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Executive summary

Introduction

Stroke is one of the most common causes of death and complex disability in the UK. By the age of 75, one in five women and one in six men will have a stroke, and over a third of stoke survivors in the UK are dependent on others[1]. One in four people die within the first year of a stroke and one in eight within the first 30 days[2].

The term 'stroke' refers to a sudden change to the blood supply to the brain, depriving it of oxygen and potentially leading to brain damage or death. Blood supply to the brain can be affected by either a haemorrhage, when a blood vessel to the brain bursts, or blockage in one of the arteries in the brain. Approximately 85% of strokes are due to a blockage in one of the arteries (ischaemic stroke). Disabilities caused by a stroke depend on the site of the affected blood vessel - most commonly, there will be weakness on one side of the body, communication problems or vision problems.

Transient ischemic attacks (TIA) are a type of ischaemic stroke where the effects last for a maximum of 24 hours and then completely resolve. A TIA is a warning sign for an impending stroke, and 8% of people who have a TIA will go on to have a stroke in the next seven days[3].

Most strokes are due to common risk factors such as high blood pressure, irregular heart beat (atrial fibrillation), smoking and high cholesterol, but there are rarer causes too. Stroke disease costs the UK on average £7 billion a year in direct care, informal care, lost productivity and disability costs.

[1] Stroke Association - State of the Nation (2016)
[2] Ibid
[3] Ibid

Investment in organised stroke services improves patient outcomes and saves overall costs for health and social care.

Modern care involves direct access to an acute stroke unit. This should provide immediate brain imaging and evidence-based interventions such as thrombolysis[4], thrombecotomy[5], the lowering of blood pressure and the use of intermittent compression stockings, as well as neuroscience services to manage patients with subarachnoid[6] and intracerebral haemorrhage[7].

For optimal recovery this acute treatment needs to be followed on discharge by specialist stroke rehabilitation in a community setting. The aim of stroke rehabilitation is to maximise activity and quality of life following a stroke. Fewer people die after a stroke than in previous decades, but more people live with a disability. Recovery can take many years – some people never regain all of their brain function and have continued problems with speech, mobility or continence, but others make a full recovery over time. Whatever the level of disability, it is not easy to adjust to life after stroke for both the survivor and their family.

Unmet need and gaps

- There is some variance across the county in the detection and management in primary care of those with undiagnosed risk factors such as high blood pressure and AF to reduce the burden of stroke.
- There is no specialist stroke community rehabilitation service in Mid-Nottinghamshire for those who have been discharged from the Early Supported Discharge (ESD) service. This gap is likely to affect patients' quality of life following a stroke and can make a difference to their eventual outcome. It may also exacerbate health inequalities and lead to extra long-term costs across the health and social care system in the area.
- Six monthly (and annual thereafter) reviews after discharge from hospital following a stroke have not been routinely carried out in Nottinghamshire County, despite recommendations in the National Stroke Strategy[8] and NICE guidelines[9] to the contrary. However, they have recently been commissioned in the south of the county for all stroke survivors. A structured health and social care review at six months and annually thereafter allows patients and their carers to discuss the issues that continue to concern them and formulate plans of action. This lack of provision may lead to increased pressure on primary care for treatment of preventable symptoms and also further risk of re-admission into hospital for stroke-related problems due to a lack of secondary prevention.
- It is reported that there is insufficient provision of services for carers, family members and partners of stroke survivors locally. By the very nature of stroke, they become carers very suddenly and may have difficulty accessing the help and information that they need in a timely way. It is also reported that there is a lack of appropriate services to support those of working age back into the workplace.
- Psychological problems such as depression and anxiety are very common after stroke and can be as debilitating as a physical disability. It is therefore essential that these are identified quickly. However, there are only a small number of patients locally who are able to access

[4] Treatment with a clot-busting drug to try to disperse the clot and return the blood supply to the brain. The medicine itself is called alteplase, or recombinant tissue plasminogen activator (rt-PA).
[5] The mechanical removal of a thrombus (solid mass stationary blood clot) to help restore blood flow and prevent or limit the damage caused by the stroke.
[6] A subarachnoid haemorrhage is an uncommon type of stroke caused by bleeding on the surface of the brain.
[7] Intracerebral haemorrhage occurs when a diseased blood vessel within the brain bursts, allowing blood to leak inside the brain.
[8] Department of Health - National Stroke Strategy (2007)
[9] NICE CG 162 (2013) - Stroke Rehabilitation in Adults

appropriate input from a qualified clinical psychologist. Other options for providing psychological support can also be considered, such as through specialist mental health nurses.

Recommendations for consideration by commissioners

Strategic

- Clinical commissioning group (CCG) and social care commissioners should plan appropriately for the forecast that:
    - there will be a rise in the actual number of people having strokes in the future (due to an increasing and ageing population).
    - there will be more stroke survivors living with disability in the community who need access to support (due to reducing mortality from stroke because of advancements in treatment and rehabilitation).
- CCGs should undertake a health equity audit in relation to access to services; variation across the county of stroke mortality rates; feedback from local stroke survivors; outcomes; and the implications of variable performance around discharge of patients with a joint health and social care plan.

Prevention

- CCG commissioners should continue to support GP practices to prevent stroke by increasing the detection, diagnosis and effective treatment of high blood pressure, atrial fibrillation and diabetes.
- Public Health commissioners should continue to support GP practices to prevent stroke by increasing patient uptake of the NHS Health Check programme, especially within high risk groups.

Acute

- Providers should aim to continue improving performance in ensuring that all people with suspected stroke are admitted directly to a specialist acute stroke unit following initial assessment - acute stroke units should provide equity of care across the region. Providers should also ensure that ESD services are effective in enabling eligible patients to be discharged sooner, so that stroke unit beds are used more efficiently.
- Providers should ensure that there is sufficient weekend nurse and therapy cover on stroke wards.
- Providers should address variability across the county in terms of both access to intra-arterial (thrombectomy) treatment and the use of intermittent pneumatic compression devices. (The local Clinical Advisory Group is currently looking at how to address the thrombectomy service.)
- CCG commissioners and providers should ensure that there is access to sufficient psychological support for stroke survivors, including qualified clinical psychologists or specialist mental health nurse support where required.

Rehabilitation

- CCG commissioners should ensure that community rehabilitation services (multi-disciplinary teams with stroke specialist skills and experience) are available for all Nottinghamshire

stroke survivors who require rehabilitation in their place of residence after discharge and beyond ESD services.

- CCG commissioners should commission structured assessments at six months following discharge from hospital for all stroke survivors and annually thereafter.
- CCG and social care commissioners should ensure that there is sufficient accessible provision of services for carers, family members and partners of stroke survivors, including respite care.
- CCG and social care commissioners should ensure that appropriate services are in place to support stroke survivors of working age to return to the workplace

Full JSNA report

What do we know?

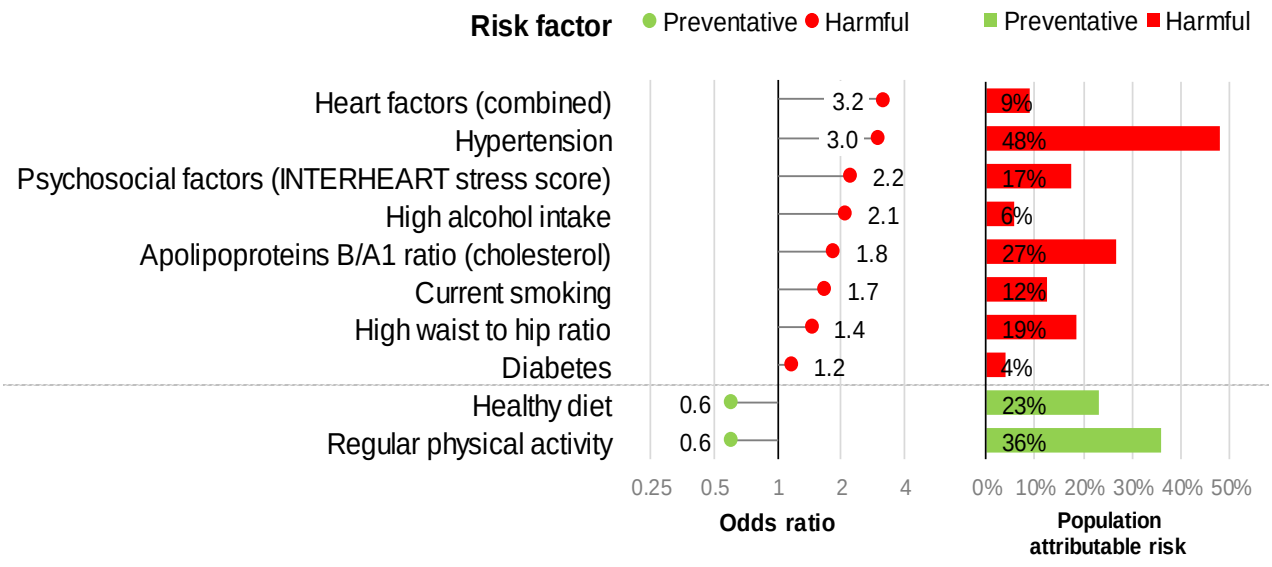
1) Who is at risk and why?

Stroke, like a heart attack, is a vascular disease. Stroke occurs when blood flow to part of the brain is interrupted, causing damage to the brain tissue. The two main causes of stroke are blood clots blocking arteries (*Ischaemic*, 85% of all strokes) and arteries bursting (*Haemorrhagic*, 15%). Stokes where the symptoms resolve within 24 hours are known as transient ischaemic attacks (TIAs).

Stroke is the fourth single largest cause of death in the UK and one of the largest causes of disability – half of all stroke survivors have a disability[10]. Emotional and behavioural disorders such as depression and anxiety can also occur following stroke, which can affect participation in rehabilitation and lead to decreased functional recovery. At least one quarter of all strokes are recurrences and people who have already suffered a stroke or transient ischaemic attack (TIA) have a five year risk of a further vascular event as high as 22.4%[11], even with modern multiple risk factor treatments.

The risk of stroke is increased by a range of factors, which may be modifiable or fixed. Fixed risk factors include age, ethnicity, gender, deprivation and family history. The main modifiable risk factors have been quantified within the 2016 INTERSTROKE case-control study[12] as follows:

Figure 1 Modifiable risk factors for stroke[13,14]



[10] Stroke Association - State of the Nation (2016)
[11] Royal College of Physicians Intercollegiate Stroke Working Party - National Clinical Guideline for Stroke (2016)
[12] http://www.thelancet.com/journals/lancet/article/PIIS0140-6736(16)30506-2/abstract
[13] Odds ratios compare the odds of the outcome in an exposed group with the odds of the same outcome in an unexposed group. Odds tell us how likely it is that an event will occur compared to the likelihood that the event will not happen. Odds of 1:3 that an event occurs, e.g. that a horse wins in a race, means the horse will win once and lose three times (over four races).
[14] Population attributable risks are an estimate of the overall disease burden that could be reduced if an individual risk factor were eliminated. It considers the risk but also the prevalence in the general population for that factor.

2) Size of the issue locally

There were 16,179 people diagnosed with stroke or TIA in Nottinghamshire in 2015/16, equating to a prevalence of 2.02% of the registered population (Table 2). This represents an increase of 1,003 people (or 0.09 percentage points in prevalence) from 2012/13 when CCG-level data collection began. While all districts have a prevalence above the national average (1.70%), it is highest in Nottingham West CCG (2.14%) and lowest in Mansfield & Ashfield CCG (1.93%).

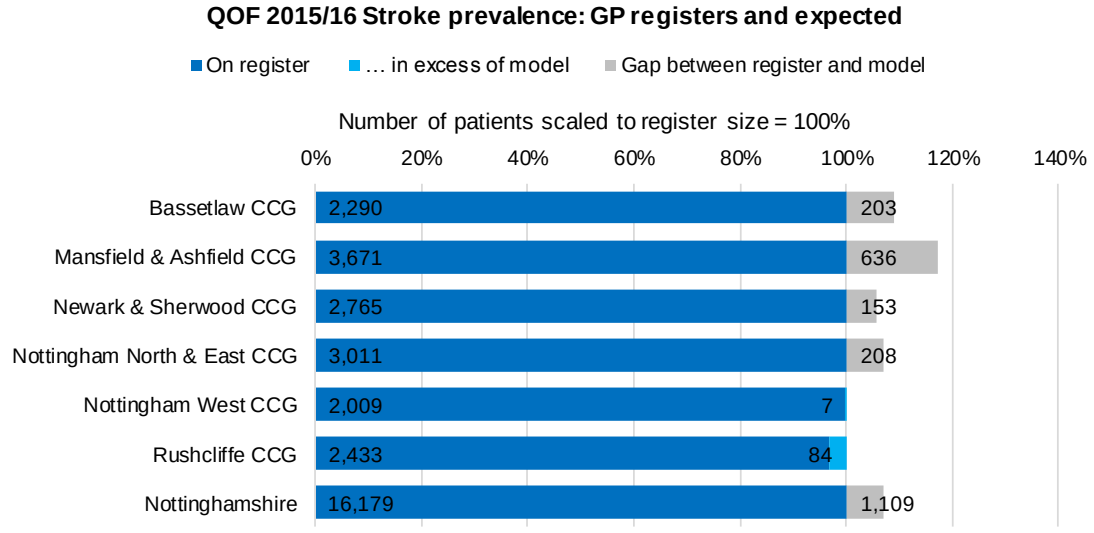
The observed prevalence for stroke and TIA is 93.6% of the estimated prevalence, with 1,109 less cases in the county than would be expected (Figure 3). This indicates that risk factors are generally being well-managed in the community, but inaccurate or lack of recording may also be a factor. Another possible explanation for a difference between the expected and observed prevalence include practices that care for many people in nursing homes, who may have a much higher than expected prevalence for stroke (e.g. in Rushcliffe).

Table 2 Recorded disease prevalence – stroke & TIA (2012/13 to 2015/16)

	2012/13		2015/16		2012/13-2015/16	2015/16
Area	**Number on GP registers**	**Prevalence**	**Number on GP registers**	**Prevalence**	**Change in prevalence (% points)**	**GP registers as % of expected numbers***
Bassetlaw CCG	2,166	1.9%	2,290	2.1%	0.17	92%
Mansfield & Ashfield CCG	3,401	1.8%	3,671	1.9%	0.13	85%
Newark & Sherwood CCG	2,439	1.9%	2,765	2.1%	0.20	95%
Nottingham North & East CCG	2,885	2.0%	3,011	2.0%	0.0	94%
Nottingham West CCG	1,906	2.0%	2,009	2.1%	0.14	100%
Rushcliffe CCG	2,379	2.0%	2,433	2.0%	-0.05	104%
Nottinghamshire	15,176	1.9%	16,179	2.0%	0.09	94%
NHS Midlands & East		1.7%		1.8%	0.10	
England		1.7%		1.7%	0.0	

Source: QOF data – www.content.digital.nhs.uk/QOF * i.e. observed vs. expected; source: QOF 2015/16, local disease model upscaling Project 12

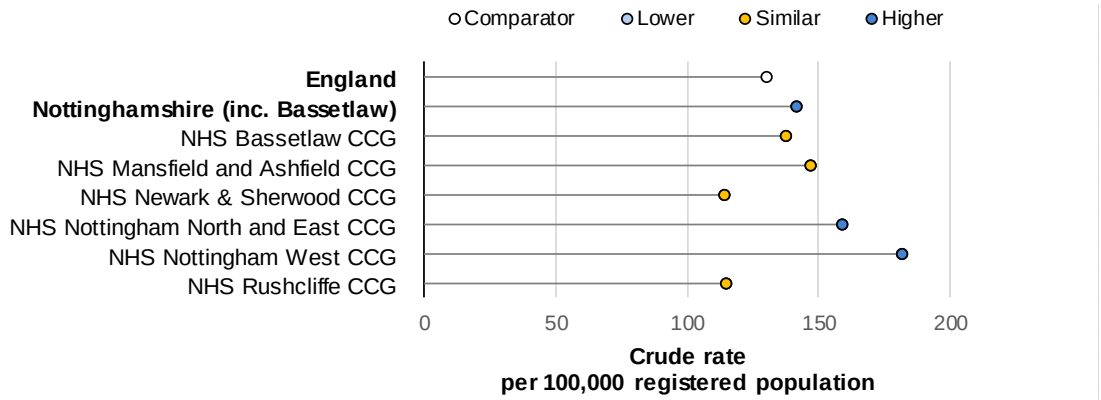
Figure 3



Source: NHS Digital QOF 2015/16, APHO/PHE disease model 2011 (scaled to 2015/16 population)

In terms of new stroke cases (or incidence), 1,143 people registered with Nottinghamshire GPs were admitted to an acute stroke unit in 2015/16. This equates to a rate of 141.8 per 100,000, compared to the England rate of 130.6 per 100,000[15] (see Figure 4). Incidence of stroke in Nottingham North & East and Nottingham West CCGs appears to have risen in the last three years and now stands significantly higher than the national figure, whereas incidence in Mansfield & Ashfield CCG has declined and is similar to the England rate.

Figure 4 Number of people registered with a Nottinghamshire GP admitted to an acute stroke unit (Crude rate compared to England – 95% confidence)



Source: NHS Digital

Fixed risk factors

The demographics of the county are detailed elsewhere in the Joint Strategic Needs Assessment (JSNA)[16], but the key elements of note within the main fixed risk factors for stroke locally are as follows:

Age - the single most important risk factor for stroke. While a stroke can occur at any age, 75% of those affected are over the age of 65[17] and the risk of having a stroke doubles every decade after the age of 55[18]. 19.4% of Nottinghamshire's population is aged 65 or above, compared with 17.3% in England. The population is predicted to continue to age and over the next fifteen years the number 65-84 year olds will increase by over 30% and 85+ year olds by over 90%.

This rise in the number of elderly people across the county will result in an increase in the number of people having strokes and those living with a longstanding health condition caused by stroke. In addition, older people are anticipated to live alone more (an estimated increase of over 40% between 2015 and 2030 in Nottinghamshire) which will have implications for service delivery, especially for those in the more rural areas of Nottinghamshire.

[15] Working based NHS Digital 'Patients registered at GP practices' for April 2016 (http://www.content.digital.nhs.uk/gppatientsregistered)
[16] http://jsna.nottinghamcity.gov.uk/insight/Strategic-Framework/Nottinghamshire-JSNA/Summaries-and-overviews/The-people-of-Nottinghamshire.aspx
[17] Department of Health - National Stroke Strategy (2007)
[18] Stroke Association - State of the Nation (2016)

Ethnicity - people of African or African-Caribbean origin are twice as likely to have a stroke and at a younger age than white people, partly due to a higher prevalence of high blood pressure, diabetes and sickle cell disease. In addition, people of South Asian origin tend to have strokes at a significantly younger age than white people[19]. The proportion of Nottinghamshire's population who belong to black and minority ethnic groups is relatively low in Nottinghamshire (4.5% in the 2011 census) compared to other areas in the East Midlands. They are predominantly resident in Broxtowe, Gedling and Rushcliffe Boroughs.

Gender - men are at a 25% higher risk of having a stroke and at a younger age than women. However, due to the higher proportion of older women in the population, there are more total incidences of stroke in women. In the United Kingdom between 2007 and 2015, there were on average 69,831 strokes per year in men and 82,314 in women[20]. While Nottinghamshire's population is evenly split (49.3% male and 50.7% female), in older age groups females far outnumber males, reflecting the higher life expectancy of females.

Deprivation - people from the most economically deprived areas of the UK are around twice as likely to have a stroke as those from the least deprived areas and are three times more likely to die from a stroke[21]. Levels of affluence and deprivation in the county are extremely varied. There are 31 Lower Super Output Areas (LSOAs) in the 10% most deprived LSOAs in England, concentrated in the districts of Mansfield (12 LSOAs), Ashfield (10), Bassetlaw (6) and Newark & Sherwood (3). The variation in deprivation is directly reflected in stroke mortality rates in people aged under 75 and, less so, in those over 75.

Modifiable risk factors

Atrial fibrillation (AF) - AF is a cardiac rhythm disorder that increases the risk of a clot developing in the heart, which may then be pumped into the general blood circulation and block arteries. People with AF have a five-fold greater risk of stroke and thromboembolism[22] than those without. Nearly 1.2 million people in the UK have been diagnosed with AF and it is estimated that there are hundreds of thousands more who are undiagnosed[23]. AF-related stroke is often more severe than in people without AF, including longer stays in hospital, greater disability and higher rates of recurrence and mortality[24]. The risk of AF-related stroke is greatly reduced with appropriate anticoagulation treatment.

In order to protect AF patients against AF-related stroke, it is important that AF is detected and diagnosed in a timely manner, and that AF patients are appropriately anticoagulated. Prevalence of AF increases with age and men are more commonly affected than women at a ratio of almost two to one[25]. A tool called GRASP-AF is used in parts of the county, which assists GP practices to interrogate their clinical data enabling them to improve the management and care of patients with AF and to reduce their risk of stroke through

[19] Ibid
[20] Ibid
[21] Ibid
[22] Stroke Association - State of the Nation (2016)
[23] British Heart Foundation UK Factsheet - CVD Statistics (2016)
[24] AF Association - In Pursuit of Excellence in the Prevention of AF-Related Stroke (2016)
[25] AF Association – In Pursuit of Excellence in the Prevention of AF-Related Stroke (2016)

appropriate intervention with anticoagulation. The tool also assists with case finding activity, helping practices to establish more accurate prevalence rates within the practice population.

In 2015/16, the diagnosed prevalence of AF in Nottinghamshire ranged from 1.7% in Mansfield & Ashfield to 2.3% in Bassetlaw, compared to an England average of 1.7% (Table 5). Each district has prevalence close to other CCGs with similar populations, although Bassetlaw is slightly higher (0.5 percentage points above its comparator CCGs). Diagnosed prevalence has risen in each area in line with the national increase. The modelled expected prevalence of AF is higher in each CCG than the diagnosed prevalence, suggesting that there may be an estimated additional 5,999 people with undiagnosed AF across the county (Figure 6).

Among the people with AF who are at highest risk of stroke (CHA2DS2-VASc score of 2 or more), across the county between 85.3% and 97.4% of those who can be treated are being treated with anti-coagulation drugs, which is in line with or above the national average and an increase on previous years. However, there are still a proportion of patients in each district who remain inappropriately treated (highest in Nottingham West CCG, lowest in Rushcliffe CCG), leaving them unprotected against the risk of AF-related stroke.

There is also considerable variance across Nottinghamshire CCGs in the percentage of AF patients admitted to hospital with a stroke who were on an anticoagulant, ranging from only 20.0% in Nottingham North & East CCG to 69.2% in Bassetlaw CCG (England average 44.4%), which indicates that there are still many opportunities to prevent strokes through diagnosis of AF and prescription of an anticoagulant.

Table 5 Atrial fibrillation prevalence (2015/16)

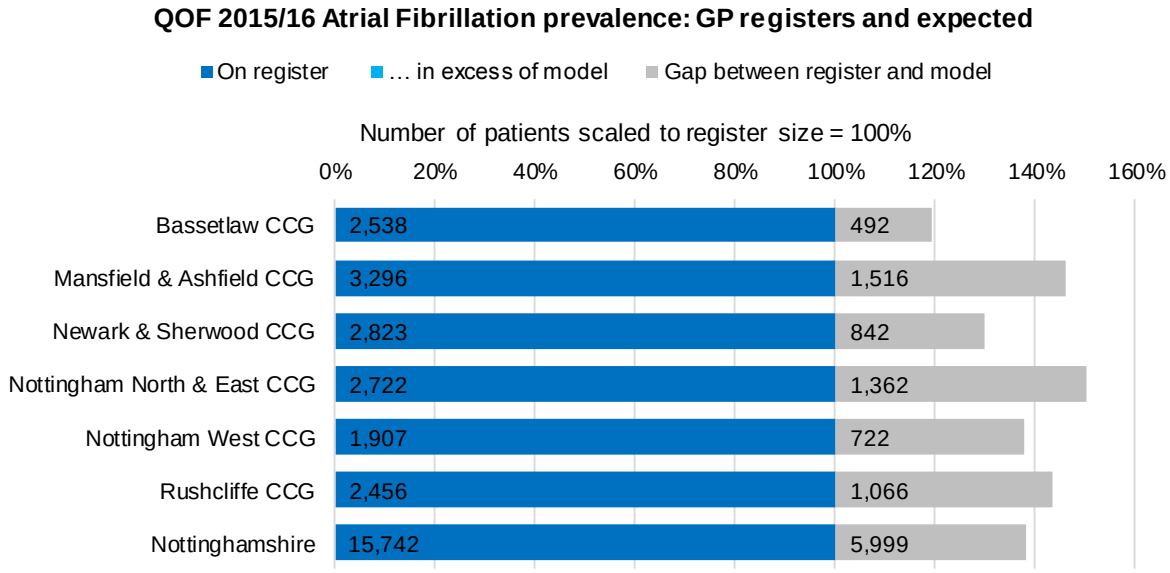
Area	Diagnosed AF Prevalence 2015/16	Expected AF prevalence[26]	Potential no. of additional people with undiagnosed AF	In AF patients with a CHA2DS2-VASc score of 2+, % currently treated with anti-coagulation[27] 2015/16	Stroke admissions with history of AF prescribed anticoagulation prior to stroke 2014/15
Bassetlaw CCG	2.3%	2.7%	492	89.2%	69.2%
Mansfield & Ashfield CCG	1.7%	2.5%	1,516	90.0%	46.2%
Newark & Sherwood CCG	2.1%	2.8%	842	90.6%	48.5%
Nottingham North & East CCG	1.8%	2.7%	1,362	88.0%	20.0%
Nottingham West CCG	2.0%	2.8%	722	85.3%	31.0%
Rushcliffe CCG	2.0%	2.8%	1,066	97.4%	40.9%
England	1.7%	2.4%	-	86.7%	44.4%

Sources: National Cardiovascular Intelligence Network – CVD Disease Profiles (http://www.yhpho.org.uk/ncvincvd/default.aspx); QOF data – www.content.digital.nhs.uk/QOF

[26] The expected prevalence of AF is taken from the national cardiovascular Intelligence Network estimates published in 2015 for people of all ages, based on age-sex specific prevalence estimates for a general population in Sweden and then applied to GP practice populations in England. Estimates for each CCG are constructed by aggregating the GP practices within those CCGs.

[27] Some people have a reason not to be treated with anticoagulants – they have been removed from this dataset.

Figure 6



Source: NHS Digital QOF 2015/16, APHO/PHE disease model 2011 (scaled to 2015/16 population)

Hypertension - hypertension is abnormally and chronically raised blood pressure. The prevalence of this increases with age – nearly 30% of adults in the UK have high blood pressure and up to half are not receiving treatment[28]. High blood pressure is a contributing factor in 54% of strokes in the UK and the number of people registered as hypertensive has been on the increase consistently since 2005[29].

Blood pressure measurements indicate the pressure which the circulating blood puts on the walls of blood vessels. It is measured in millimetres of mercury (mmHg) and is usually written as systolic blood pressure/diastolic blood pressure. Blood pressure of 140/90 mmHg or greater usually indicates hypertension because persistent levels of blood pressure above this start to be associated with increased risks of cardiovascular events such as stroke. In 2015/16, between 90% and 93% of Nottinghamshire patients aged 45 or over had a blood pressure measurement recorded in the preceding five years, in line with the England average (Table 7).

Table 7 Percentage of patients aged 45 or over who have a record of blood pressure in the preceding five years (2015/16)

Area	Percentage of patients (net of exceptions)
Bassetlaw CCG	92.0%
Mansfield & Ashfield CCG	92.5%
Newark & Sherwood CCG	91.1%
Nottingham North & East CCG	90.4%
Nottingham West CCG	91.8%
Rushcliffe CCG	91.6%
England	91.1%

Source: QOF data – www.content.digital.nhs.uk/QOF

[28] Ibid
[29] Stroke Association - State of the Nation (2016)

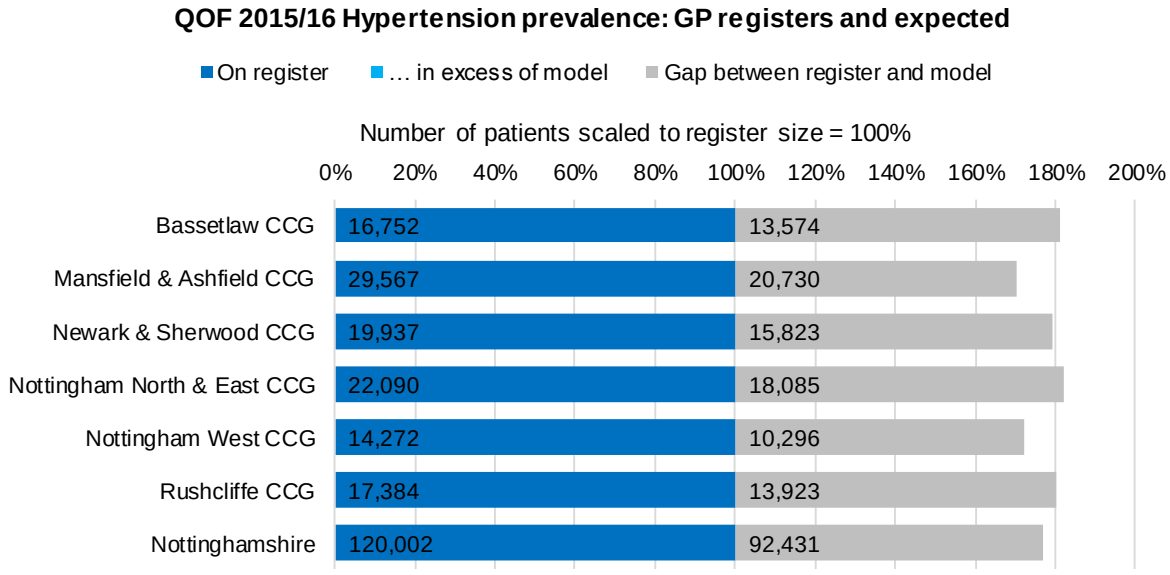
Diagnosed prevalence of hypertension in 2015/16 ranged from 14.0% in Rushcliffe CCG to 15.5% in Mansfield & Ashfield CCG, slightly above the national average of 13.8% (Table 8). This equates to 120,002 people across Nottinghamshire. Of the 120,002 people diagnosed with hypertension in 2015/16, 18,502 (or 15.4%) were not being optimally managed. However, effective treatment was above the national average in each CCG. Levels have remained relatively stable in recent years, but the locally observed prevalence is consistently lower across each CCG than the expected prevalence, indicating that 92,431 people in Nottinghamshire could have hypertension that has not been diagnosed (Figure 9).

Table 8 Prevalence of hypertension (2015/16)

Area	Observed prevalence 2015/16	Expected prevalence 2015/16	% patients with hypertension in whom last blood pressure reading (measured in the preceding 12 months) is 150/90 mmHg or less 2015/16
Bassetlaw CCG	15.1%	27.4%	83.5%
Mansfield & Ashfield CCG	15.5%	26.4%	83.8%
Newark & Sherwood CCG	15.1%	27.1%	85.2%
Nottingham North & East CCG	14.7%	26.7%	84.4%
Nottingham West CCG	15.2%	26.1%	84.7%
Rushcliffe CCG	14.0%	25.1%	86.4%
England	13.8%	24.7%	82.9%

Sources: National Cardiovascular Intelligence Network – CVD Disease Profiles (http://www.yhpho.org.uk/ncvincvd/default.aspx); QOF data – www.content.digital.nhs.uk/QOF

Figure 9



Source: NHS Digital QOF 2015/16, Doncaster disease model 2000 (scaled to 2015/16 population)

Cholesterol - cholesterol contributes to the development of atherosclerosis (the build-up of fatty material inside arteries), which increases the risk of stroke. This can be effectively treated by statins, a group of medicines that can help lower the level of low-density lipoprotein (LDL) cholesterol in the blood. LDL cholesterol is often referred to as "bad cholesterol", and statins reduce the production of it inside the liver.

The use of statins in individuals with a high risk of cardiovascular events reduces the risk of stroke by 25%[30]. In 2015/16, in those patients with a new diagnosis of hypertension aged between 30 and 75 (excluding those with pre-existing heart disease, diabetes, stroke and/or TIA), who had a recorded cardiovascular risk assessment score of greater than 20% in the preceding 12 months (i.e. high risk), the percentage of eligible patients who were currently treated with statins stood at 97.6% in Nottinghamshire[31], slightly above the national average of 96.8%.

Diabetes – diabetes (Type 1 and Type 2) almost doubles the risk of stroke and is a contributing factor to 20% of strokes in the UK[32]. Persistently elevated glucose levels contribute to the build-up of plaque in blood vessels, made up of cholesterol, protein and cellular waste, which impairs blood flow and can lead to stroke.

Diagnosed prevalence of diabetes is based on the number of patients aged 17 years or over who are on GP practice diabetes registers on 31 March in any given financial year. No distinction is made between Type 1 or Type 2 diabetes. Prevalence in 2015/16 ranged from 5.5% in Rushcliffe CCG to 7.9% in Bassetlaw CCG, compared to a national average of 6.6% (Table 10). This equates to 44,373 people across Nottinghamshire, which represents an increase from 38,865 people in 2012/13.

Table 10 Prevalence of diabetes (2015/16)

Area	Diagnosed prevalence 2015/16	Diagnosed prevalence 2012/13	Estimated number undiagnosed 2015/16	Additional risk of stroke* (compared to non-diabetic population) 2010/11-2012/13
Bassetlaw CCG	7.9%	6.8%	819	70.7%
Mansfield & Ashfield CCG	7.1%	6.4%	2,398	106.1%
Newark & Sherwood CCG	6.9%	6.0%	1,855	62.0%
Nottingham North & East CCG	6.6%	6.1%	2,339	88.2%
Nottingham West CCG	6.6%	6.0%	1,309	118.0%
Rushcliffe CCG	5.5%	5.0%	2,318	37.7%
England	6.6%	6.0%	n/a	81.3%

Sources: National Cardiovascular Intelligence Network – CVD Disease Profiles (http://www.yhpho.org.uk/ncvincvd/default.aspx); QOF data – www.content.digital.nhs.uk/QOF; PHE diabetes prevalence model: https://www.gov.uk/government/publications/diabetes-prevalence-estimates-for-local-populations (adapted to match QOF age range); * Number of people in the 2009/10 National Diabetes Audit who experienced the complication at least once during 1 April 2010 to 31 March 2013 (i.e. a three year follow up).

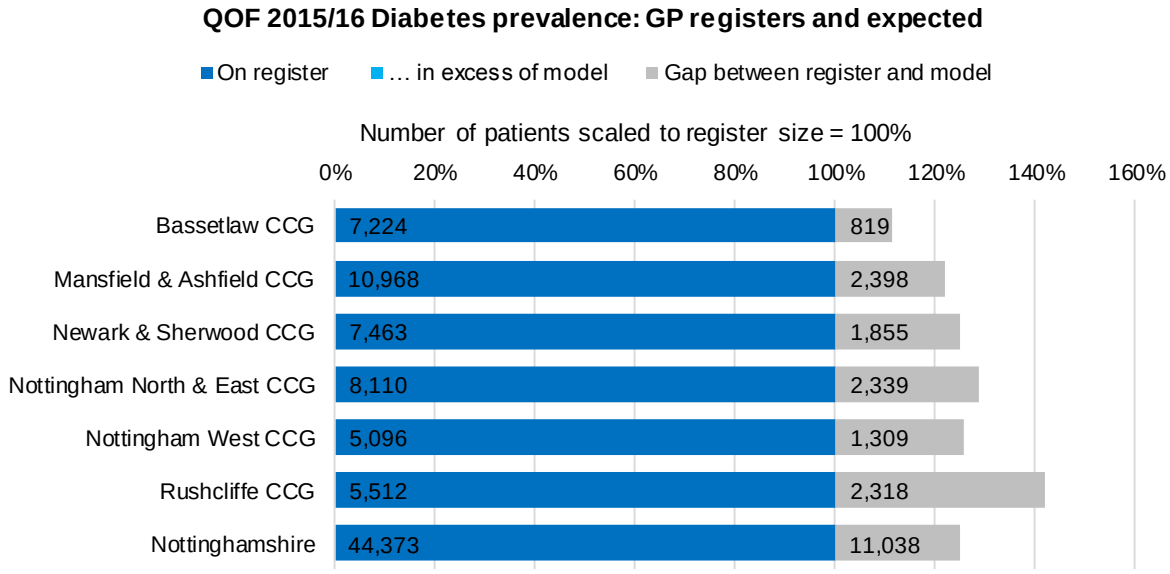
Work from Public Health England, based on analysis of three years of the Health Survey for England, provides CCG estimates of undiagnosed diabetes based on age, gender, ethnicity and deprivation. These estimates suggest there are 11,038 people with undiagnosed diabetes in the county (Table 10 and Figure 11).

The additional risk of stroke for people with diabetes compared to those without diabetes in the same CCG over a three year period is also presented in Table 10. The figures have been adjusted to allow for the local variations in the age and sex of the population. In Nottinghamshire, the additional risk of stroke among people with diabetes is above the national average (81.3%) in Nottingham West (118.0%), Mansfield & Ashfield (106.1%) and Nottingham North & East (88.2%) CCGs. In addition, the percentage of patients on the

[30] Stroke Association - State of the Nation (2016)
[31] QOF data (CVDPP001) – www.content.digital.nhs.uk/QOF
[32] Ibid

diabetes register whose last measured total cholesterol (measured within the preceding 12 months) is 5mmol/l or less stood at 82.0% in 2015/16[33], slightly above the national average of 80.2%.

Figure 11



Source: NHS Digital QOF 2015/16, APHO/PHE disease model 2011 (scaled to 2015/16 population)

Full details of the local picture relating to the remaining modifiable risks listed below are covered elsewhere in the Nottinghamshire JSNA[34].

Alcohol - people who regularly consume a large amount of alcohol have a greater chance of suffering a stroke. A recent study has shown that alcohol increases the risk of stroke in late middle age to early old age more than other traditional risk factors – those who drink more than two alcoholic drinks a day had a 34% increased risk of stroke[35].

Smoking - smoking can increase stroke risk by a factor of six if the smoker has more than 20 cigarettes a day[36]. In 2015, 17% of adults in Great Britain smoked, down from a peak of 46% in 1974[37]. A 2012 study of stroke in younger people discovered that half (52%) of those having strokes under the age of 45 were active smokers (66% current or previous smokers)[38].

Psychosocial factors - stroke has been associated with stress and depression. In contrast, protective psychological factors such as optimism and positive coping style have been linked with a reduced incidence of stroke. However, further studies are necessary to understand the mechanism by which psychological factors influence the risk of stroke.

Other risk factors include obesity, low levels of physical activity and a poor diet, as they all contribute to the development of high blood pressure and atherosclerosis (the build-up of fatty material inside arteries).

[33] QOF data (DM004) – www.content.digital.nhs.uk/QOF
[34] Ibid
[35] Kadlecová et al - Alcohol Consumption at Midlife and Risk of Stroke During 43 Years of Follow-Up (2016)
[36] Stroke Association - Smoking and the Risk of Stroke (2012)
[37] Health & Social Care Information Centre – Statistics on Smoking (2016)
[38] Stroke Association - State of the Nation (2016)

3) Targets and performance

Mortality

Stroke is the fourth single leading cause of mortality in the UK. One in eight strokes are fatal within the first 30 days and one in four within the first year. Stroke mortality rates in the UK have decreased by 46% between 1990 and 2010[39]. High mortality rates following stroke, however, do not necessarily reflect poor quality or unsafe care, but may reflect warranted variation.

Stroke premature mortality rates (i.e. aged under 75) in Nottinghamshire range from 6.9 per 100,000 in Rushcliffe CCG to 18.2 per 100,000 in Newark & Sherwood CCG; later stroke mortality (over 75's) rates range from 552.2 per 100,000 in Bassetlaw CCG to 638.7 per 100,000 in Mansfield & Ashfield CCG (Table 12). Mortality rates have reduced in all districts between 2007-09 and 2012-14 for those aged over 75, but have increased in Bassetlaw and Newark & Sherwood within the under 75 cohort. It is not clear why this is the case and further detailed work needs to be undertaken to understand variation in stroke mortality rates.

Premature mortality rates from stroke generally correlate with deprivation, although this is better measured at a lower level than CCG (for example, Lower Super Output Areas). In the under 75 age group in 2012-14, rates were highest in Bassetlaw, Mansfield & Ashfield and Newark & Sherwood (all above the national average); in the over 75's, Nottingham North & East also had a high level, whereas Bassetlaw was lower.

Table 12 Mortality rates from stroke in Nottinghamshire CCGs (2007-2009 to 2012-2014)

	2007-2009	2012-2014	2007-2009	2012-2014
Area	**Stroke mortality rate per 100,000 (aged under 75)**		**Stroke mortality rate per 100,000 (aged 75 and over)**	
Bassetlaw CCG	11.0	16.3	871.3	552.2
Mansfield & Ashfield CCG	16.9	15.3	721.9	638.7
Newark & Sherwood CCG	14.3	18.2	877.3	611.1
Nottingham North & East CCG	12.0	11.3	860.5	636.3
Nottingham West CCG	11.5	11.6	918.9	579.1
Rushcliffe CCG	11.5	6.9	819.9	570.3
England	16.8	13.8	819.7	616.4

Source: PHE Cardiovascular Disease Profiles (https://fingertips.phe.org.uk/profile/cardiovascular/)

The Public Health England 'premature mortality' tool, Longer Lives, ranks each local authority in the country against a range of health conditions, including premature death from stroke (Table 13). Based on the rate of stroke deaths in the under-75 cohort between 2013 and 2015, Nottinghamshire ranks 52nd out of 149 upper tier local authorities (1st is best) with a rate of 13.0 per 100,000, which is better than the average. However, there is wide variation in the rankings, from Broxtowe (at 66th out of 284; 11.3 per 100,000) to Mansfield (224th out of 284; 16.4 per 100,000).

[39] Stroke Association - State of the Nation (2016)

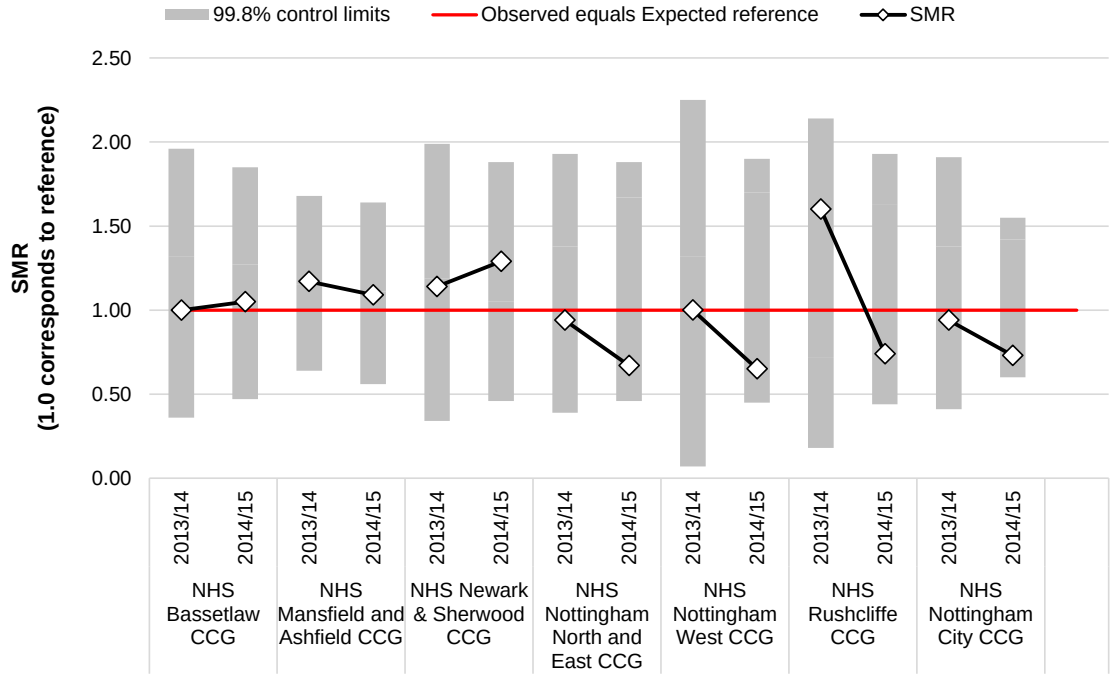
Table 13 Premature (under 75 years) mortality due to stroke (per 100,000) (2013-15)

Area	Rate per 100,000	Ranking (out of 284)	Compared with average
Ashfield	12.5	119th	Better
Bassetlaw	12.6	122nd	Better
Broxtowe	11.3	66th	Better
Gedling	14.3	174th	Worse
Mansfield	16.4	224th	Worse
Newark & Sherwood	14.5	181st	Worse
Rushcliffe	No data	No data	No data
Nottinghamshire	13.0	52nd (out of 149)	Better

Source: Public Health England: Longer Lives (http://healthierlives.phe.org.uk/topic/mortality/comparisons#are//par/E92000001/ati/101/pat/101)

The Sentinel Stroke National Audit Programme (SSNAP)[40] provides information on the 30-day standardised mortality ratio (SMR) after stroke (Figure 14). Rates are adjusted for patients' age, stroke type, presence of atrial fibrillation before stroke and stroke severity. The SMR is the ratio between the observed number of deaths and the number of deaths that would be expected, based on the age- and sex-specific rates in a standard population and the age and sex distribution of the local population. The data indicates that, in Nottinghamshire, there were 129 deaths observed in the 30 days following admission to hospital for a stroke in 2014/15, compared to an expected 138. All of the Nottinghamshire CCGs had an SMR well within the control limit, so there are no significant outliers within the county.

Figure 14 Mortality within 30 days of hospital admission for stroke (2013/14 to 2014/15)



Source: Sentinel Stroke National Audit Programme (www.strokeaudit.org/results.aspx); SMR = Standardised Mortality Ratio

[40] The Sentinel Stroke National Audit Programme (SSNAP) is an important source of stroke data in England, Wales and Northern Ireland. There are three main components of SSNAP, the clinical audit, acute organisational audit, and post-acute organisational audit.

Service performance

Nationally, there has been significant progress in stroke care in the NHS over the last 20 years. However, the 2016 SSNAP acute organisational audit, which measures the structure of stroke services every two years, evidences that there is still marked variation of services and patient outcomes. Some patients cannot access acute stroke units rapidly and are therefore denied some of the treatments that are time-limited, such as thrombolysis or thrombectomy. Seven-day working is not comprehensive and access to speech and language therapy at weekends is extremely low. The 2016 audit report makes 13 key recommendations[41], including ensuring that:

i) every patient with acute stroke is directly admitted to a dedicated stroke unit within four hours of arrival in hospital
ii) seven day working should be available for at least two types of qualified therapy (including occupational therapy, physiotherapy and speech and language therapy)
iii) all patients with stroke should be offered a structured health and social care review at six months and annually thereafter.

Table 15 details the key results of the 2016 audit for the three hospital trusts that serve the majority of Nottinghamshire residents. Each key performance indicator represents an important aspect of acute stroke service organisation and is based on services as of 1 July 2016. They are broken down as follows:

- **Staffing/workforce** - although only 51% of sites nationally were achieving the key indicator of adequate levels of senior nurses on the stroke unit (Key Indicator 1), the three Nottinghamshire hospital trusts successfully met this target. Higher ratios of trained nurses to beds throughout the week in stroke units are associated with better chances of survival for stroke patients[42]. However, in common with the vast majority of sites nationally (94%), no Nottinghamshire hospital trusts offer the target level of one whole time equivalent qualified clinical psychologist for every 30 stroke unit beds (Key Indicator 2). Psychological problems following stroke can be as debilitating as a physical disability and it is important that these are identified quickly – this data suggests that only a small number of patients locally are able to access appropriate input from a psychologist.
- **7-day working** - each of Nottinghamshire's hospital trusts have daily stroke consultant ward rounds seven days a week (Key Indicator 3), but weekend nurse and therapy (occupational therapy, physiotherapy and speech & language therapy) cover is more variable. Well-staffed wards have the capacity to undertake the intensive nursing and therapeutic management that acute stroke patients need – for example, a recent study found a strong association between delays in receiving a speech and language therapy swallow assessment and the risk of pneumonia[43]. In the audit, Nottingham University Hospitals NHS Trust (NUH) did not meet the SSNAP targets of three or more nurses per ten Type 1 & Type 3 beds[44] at weekends (Key Indicator 4) and at least two types of therapy available seven days a week (Key Indicator 5).

[41] The full 2016 SSNAP acute organisational audit report and recommendations can be viewed at: https://www.strokeaudit.org/Documents/Results/National/2016/2016-AOANationalReport.aspx
[42] National Institute for Health Research – Roads to Recovery (2017)
[43] Bray BD et al - Importance of early assessments: Swallow assessment and pneumonia after stroke (2016)
[44] Type 1 bed = beds solely for 1st 72 hours of care; Type 2 bed = beds solely for beyond 72 hours of care; Type 3 beds = beds for both 1st 72 hours of care and post-72 hour care

- **Access to specialist treatment and support** - a thrombectomy[45] is the mechanical removal of a thrombus (solid mass stationary blood clot) to help restore blood flow and prevent or limit the damage caused by the stroke. At the time of the audit, this emerging treatment for ischaemic stroke was available at NUH and Sherwood Forest Hospitals NHS Foundation Trust (SFHT), but not at Doncaster & Bassetlaw Hospitals NHS Foundation Trust (DBH) (Key Indicator 6). In contrast, the audit found that DBH was the only hospital trust in the county that applies intermittent pneumatic compression (IPC)[46] as first line prevention of venous thromboembolism (formation of blood clots in the vein), compared to 80% of sites nationally (Key Indicator 7). IPC is an effective and potentially life-saving treatment for immobile stroke survivors recommended by NICE (CG92), so limited application of this inexpensive and safe treatment in trusts across the county is a concern. However, each of the county's hospital trusts meets the targets both for providing access to specialist ESD teams (Key Indicator 8) and rapid investigation of people with TIA (Key Indicator 9).
- **Patient and carer engagement** - each local hospital trust undertakes surveys to seek patient and carer views.

The SSNAP also provides a composite score for the quality of care that stroke patients receive, which combines elements from the whole pathway of stroke care. The overall SSNAP score is calculated from scores on 44 key indicators measuring the many aspects of multi-disciplinary care important in achieving the best outcomes after stroke. These include brain scanning; stroke unit-based care; improving access to a stroke unit; thrombolysis; specialist assessments; occupational therapy; physiotherapy; speech and language therapy; multi-disciplinary team working; and discharge planning.

The SSNAP score also includes components for data quality and audit participation. However, the SSNAP score does not define whether services are safe. Results for Nottinghamshire CCGs can be seen in Table 16, with notably better performance achieved in the north of the county.

One of the 44 key indicators is the percentage of people with acute stroke directly admitted to a stroke unit within four hours of arrival at hospital. From the results of randomised controlled trials, admission to a stroke unit has been identified as the key evidence-based intervention for acute stroke, not only to improve survival but also to reduce dependency after stroke. It is important that a patient is managed on the stroke unit from the time of admission, when close monitoring of physiological variables and provision of thrombolysis, where appropriate, can be performed as effectively as possible.

[45] With the patient under sedation and local anaesthetic, or under general anaesthetic, a catheter is inserted through a large blood vessel and the clot is located through a cerebral angiography – where dye and X-rays are used to see how blood through the arteries in the neck and brain. The clot retrieval device is then inserted through a catheter and positioned near the side of the clot. Recent studies have shown that removal of the blood clot by thrombectomy may be more beneficial in selected patients than thrombolysis (Mind the Gap: The Third SSNAP Annual Report (2016)).

[46] Intermittent pneumatic compression is a therapeutic technique used in medical devices that include an air pump and inflatable auxiliary sleeves, gloves or boots in a system designed to improve venous circulation. The primary functional aim of the device is to squeeze blood from the underlying deep veins, which, assuming that the valves are competent, will be displaced proximally. When the inflatable sleeves deflate, the veins will replenish with blood. The intermittent compressions of the sleeves will ensure the movement of venous blood.

Table 15 SSNAP 2016 acute organisational audit report key indicators: acute hospitals serving Nottinghamshire residents

Key Indicator (KI)	National (% sites met KI)	DBH (met KI?)	NUH (met KI?)	SFHT (met KI?)
Staffing/workforce				
1. Establishment of Band 6 and Band 7 nurses per stroke unit (SU) beds (=>2.375 per 10 SU)	51%	Yes	Yes	Yes
2. Presence of a qualified clinical psychologist (at least 1 WTE per 30 SU beds)	6%	No	No	No
7-day working				
3. Stroke consultant led ward rounds (at least one ward round per day, 7 a week minimum, Type 1 & Type 3 beds*)	72%	Yes	Yes	Yes
4. Nurses on duty at 10am and 10pm weekends (3.0 or more nurses per 10 Type 1 & Type 3 beds)	20%	Yes	No	Yes
5. At least two types of therapy available 7 days a week (includes occupational therapy, physiotherapy and speech & language therapy)	31%	Yes	No	Yes
Access to specialist treatment and support				
6. Patients can access intra-arterial (thrombectomy) treatment	67%	No	Yes	Yes
7. Intermittent pneumatic compression device used as first line prevention of venous thromboembolism	80%	Yes	No	No
8. Access to a specialist (stroke/neurological specific) Early Supported Discharge team	81%	Yes	Yes	Yes
9. Timescale to see, investigate and initiate treatment for both high risk and low risk patients**	73%	Yes	Yes	Yes
Patient and carer engagement				
10. Formal survey undertaken seeking patient/carer views on stroke services	61%	Yes	Yes	Yes
Total number of key indicators achieved (Maximum = 10)		**8** (scored by 19/178 trusts)	**6** (scored by 37/178 trusts)	**8** (scored by 19/178 trusts)

DBH = Doncaster & Bassetlaw Hospitals NHS Foundation Trust
NUH = Nottingham University Hospitals NHS Trust
SFHT = Sherwood Forest Hospitals NHS Foundation Trust
*Type 1 bed = beds solely for 1st 72 hours of care; Type 2 bed = beds solely for beyond 72 hours of care; Type 3 beds = beds for both 1st 72 hours of care and post-72 hour care
** High risk TIA patients = same day or next day, 7 days a week; low risk TIA patients = within a week
Source: SSNAP Acute Organisational Audit Report (2016) (https://www.strokeaudit.org/results/Organisational/Site.aspx)

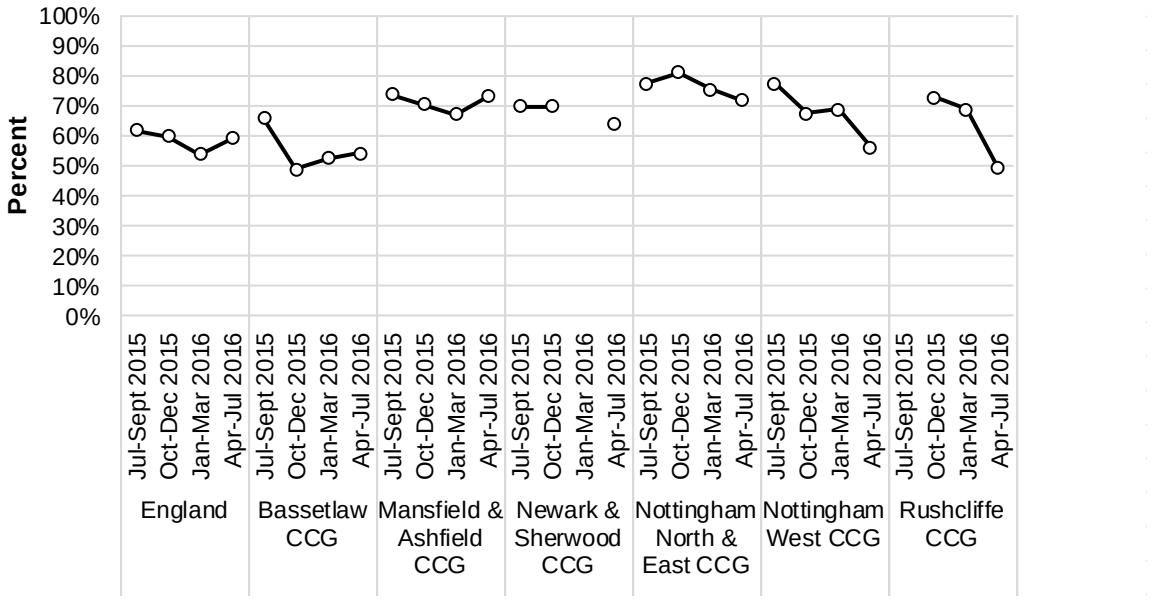
Table 16 Average composite score for the quality of stroke services (July 2015 – July 2016)

	Jul-Sept 2015	Oct-Dec 2015	Jan-Mar 2016	Apr-Jul 2016
Bassetlaw CCG	**B**	**B**	**B**	**B**
Mansfield & Ashfield CCG	**A**	**A**	**B**	**B**
Newark & Sherwood CCG	**B**	**B**	**B**	**B**
Nottingham North & East CCG	**D**	**D**	**D**	**C**
Nottingham West CCG	**D**	**D**	**D**	**D**
Rushcliffe CCG	**Insufficient records**	**D**	**D**	**D**

Source: SSNAP clinical audit (2016) (https://www.strokeaudit.org/results/Clinical-audit/Clinical-CCG-LHB-LCG.aspx)
A = highest quality of care; E = lowest quality of care

At some stage during admission, about 95% of stroke patients nationally are managed on a stroke unit[47] but only about 60% are directly admitted to a stroke unit within four hours of arrival at hospital. Figure 17 shows recent results for Nottinghamshire, which indicates that local CCGs generally scored higher than the national average through the year, although the results are variable. However, there is some room for improvement in performance across the county and providers need to ensure that all people with suspected stroke are admitted directly to a specialist acute stroke unit following initial assessment, either from the community or A&E. They should also continue to make sure that ESD services are effective in enabling patients to be discharged sooner so that stroke unit beds are used more efficiently.

Figure 17 Percentage of applicable patients who go to a stroke unit within four hours of arrival at hospital



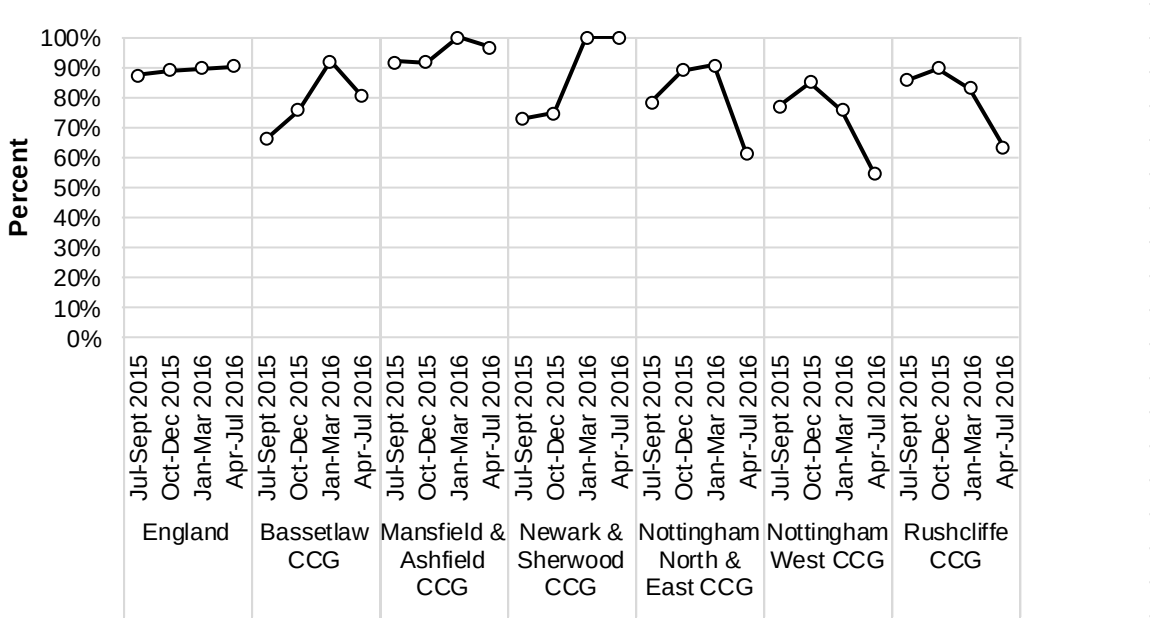
Source: SSNAP clinical audit (2016) URL: https://www.strokeaudit.org/results/Clinical-audit/Clinical-CCG-LHB-LCG.aspx

Another key indicator is the percentage of applicable patients who are discharged with a joint health and social care plan. Recovery after stroke can be slow and people are often left with long-term impairments. To improve recovery after stroke, it is important that survivors are

[47] NHS Atlas of Variation – cardiovascular family of diseases (2015)

well supported to rehabilitate in the community by both health and social care providers, optimising rehabilitation across the whole system. Figure 18 indicates variable performance across Nottinghamshire, which is sometimes below the national average. More work needs to be undertaken to track and interrogate this data over forthcoming quarters to understand the reasons for (and implications of) under-performance. In terms of ESD and community stroke rehabilitation, the SSNAP clinical audit includes a wide range of key performance indicators, a selection of which are detailed below (Table 19).

Figure 18 Percentage of applicable patients who are discharged with a joint health and social care plan



Source: SSNAP clinical audit (2016) URL: https://www.strokeaudit.org/results/Clinical-audit/Clinical-CCG-LHB-LCG.aspx

Table 19 Performance of early supported discharge (ESD) and community stroke rehabilitation (CSR) services in Nottinghamshire (2015/16)

	DBH (ESD)	NUH (ESD)	NUH (complex ESD)	SFHT (ESD)	NHFT (CSR)
Mean length of stay at this team (days)	15.4	17.7	37.3	23.7	68.0
Mean number of minutes of occupational therapy received per day whilst under the care of this team	29.7	22.2	7.9	15.3	4.0
Mean number of minutes of physiotherapy received per day whilst under the care of this team	25.7	27.9	10.0	20.9	6.3
Mean number of minutes of speech & language therapy received per day whilst under the care of this team	27.5	17.8	0	19.1	5.4
Mean number of minutes of psychology received per day whilst under the care of this team	No data	5.5	0	4.3	No data

DBH = Doncaster & Bassetlaw Hospitals NHS Foundation Trust
NHFT = Nottinghamshire Healthcare NHS Foundation Trust
NUH = Nottingham University Hospitals NHS Trust (Stroke Outreach Service)
SFHT = Sherwood Forest Hospitals NHS Foundation Trust
Source: SSNAP clinical audit (2016) (https://www.strokeaudit.org/results/Clinical-audit/Regional-Results.aspx)

It is both a recommendation within the National Stroke Strategy in England and NICE guidelines[48] that all eligible patients receive a six month assessment after their discharge from hospital following a stroke. This assessment is considered important in assessing the outcomes of stroke care. One of the key indicators in the SSNAP dataset covers this and results (Table 20) demonstrate the lack of local provision to date at six months in Nottinghamshire. However, six month reviews have recently been commissioned in the south of the county.

Table 20 Percentage of applicable patients who are assessed at six months following a stroke

	Jul-Sept 2015	Oct-Dec 2015	Jan-Mar 2016	Apr-Jul 2016
Bassetlaw CCG	3.3%	0.0%	3.4%	0.0%
Mansfield & Ashfield CCG	0.0%	0.0%	0.0%	0.0%
Newark & Sherwood CCG	0.0%	0.0%	Insufficient records	0.0%
Nottingham North & East CCG	0.0%	5.5%	0.0%	5.3%
Nottingham West CCG	0.0%	5.6%	2.9%	2.2%
Rushcliffe CCG	Insufficient records	0.0%	0.0%	0.0%
England	25.6%	26.0%	29.6%	30.6%

Source: SSNAP clinical audit (2016) (https://www.strokeaudit.org/results/Clinical-audit/Clinical-CCG-LHB-LCG.aspx)

In 2015, the SSNAP also carried out a post-acute organisational audit (Table 21). This audit was carried out in two phases, the first obtaining information from CCGs on what post-acute stroke services they commission and the second collecting structural data from all identified post-acute stroke services on the make-up of their service. A new audit will be carried out this year (2017), which will provide a more up to date view of local post-acute service provision.

Table 21 Post-acute stroke service commissioning audit

	Bassetlaw CCG	Mansfield & Ashfield CCG	Newark & Sherwood CCG	Nottingham North & East CCG	Nottingham West CCG	Rushcliffe CCG
Inpatient	No	Yes	Yes	Yes	Yes	No
Outpatient	No	No	No	No	No	No
Early Supported Discharge (ESD)	Yes	Yes	Yes	Yes	Yes	Yes
Community Rehab Team (CRT)	Yes	Yes	Yes	Yes	Yes	Yes
Domiciliary only (not ESD/CRT)	Yes	No	No	No	No	No
6 month assessment	Yes	No	No	No	No	No
Vocational rehabilitation	No	No	No	No	No	No
Psychological support	Yes	Yes	Yes	No	No	No
Physiotherapy	Yes	Yes	Yes	No	No	No
Occupational therapy	Yes	Yes	Yes	No	No	No
Speech & language therapy	Yes	Yes	Yes	No	No	No
Family & carer support service	No	Yes	Yes	Yes	Yes	Yes

Source: SSNAP post-acute organisational audit (2015) (https://www.strokeaudit.org/results/PostAcute/Regional.aspx)

[48] NICE CG 162 (2013) - Stroke Rehabilitation in Adults

There is not enough space within this chapter to discuss the many other key indicators that are collected through the SSNAP, but the data can be accessed at www.strokeaudit.org/results.

Another important data source is the NHS Quality and Outcomes Framework (QOF), which is an annual reward and incentive programme for all GP surgeries in England. A key aspect of the QOF is the ability to record accurately all those who have had a stroke, in order to ensure that they can be followed up and offered the best care to prevent a further stroke. This can demonstrate whether patients with a history of stroke or at risk of stroke are being well managed in primary care.

There are four QOF stroke and TIA clinical indicators which describe the management of stroke and TIA in primary care. These are detailed in Table 22 below. The key atrial fibrillation QOF indicator (AF007) is provided in Table 5 above. Performance across all indicators is broadly in line with or better than the national average, although there is some minor variation across the county in terms of referrals for further investigation between three months before or one month after the date of the latest recorded stroke or the first TIA.

Table 22 Stroke/TIA QOF indicators for Nottinghamshire CCGs 2015/16

	STIA 003	STIA 007	STIA 008	STIA 009
Bassetlaw CCG	88.43%	96.51%	96.03%	97.28%
Mansfield & Ashfield CCG	88.80%	96.88%	93.13%	94.57%
Newark & Sherwood CCG	89.47%	97.36%	88.95%	94.82%
Nottingham North & East CCG	89.23%	97.74%	89.71%	96.66%
Nottingham West CCG	90.68%	98.22%	88.52%	95.17%
Rushcliffe CCG	90.71%	98.45%	93.42%	96.27%
England	87.63%	97.00%	88.99%	94.36%

Source: www.content.digital.nhs.uk/QOF

Codes:

STIA 003 = The percentage of patients with a history of stroke or TIA in whom the last blood pressure reading (measured in the preceding 12 months) is 150/90 mmHg or less

STIA 007 = The percentage of patients with a history of stroke shown to be non-haemorrhagic, or a history of TIA, who have a record in the preceding 12 months that an anti-platelet agent or an anti-coagulant is being taken

STIA 008 = The percentage of patients with a stroke or TIA (diagnosed on or after 1 April 2014) who have a record of a referral for further investigation between three months before or one month after the date of the latest recorded stroke or the first TIA

STIA 009 = The percentage of patients with a stroke or TIA who have had an influenza immunisation in the preceding 1 August to 31 March

4) Current activity, service provision and assets

A whole pathway approach to the provision of stroke services is crucial to maximising clinical outcomes for patients, the resultant quality of life and their experience of stroke services. The first 72 hours of care is vital to ensure the optimum clinical outcome for stroke survivors. This needs to be underpinned by an effective whole system pathway for assessment, discharge and repatriation to local stroke services, subsequent rehabilitation and longer term

support. The average national cost of care (acute and rehabilitation) per stroke patient is currently £23,315[49].

Services can be broadly split into three key groups, although there is some overlap - awareness and prevention, acute stroke services and post-acute stroke services. An overview of local provision is given below, but more detail can be found within the findings of the East Midlands Academic Health Science Network Stroke Rehabilitation Programme (http://emahsn.org.uk/programmes-and-projects/stroke-rehabilitation/). *It should be noted that some acute and post-acute services are currently subject to service re-design and re-procurement, so may change imminently or in due course from those that are described below.*

a) Awareness & prevention

Lifestyle issues

A range of services across the county support the primary and secondary prevention of cardiovascular disease. These are mostly detailed within the lifestyle sections of the JSNA[50], including tobacco, diet and nutrition, physical activity and excess weight.

FAST campaign

In February 2017, Public Health England relaunched the national 'Act FAST' stroke campaign, working closely with the Stroke Association. The campaign, originally launched in 2009, aims to raise awareness of the symptoms of stroke and to encourage people who recognise any single one of the symptoms of stroke to call for an ambulance immediately. The campaign aims to highlight the role that others can play when someone is having a stroke, empowering them to ring 999 if they notice any symptoms.

NHS Health Checks

NHS Health Checks are available to people between the ages of 40 and 74 who have not been diagnosed with heart disease, stroke, kidney disease or diabetes. Patients are assessed for the risk factors for cardiovascular disease. Risk reduction advice is provided and referral when necessary. Eligible patients are invited to attend a clinic every five years, with those in the highest risk categories targeted primarily. Between 2013/14 (Quarter 1) and 2016/17 (Quarter 3), 55.1% of the eligible Nottinghamshire population aged 40-74 were offered an NHS Health Check and 56.4% of those invited took up the offer. This means that 31.1% of eligible people in the county received a health check during the period[51].

TIA one stop clinics

TIA one stop clinics enable patients presenting to their GP or the emergency services to be assessed and referred to vascular surgery if appropriate, with surgical assessment on the same day. This means that these patients can be offered rapid access to a carotid endarterectomy (surgery to open up blocked main vessels supplying the brain) if necessary. Nottingham City Hospital (NUH) provides a same day assessment via fast track TIA clinics for those with a high risk TIA, and twice weekly TIA clinics for those with a low risk TIA.

[49] Stroke Association - State of the Nation (2016)
[50] http://jsna.nottinghamcity.gov.uk/insight/Strategic-Framework/Nottinghamshire-JSNA.aspx
[51] Source: Public Health England - https://fingertips.phe.org.uk

King's Mill Hospital (SFHT) provides a daily TIA clinic, where patients may be seen the same day. Doncaster Royal Infirmary (DBH) provides a same day rapid access TIA clinic. There is also a TIA clinic at Bassetlaw Hospital.

b) Acute stroke services

All patients should be admitted to hospital following a stroke, as early assessment, treatment and initiation of rehabilitation have been shown to improve outcomes. Best evidence[52] shows that people receiving care in dedicated stroke units are more likely to be alive, independent and living at home one year after their stroke. As well as staff in stroke units, important NHS staff at this stage include ambulance call handlers and paramedics, primary care and hospital emergency staff.

Locally, patients can be admitted to three hospitals with stroke units in the first instance - Nottingham City Hospital, King's Mill Hospital and Doncaster Royal Infirmary. Care ranges from emergency assessment and treatment in the first few hours after stroke to early rehabilitation such as physiotherapy, occupational and speech therapy.

Stroke patients in the south of the county are admitted to the Hyper Acute Stroke Unit (HASU) at Nottingham City Hospital. Those with more complex needs will move on to an Acute Stroke Unit for further treatment and assessment, while less complex cases are sent to a rehabilitation ward. Stroke patients in Mid-Nottinghamshire are admitted to the Stroke Unit at King's Mill Hospital, which comprises an acute ward and a rehabilitation ward. At Doncaster Royal Infirmary, patients are admitted to the HASU and are often transferred to Bassetlaw Hospital thereafter to begin their rehabilitation.

c) Post-acute stroke services

Discharge and community rehabilitation

While the stroke care pathway begins with initial treatment in a hyper-acute or acute stroke unit in hospital, for optimal recovery this needs to be followed on discharge by specialist stroke rehabilitation in a community setting. The aim of stroke rehabilitation is to maximise activity and quality of life following a stroke and it can make a real difference to the eventual outcome. It also has the potential to reduce health inequalities and make significant cost savings across the health and social care system.

Hospitals which deal with stroke patients have various specialists who help with rehabilitation, including physiotherapists, occupational therapists, speech therapists, dieticians, psychologists, specialist nurses and doctors. Each area of the county has its own multi-disciplinary ESD service, which helps to coordinate transfer of care from hospital to home and provides intensive rehabilitation in the patient's home in the early stages of recovery. ESD is considered to significantly increase the likelihood of gaining independence for patients with mild to moderate stroke and the estimated NHS cost savings over five years per extra patient receiving ESD is £1,600[53]. Given the long-term and individualised nature of recovery from stroke, access to further specialist community rehabilitation is also highly important so that patients can receive specialist care at home.

[52] National Institute for Health Research – Roads to Recovery (2017)
[53] National Institute for Health Research – Roads to Recovery (2017)

In the south of the county, on discharge from City Hospital patients may be referred to the ESD service, which is provided to patients in their own homes by Nottinghamshire Healthcare NHS Foundation Trust (NHFT)). After discharge from ESD, patients requiring further rehabilitation are referred to the Community Stroke Service, also provided by NHFT. This service provides specialist rehabilitation in the patient's home and the patient may also be referred for speech and language therapy provide by NHFT. There has previously been no provision for six month reviews, but this has recently been commissioned.

On discharge from the Acute Stroke Unit at King's Mill Hospital, patients may be transferred to the hospital's stroke rehabilitation ward or referred to the ESD Service if they are eligible for the service. Patients who do not require inpatient intensive rehabilitation but are not suitable for ESD are able to access further rehabilitation provided by the Neuro-Rehabilitation Outpatients Service at Mansfield Community Centre, King's Mill Hospital and Newark Hospital. Patients may also access speech and language therapy (provided by NHFT) at Mansfield Community Centre. However, patients in mid-Nottinghamshire do not have access to stroke specialist community rehabilitation in their own homes (beyond ESD) or six month reviews.

Patients from Nottinghamshire admitted to Doncaster Royal Infirmary move from the HASU to the acute stroke wards at Bassetlaw Hospital or Doncaster. Their needs are assessed and a discharge arranged with social workers and with the ESD Team. However, if the needs of the patient are more complex, further rehabilitation takes place at Rowan Lodge (Tickhill Road Hospital). Community rehabilitation is provided by NHFT through the Bassetlaw Long Term Neurological/Stroke Team, but six month reviews are not routinely undertaken.

The National Stroke Strategy and NICE guidelines[54] recommend that all eligible patients receive a six month assessment after their discharge from hospital following a stroke and annually thereafter. This assessment is important in assessing the outcomes of stroke care - a structured health and social care review allows patients and their carers to discuss the issues that continue to concern them and formulate plans of action. These may include reinforcement of lifestyle advice for secondary prevention, discussion of medication needs, 'silent symptoms' such as fatigue, memory or mood disturbance and pain, and return to work or usual activities. It is therefore a concern that patients are generally not being offered a review at six months in Nottinghamshire and annually thereafter, although this has recently been addressed in the south of the county.

Stroke Ability

Stroke Ability is a countywide community service run by Nottinghamshire County Council that offers a 12 week information and gentle group exercise programme for those who have suffered a stroke. It also provides relaxation techniques and signposts participants to other services they may wish to use, such as ongoing exercise classes, welfare rights advice and carers support.

Carers Hub

The Carers Hub is a programme funded by Nottinghamshire County Council to support carers. It provides information, advice and guidance and signposts carers to services that

[54] NICE CG 162 (2013) - Stroke Rehabilitation in Adults

they may need, including respite care, further training and grants. In addition, it runs support groups and drop-ins.

Stroke Association

The Stroke Association is a registered charity with national reach which provides research funding, advice, support services and campaigns for better stroke care. Locally, there is an Information and Advice Support Service for patients providing up to a year's support. Information about the service is offered on discharge from hospital and stroke survivors can self-refer. The service also offers support to carers of stroke survivors. In addition, there are also a number of stroke support groups and courses across the county to help survivors to regain confidence and support adjustment to change.

5) Evidence of what works

In line with the current evidence base, the key elements that a 'best practice' stroke care pathway (not including primary prevention[55]) should contain are as follows:

Acute

a) Ambulance services and call handlers respond to every person with a suspected stroke as a medical emergency.
b) There is provision of the following specialist services:
    a. urgent brain imaging for patients with acute stroke
    b. treatment with Alteplase[56] for patients with acute ischaemic stroke
    c. an endovascular[57] service for patients with acute ischaemic stroke
    d. a neuroscience service to admit, investigate and manage patients referred with subarachnoid haemorrhage[58], both surgically and with interventional radiology
    e. a neuroscience service delivering neurological interventions for intracerebral haemorrhage[59], malignant cerebral oedema[60] and hydrocephalus[61]
    f. direct admission of patients with acute stroke to a hyper-acute stroke unit within four hours of arrival at hospital
    g. an acute neurovascular service for the diagnosis and treatment of people with suspected TIA
    h. an acute vascular surgical service to investigate and manage patients with TIA and non-disabling stroke due to carotid artery stenosis[62]

[55] While the role of primary prevention is crucial, evidence of what works is covered in other areas of the Nottinghamshire JSNA (http://jsna.nottinghamcity.gov.uk/insight/Strategic-Framework/Nottinghamshire-JSNA.aspx) – for example, see chapters on Tobacco (2014), Diet and Nutrition (2015), Physical Activity (2015), Excess Weight in Children, Young People and Adults (2016)
[56] Alteplase is a tissue plasminogen activator. It works by helping to break down unwanted blood clots.
[57] Endovascular surgery is a procedure used to treat problems affecting the blood vessels, such as an aneurysm.
[58] A subarachnoid haemorrhage is an uncommon type of stroke caused by bleeding on the surface of the brain.
[59] Intracerebral haemorrhage occurs when a diseased blood vessel within the brain bursts, allowing blood to leak inside the brain.
[60] An uncommon, often fatal complication of traumatic brain injury, which is more common in children and adolescents.
[61] Hydrocephalus is a condition in which there is an abnormal build-up of cerebrospinal fluid in the cavities (ventricles) of the brain. The build-up is often caused by an obstruction which prevents proper fluid drainage.
[62] Carotid artery stenosis refers to the narrowing of the carotid arteries, usually caused by the build-up of fatty substances and cholesterol deposits.

Post-acute

a) There is provision of the following specialist services:
   a. an inpatient stroke unit capable of providing stroke rehabilitation for all people with stroke admitted to hospital
   b. a specialist ESD service to enable eligible stroke survivors to receive responsive and intensive rehabilitation at home
   c. specialist stroke rehabilitation services capable of meeting the specific health, social and vocational needs of people with stroke of all ages
b) There are services available that are capable of meeting all the needs of people with stroke identified by members of the specialist team (e.g. orthotics, specialist seating, equipment provision, continence, vocational rehabilitation, family/carer support).
c) People with stroke whose mental capacity is impaired can access independent specialist advice and support in relation to advocacy.
d) Secondary prevention:
   a. modifiable vascular risk factors are identified and treated as soon as possible
   b. all people with stroke or TIA are provided with information and advice on treatments and lifestyle changes to reduce their risk of stroke
   c. there is liaison and support between stroke services and GPs in the long-term management of risk factors in people with stroke or TIA
e) Longer-term:
   a. there is routine follow-up of people with stroke six months after hospital discharge and annually thereafter
   b. there is reassessment and further treatment of people with stroke who are no longer receiving rehabilitation - services are accessible from primary or secondary care, social services or by self-referral
   c. people with stroke can receive the practical (e.g. housing, employment) and emotional support they need to live with a long-term disability; access suitable social and leisure activities outside their homes; and receive maintenance interventions (e.g. provision of exercise programmes and peer support) to enhance and maintain health and well-being
   d. Carers of people with stroke are aware that their needs can be assessed separately; are able to access the advice and support that they need; are provided with information, equipment and appropriate training to enable them to care for a person with stroke; and have their need for information and support whenever there is a significant change in circumstance
f) Advance care planning and community palliative care services are available for people with stroke with limited life expectancy, and their family/carers where appropriate.

Key documents outlining best practice in stroke care (not including primary prevention) include:

- The National Stroke Strategy (2007), Department of Health, presents 20 quality markers outlining the features of a good service.
- NICE CG 68 (2008) - *Stroke and transient ischaemic attack in over 16s: diagnosis and initial management* offers 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.

- NICE CG 127 (2016) - *Hypertension in adults: diagnosis and management* covers identifying and treating primary hypertension in people aged 18 and over.
- NICE CG 162 (2013) - *Stroke Rehabilitation in Adults* contains evidence-based advice on the rehabilitation of adult survivors of a stroke.
- NICE CG180 (2014) - *Atrial fibrillation: management* covers diagnosing and managing atrial fibrillation in adults. It aims to ensure that people receive the best management to help prevent harmful complications, in particular stroke and bleeding.
- NICE IPG 548 (2016) - *Mechanical clot retrieval for treating acute ischaemic stroke* supports the use of clot retrieval in appropriately selected cases of ischaemic stroke. Treatment is most effective if undertaken within eight hours of onset of the stroke.
- NICE QS2 (2016) - *Stroke in adults* covers diagnosis and initial management, acute-phase care, rehabilitation and long-term management of stroke in adults.
- Royal College of Physicians Intercollegiate Stroke Working Party (2016) - *National Clinical Guideline for Stroke* provides a comprehensive examination of stroke care, encompassing the whole of the stroke pathway from acute care through to longer-term rehabilitation, including secondary prevention.
- Stroke Sentinel National Audit Programme (2016) - *Annual Report 'Mind the Gap!'* uses information collected over the past three years to provide a detailed, accurate picture of stroke care in England, Wales and Northern Ireland.
- The Royal College of Paediatrics and Child Health and the Stroke Association (2017) - *Stroke in childhood: clinical guideline for diagnosis, management and rehabilitation* sets out how stroke care should be provided, covering the whole pathway from identification, diagnosis and management of children and young people with arterial ischaemic stroke and haemorrhagic stroke until their transition to adult care.

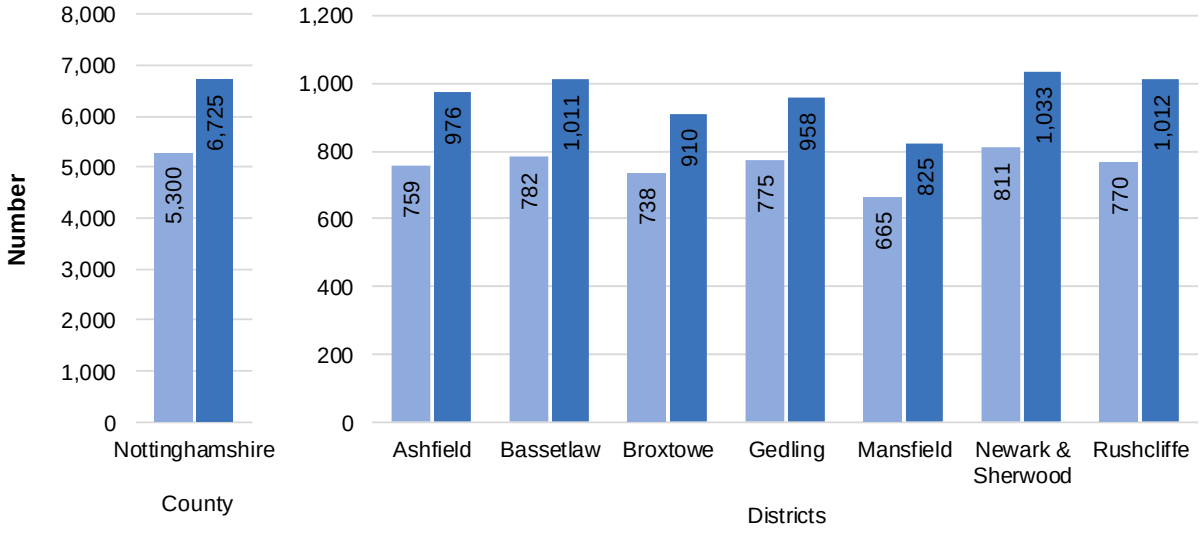
6) What is on the horizon?

A recent report[63] estimates that the number of strokes in the UK will increase by 44% in the next twenty years and the number of stroke survivors is expected to rise by 32%. As the population ages (most notably the very elderly population), there will clearly be an increase in the number of people having strokes, despite improvements led by local CCGs (for example, Nottingham North & East CCG's CVD Strategy) in the detection and management of key risk factors such as high blood pressure, diabetes and atrial fibrillation. In addition, with reducing mortality from stroke due to ongoing advancements in acute treatment and integrated rehabilitation, there are more stroke survivors in the community who need access to preventative care and support.

Projecting Adult Needs and Service Information (PANSI) data estimates that there were 5,300 people with a longstanding health condition caused by stroke across Nottinghamshire in 2015 (Figure 23). It is predicted that this number will increase by 26.9% to 6,725 by 2030, with the highest percentage increase in Rushcliffe.

[63] King's College London for the Stroke Alliance for Europe: The Burden of Stroke in Europe (2017)

Figure 23 People aged 18 and over predicted to have a longstanding health condition caused by a stroke projected to 2030



Source: Projecting Adult Needs & Service Information (www.pansi.org.uk)

There is an increasing role for new technology to support recovery after stroke. This ranges from robots to help people move their arms to electrical stimulus to activate muscles. Recent studies have included:

- using wearable devices to track the range of movement in stroke survivors carrying out prescribed exercise
- using hi-tech insoles to provide sensors around walking
- testing the feasibility of a trial to assess a virtual glove to strengthen arm function after stroke
- an early assessment of technology to strengthen facial expression in stroke survivors
- testing tailored apps for people with speech difficulties after stroke
- evaluating the use of specialist speech and language software to deliver high doses of self-managed language practice to people with aphasia after stroke.

7) Local Views

Nationally, a 2016 survey by the Stroke Association[64] indicated that over 45% of stroke survivors felt abandoned after leaving hospital and half of those surveyed rated the support they received for fatigue, memory problems and the emotional effects of stroke as poor or very poor (because they did not receive enough). A 2013 Stroke Association report[65] found that:

- 73% of stroke survivors lack confidence
- 63% live in fear of another stroke
- 44% find it difficult to talk about their stroke and its effect on their lives
- 56% feel that friends and family treat them differently
- 55% are unable to care for family in the same way as before

[64] Quoted in Mind the Gap: The Third SSNAP Annual Report (2016)
[65] Stroke association: Feeling overwhelmed – the emotional impact of stroke (2013) [as quoted in Stroke Association - State of the Nation (2016)]

- 44% had broken up with their partner or considered doing so
- Up to 72% of carers feel ill-prepared to take on the role of carer
- Up to 69% of carers experience stress and 79% anxiety

Locally, the Stroke Association has noted that the current issues include:

- Lack of six monthly reviews
- Lack of appropriate services to support those of working age back into the workplace
- Insufficient carer support
- No access to stroke specialist community rehabilitation in patients' own homes in Mid-Nottinghamshire
- Insufficient psychological support
- Lack of recognition that people who have a 'milder' stroke may have greater issues with psychological wellbeing

What does this tell us?

8) Unmet need and gaps

- There is some variance across the county in the detection and management in primary care of those with undiagnosed risk factors such as high blood pressure and AF to reduce the burden of stroke.
- There is no specialist stroke community rehabilitation service in Mid-Nottinghamshire for those who have been discharged from the Early Supported Discharge (ESD) service. This gap is likely to affect patients' quality of life following a stroke and can make a difference to their eventual outcome. It may also exacerbate health inequalities and lead to extra long-term costs across the health and social care system in the area.
- Six monthly (and annual thereafter) reviews after discharge from hospital following a stroke have not been routinely carried out in Nottinghamshire County, despite recommendations in the National Stroke Strategy[66] and NICE guidelines[67] to the contrary. However, they have recently been commissioned in the south of the county for all stroke survivors. A structured health and social care review at six months and annually thereafter allows patients and their carers to discuss the issues that continue to concern them and formulate plans of action. This lack of provision may lead to increased pressure on primary care for treatment of preventable symptoms and also further risk of re-admission into hospital for stroke-related problems due to a lack of secondary prevention.
- It is reported that there is insufficient provision of services for carers, family members and partners of stroke survivors locally. By the very nature of stroke, they become carers very suddenly and may have difficulty accessing the help and information that they need in a timely way. It is also reported that there is a lack of appropriate services to support those of working age back into the workplace.
- Psychological problems such as depression and anxiety are very common after stroke and can be as debilitating as a physical disability. It is therefore essential that these are identified quickly. However, there are only a small number of patients

[66] Department of Health - National Stroke Strategy (2007)
[67] NICE CG 162 (2013) - Stroke Rehabilitation in Adults

locally who are able to access appropriate input from a qualified clinical psychologist. Other options for providing psychological support can also be considered, such as through specialist mental health nurses.

9) Knowledge gaps

Due to the availability of broad, high quality data from sources such as the national audit of stroke care (SSNAP) and extensive local research, there are fewer major knowledge gaps within this policy area than there may otherwise have been. However, there are still many unanswered questions and avenues for further research. In particular, further work needs to be undertaken on exploring the interface between specialist stroke rehabilitation and social care, including analysis of social care data and intelligence to understand the impact on local authority support services.

For future iterations of the Joint Strategic Needs Assessment, given the nature of fixed risk factors for stroke, it would be helpful to more fully understand access issues to preventative and acute treatment services in relation to age, ethnicity, deprivation and geography (the latter especially given the rural nature of parts of Nottinghamshire[68]). It would also be useful to obtain more qualitative data from local stroke survivors, including their experience of primary and secondary care, and the longer term emotional and financial impact of stroke on themselves and their families in managing everyday life. In addition, further detailed work needs to be undertaken to understand variation across the county in relation to stroke mortality rates, including the influence on this of the detection of risk factors in primary care.

What should we do next?

10) Recommendations for consideration by commissioners

Strategic

- CCG and social care commissioners should plan appropriately for the forecast that:
    - there will be a rise in the actual number of people having strokes in the future (due to an increasing and ageing population).
    - there will be more stroke survivors living with disability in the community who need access to support (due to reducing mortality from stroke because of advancements in treatment and rehabilitation).
- CCGs should undertake a health equity audit in relation to access to services; variation across the county of stroke mortality rates; feedback from local stroke survivors; outcomes; and the implications of variable performance around discharge of patients with a joint health and social care plan.

Prevention

- Clinical commissioning group (CCG) commissioners should continue to support GP practices to prevent stroke by increasing the detection, diagnosis and effective treatment of high blood pressure, atrial fibrillation and diabetes.

[68] A particular challenge in rural areas is getting access to brain scans and specialists quickly before starting thrombolytic treatment.

- Public Health commissioners should continue to support GP practices to prevent stroke by increasing patient uptake of the NHS Health Check programme, especially within high risk groups.

Acute

- Providers should aim to continue improving performance in ensuring that all people with suspected stroke are admitted directly to a specialist acute stroke unit following initial assessment - acute stroke units should provide equity of care across the region. Providers should also ensure that ESD services are effective in enabling eligible patients to be discharged sooner, so that stroke unit beds are used more efficiently.
- Providers should ensure that there is sufficient weekend nurse and therapy cover on stroke wards.
- Providers should address variability across the county in terms of both access to intra-arterial (thrombectomy) treatment and the use of intermittent pneumatic compression devices. (The local Clinical Advisory Group is currently looking at how to address the thrombectomy service.)
- CCG commissioners and providers should ensure that there is access to sufficient psychological support for stroke survivors, including qualified clinical psychologists or specialist mental health nurse support where required.

Rehabilitation

- CCG commissioners should ensure that community rehabilitation services (multi-disciplinary teams with stroke specialist skills and experience) are available for all Nottinghamshire stroke survivors who require rehabilitation in their place of residence after discharge and beyond ESD services.
- CCG commissioners should commission structured assessments at six months following discharge from hospital for all stroke survivors and annually thereafter.
- CCG and social care commissioners should ensure that there is sufficient accessible provision of services for carers, family members and partners of stroke survivors, including respite care.
- CCG and social care commissioners should ensure that appropriate services are in place to support stroke survivors of working age to return to the workplace.

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