficulty in swallowing.

embolic stroke: a stroke resulting from the blockage of an artery by material (clot, fat, air) that has travelled from another part of the body.

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embolism: a term used to describe the blockage of a blood vessel by a blood clot originating in another area of the body, usually the heart.

epidemiology: the study of the causes and prevention of disease in populations or communities, making it the main source of evidence for public health decision making.

evidence-based medicine: the use of agreed-upon standards of evidence in making clinical decisions for treating individual patients or categories of patients.

F.A.S.T. Campaign: DH public health campaign, launched February 2009, aimed at informing the public about FAST – Face, Arm, Speech, Time to call 999. FAST is a simple test to help people to recognize the signs of stroke and understand the importance of emergency treatment.

haemorrhagic stroke: a stroke caused by a ruptured blood vessel and characterized by bleeding within the brain, or bleeding into the space between the brain and the skull.

heart attack: an acute event in which the heart muscle is damaged because of a lack of blood flow from the coronary arteries, typically accompanied by chest pain and other warning signs, but sometimes occurring with no recognized symptoms (i.e., "silent heart attack").

heart disease: any affliction that impairs the structure or function of the heart (e.g., atherosclerotic and hypertensive diseases, congenital heart disease, rheumatic heart disease, and cardiomyopathies).

heart failure: impairment of the pumping function of the heart as the result of heart disease; heart failure often causes physical disability and increased risk for other cardiovascular disease (CVD) events.

high blood pressure: a condition in which the pressure in the arterial circulation is greater than desired; associated with increased risk for heart disease, stroke, chronic kidney disease, and other conditions; blood pressure is considered "high" if systolic pressure (measured at the peak of contraction of the heart) is greater than or equal to 140 mm Hg, or if diastolic pressure (measured at the fullest relaxation of the heart) is greater than or equal to 90 mm Hg.

hypertensive heart disease: abnormality in the structure and function of the heart caused by long-standing high blood pressure; often manifests as heart failure.

incidence: a measure of the risk of developing some new condition within a specified period of time.

infarct: the process of tissue death (necrosis) caused by blockage of the tissue's blood supply. Infarctions are commonly associated with hypertension or atherosclerosis.

Intervention Study: comparison of an outcome (e.g. morbidity or mortality) between two groups of people deliberately subjected to different dietary or drug regimes.

ischaemia: an interruption or blockage of blood flow to any organ, including heart and brain.

Lipoprotein: Lipoprotein is a molecule that is a combination of lipid (fat) and protein. Lipoproteins are the form in which lipids are transported in the blood. There are two main types: high density and low density. High-density (HDLs), transport cholesterol to the liver for disposal. High HDL levels are associated with low body cholesterol and decreased risk of heart disease. Low-density lipoprotein (LDL) transports cholesterol from the liver to the tissues of the body. High amounts of LDLs may raise cholesterol levels in the body and increase the risk of developing atherosclerosis. LDL cholesterol is therefore considered the "bad" cholesterol.

modifiable characteristics: factors related to cardiovascular disease (CVD) risk that can be changed or controlled (e.g., diet, physical activity, smoking), in contrast to those that are unmodifiable, and unable to be changed or controlled by the individual (e.g., age, sex, race, genetic traits).

mortality: rate of death expressed as the number of deaths occurring in a population of given size within a specified time interval e.g.

obesity: a medical condition in which excess body fat has accumulated to the extent that it may have an adverse effect on health, leading to reduced life expectancy and/or increased health problems. In the UK it is defined by a Body Mass Index (BMI) in excess of 30 kg/m².

primary prevention: is the term used for measures that avoid the development of a disease. Most population-based health promotion activities are primary preventive measures.

population attributable risk (PAR): is the reduction in incidence that would be observed if the population were entirely unexposed, compared with its current (actual) exposure pattern.

population-wide approach: an intervention strategy that targets the population as a whole without regard to the risk levels of various subgroups; distinguished from and complementary to the high-risk approach.

prevalence: the frequency of a particular condition within a defined population at a designated time.

public health: "the science and art of preventing disease, prolonging life and promoting health through the organized efforts and informed choices of society, organizations, public and private, communities and individuals[viii].

relative risk: the ratio of the chance of a disease developing among members of a population exposed to a factor compared with a similar population not exposed to the factor. In many cases the relative risk is modified by the duration or intensity of exposure to the causative factors.

risk behaviour: a behavioural pattern associated with increased frequency of specified health problems; for example, high salt, high fat, low fibre intake, and cigarette smoking are all associated with cardiovascular disease.

risk factor: an individual characteristic associated with increased frequency of specified health problems or risk behaviours; for example, a high low-density lipoprotein (LDL) cholesterol, Low high-density lipoprotein cholesterol; high blood pressure, overweight/obesity and diabetes are all associated with cardiovascular disease.

secondary prevention: are activities aimed at early disease detection, thereby increasing opportunities for interventions to prevent progression of the disease and emergence of symptoms.

stroke: damage to the brain caused by an obstruction or the rupture of a blood vessel.

tertiary cardiovascular disease (CVD) prevention: an intervention approach included in secondary prevention, sometimes distinguished as reducing disability among survivors of CVD events through rehabilitation.

tertiary prevention: reduces the negative impact of an already established disease by restoring function and reducing disease-related complications.

[viii] C.E. A. Winslow, "The Untilled Fields of Public Health," Science, 51 (1920), p. 23

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thrombophilia or **hypercoagulability:**   is the propensity to develop thrombosis (blood clots) due to an abnormality in the system of coagulation.S

thrombosis: is the formation of a blood clot (thrombus) inside a blood vessel, obstructing the flow of blood through the circulatory system.

Transient Ischemic Attack: called TIA, this is a temporary interruption of the blood supply to an area of the brain. During a TIA, a person experiences a sudden onset of stroke symptoms. By definition, a TIA can last up to 24 hours, but most last only a few minutes and cause no permanent damage or disability. Sometimes called "mini-strokes". TIAs must be taken seriously because they are usually a precursor to full strokes.

Further sources of information on strokes and health

The Stroke Association	http://www.stroke.org.uk

The Stroke Association is the only UK wide charity solely concerned with combating stroke in people of all ages. It funds research into prevention, treatment and better methods of rehabilitation, and helps stroke patients and their families directly through its Life After Stroke Services. These include Information, Advice and Support, Communication Support and Life After Stroke grants. They campaign, educate and inform to increase knowledge of stroke at all levels of society, and act as a voice for everyone affected by stroke.

The Stroke Association produces a number of publications including patient leaflets, Stroke News (a quarterly magazine) and information for health professionals.

The British Heart Foundation website Heartstats	Useful website providing up to date statistical information on heart disease, including stroke, in the UK. Contains Stroke Statistics 2009. http://www.heartstats.org

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