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NHS National Services Scotland

Scottish Stroke Improvement Programme.

2017 report.

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Contents

Foreword

Scotland has made steady progress in reducing mortality from stroke over the last ten years – by 38% according to official figures published this year[1]. This indicates that our strategy for stroke is delivering real improvements for people.

We continue to support the Scottish Stroke Improvement Programme as key to informing and driving improvement across stroke care. The Scottish Stroke Care Audit (SSCA) enables us to see where efforts are achieving the Scottish Stroke Care Standards and where further improvement is required.

The SSCA shows that last year improvements were made and maintained in all four "stroke care bundle" provisions. These are the core elements, associated with better outcomes, that all patients should receive. In 2016, one bundle standard, "percentage with swallow screen" was changed from "day of admission" to a more challenging "within 4 hours of admission". It is encouraging to note that already 72% of stroke patients achieved this standard.

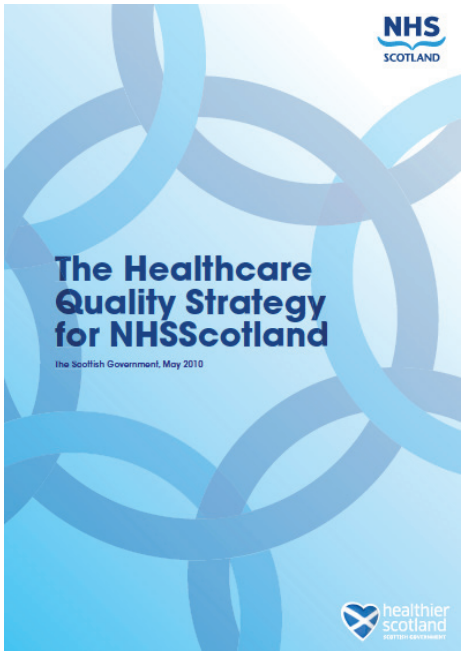
Post discharge stroke care has been a key focus of the Stroke Improvement Plan since the outset, evident in the key actions Priority 7 "Transition to the Community" and Priority 8 " Living with Stroke". Over the past year a focus on areas such as Goal Setting and Self-Management has encouraged work directed at the challenges patients face after discharge. The Scottish Stroke Improvement Team are working with NHS Boards and the voluntary sector to develop care and support services to ensure that people are able to return to independent living. This activity is monitored using the Stroke Improvement Plan benchmarking tool to allow Boards to better understand the current service provision and inform areas for improvement against nationally agreed criteria.

We will continue to seek improvement in the delivery of high quality stroke services in Scotland. This includes considering new treatments, including thrombectomy and new oral anticoagulants, that can offer additional opportunities to reduce the effects of a stroke. This is in line with our Health and Social Care Delivery Plan and the focus on prevention, early intervention and supported self-management to achieve the triple aim: better care, better health and better value.

I would like to acknowledge and thank the numerous people responsible for these achievements. It is the hard work of frontline staff, patients, carers, co-coordinators, and analysts, that contribute to improving services that achieve the best quality of life for people.

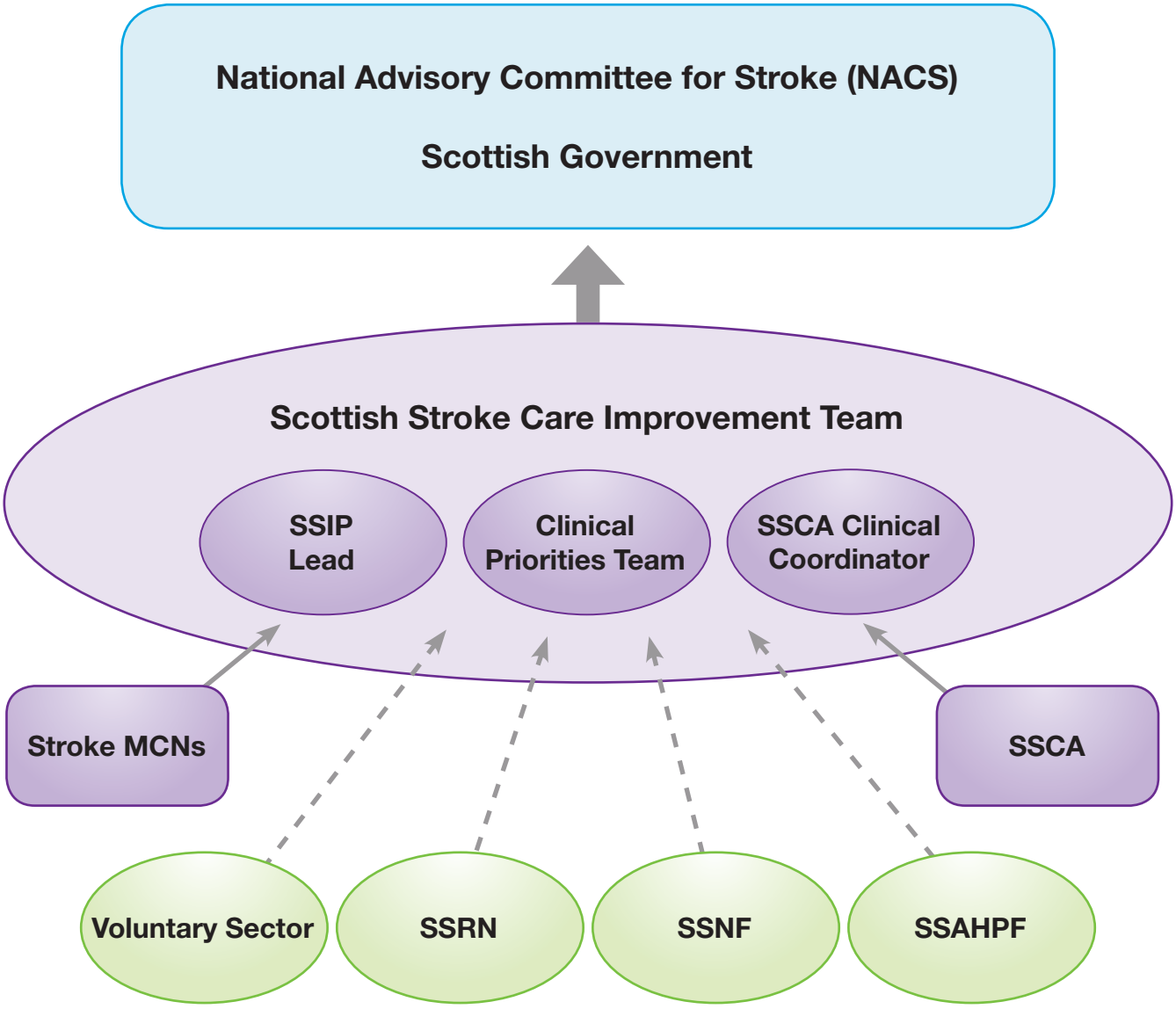
Jason Leitch
National Clinical Director
DG Health and Social Care
Scottish Government

1 Scottish Stroke Improvement Programme



The NHS Scotland Quality Strategy[2] is the NHS Scotland Blueprint for improving the quality of care that patients and carers receive from the NHS across Scotland. It sets out that an ambition for health care that is person centred, safe and effective, underpinned by the need to "embed the mutual approach of shared rights and responsibilities into every interaction between patients, their families and those providing health services." The Scottish Stroke Improvement Programme (SSIP) works with stroke Managed Clinical Networks (MCNs)/ Health Boards to focus on building capacity for all staff to ensure that they have the knowledge, skills and attitudes necessary to deliver high quality services. Stroke remains the third biggest killer in Scotland and the leading cause of disability. Further reducing the number of deaths from stroke has been a clinical priority for NHS Scotland since the mid 1990s. Scotland continues to have exceptionally high levels of stroke related deaths compared to the rest of Western Europe. The SSIP has set out ambitions to deliver world-leading stroke care which is consistently person-centred, clinically effective and safe. One of the key factors for success is that there is commitment to patient safety and, in particular, to avoiding infection and harm, using consistent and reliable improvement methods. One of the triple aims of the 2020 vision[3] is to further improve the quality of care provided, with one of the focuses being to improve the approach to supporting and treating people with stroke.

Structure of SSIP



Key

SSCA - Scottish Stroke Care Audit

MCNs - Managed Clinical Networks

SSRN - Scottish Stroke research Network

SSNF - Scottish Stroke Nurse Forum

SSAHPF - Scottish Stroke Allied Health Professionals Forum

To improve services effectively the SSIP recognises the need to set clear aims which have been established through the Scottish Stroke Care Standards (2013) and the priority actions from the Stroke Improvement Plan[4]. Through the Scottish Stroke Care Audit (SSCA) and the regular monitoring against the priority actions, performance is mapped and the Stroke MCNs develop action plans, test change and implement improvement methodologies. The Stroke Improvement Programme Lead and SSCA National Clinical Coordinator work closely with the Health Boards to ensure the key priorities from the Improvement Plan and the Scottish Stroke Care Standards are implemented and monitored. However, it is ultimately the responsibility of each Health Board's Chief Executive to ensure that services improve.

The following table represents the self evaluated performance of Health Boards when benchmarking themselves against the Stroke Improvement Plan priorities, displayed in Red, Amber, Green (RAG), Blue or Black with further detailed information in Appendix B.

Generic key for RAG chart and RAG status pages 3 and 4:

- No process or pathway in place
- Available but not implemented
- Plan to implement or partially implemented
- Implemented but not delivered consistently
- Complete and embedded in practice

Priority Area	1.Early Recognition of TIA/ Stroke		2. Pre-hospital protocols		3. Stroke Bundle Delivery	4. Trained workforce	5. Early diagnosis	
Priority Action	(1) Public FAST	(2) Early identification of stroke by SAS/ Primary Care / Emergency Departments	(1) SAS Pre-alert	(3) Thrombolysis Process & Pathway	Intermittent Pneumatic Compression	Education Template & Training	(1) TIA Access	(2) TIA Imaging
Ayrshire and Arran	GREEN	AMBER	AMBER	GREEN	GREEN	GREEN	AMBER	GREEN
Borders	GREEN	GREEN	GREEN	AMBER	GREEN	GREEN	AMBER	BLUE
Dumfries and Galloway	GREEN	GREEN	GREEN	AMBER	GREEN	GREEN	GREEN	GREEN
Fife	BLUE	GREEN	AMBER	GREEN	AMBER	GREEN	AMBER	AMBER
Forth Valley	BLUE	AMBER	AMBER	AMBER	BLUE	GREEN	AMBER	GREEN
Grampian	BLUE	GREEN	AMBER	GREEN	GREEN	GREEN	GREEN	AMBER
Greater Glasgow and Clyde	GREEN	GREEN	AMBER	AMBER	GREEN	AMBER	AMBER	RED
Highland	GREEN	GREEN	AMBER	AMBER	GREEN	AMBER	GREEN	RED
Lanarkshire	BLUE	BLUE	AMBER	GREEN	GREEN	BLUE	AMBER	AMBER
Lothian	GREEN	AMBER	AMBER	GREEN	GREEN	GREEN	BLUE	BLUE
Orkney	AMBER	AMBER	AMBER	GREEN	AMBER	AMBER	BLUE	GREEN
Shetland	BLUE	GREEN	GREEN	AMBER	GREEN	RED	BLUE	AMBER
Tayside	GREEN	GREEN	GREEN	AMBER	AMBER	GREEN	AMBER	AMBER
Western Isles	BLUE	GREEN	AMBER	GREEN	GREEN	GREEN	BLUE	AMBER

Priority Area	6. Secondary Prevention	7. Transition to Community						8. Living with Stroke			
Priority Action	Anti-coagulation for AF	(1.1) Access to Stroke Therapy	(1.2) Access to Stroke Rehabilitation Services	(2) Goal Setting	(3.1) Specialist Visual Assess-ment and Rehabilitation	(3.2) Access to Specialist Clinical Neuro-psychological Services	(3.3) Specialist Driving Assessment	(1) Self Manage-ment post discharge support	(2) Exercise	(3) vocational rehabilita-tion	(4) Stroke Spasticity Manage-ment
Ayrshire and Arran	GREEN	GREEN	AMBER	AMBER	BLUE	AMBER	BLUE	GREEN	BLUE	GREEN	RED
Borders	GREEN	BLUE	AMBER	GREEN	GREEN	RED	GREEN	AMBER	AMBER	AMBER	GREEN
Dumfries and Galloway	BLUE	BLUE	AMBER	AMBER	BLUE	GREEN	BLUE	AMBER	AMBER	BLUE	RED
Fife	GREEN	GREEN	GREEN	GREEN	AMBER	RED	AMBER	GREEN	BLUE	BLUE	AMBER
Forth Valley	AMBER	GREEN	GREEN	GREEN	GREEN	RED	GREEN	AMBER	GREEN	AMBER	GREEN
Grampian	AMBER	BLUE	AMBER	AMBER	BLUE	AMBER	BLUE	GREEN	GREEN	AMBER	AMBER
Greater Glasgow and Clyde	BLUE	GREEN	GREEN	GREEN	GREEN	BLUE	AMBER	AMBER	BLUE	AMBER	BLUE
Highland	AMBER	AMBER	AMBER	GREEN	GREEN	AMBER	BLUE	BLUE	GREEN	AMBER	BLUE
Lanarkshire	AMBER	BLUE	GREEN	AMBER	GREEN	GREEN	BLUE	BLUE	BLUE	BLUE	GREEN
Lothian	AMBER	GREEN	AMBER	BLUE	AMBER	GREEN	BLUE	GREEN	GREEN	GREEN	GREEN
Orkney	AMBER	AMBER	GREEN	BLUE	BLUE	BLUE	BLUE	AMBER	GREEN	BLUE	GREEN
Shetland	BLUE	AMBER	AMBER	BLUE	RED	RED	AMBER	GREEN	BLUE	GREEN	AMBER
Tayside	GREEN	GREEN	AMBER	AMBER	GREEN	GREEN	GREEN	GREEN	GREEN	AMBER	AMBER
Western Isles	AMBER	GREEN	AMBER	GREEN	GREEN	GREEN	GREEN	GREEN	AMBER	AMBER	BLACK

Clearly there is variability across the country and Health Boards should strive to improve access to high quality services to ensure the best treatment and support is available to people living with stroke. Sections 1.1 -1.2 provide detail of some of the local and national work currently being undertaken.

1.1 Scottish Ambulance Service Stroke Improvement Plan

Stroke Improvement Plan, Priority 1, Action 2

Improve early identification of stroke and Transient Ischaemic Attack (TIA) by Scottish Ambulance Service (SAS)/NHS24, primary care and hospital Emergency Departments.

Stroke Improvement Plan, Priority 2, Action 1

Pre-alert by SAS – The SAS should pre-alert Emergency Departments of the arrival of stroke patients who might potentially benefit from thrombolysis.

The Scottish Ambulance Service Hyper Acute Stroke Clinical Pathway is now fully embedded across the Service ensuring that evidenced based best clinical practice is able to be delivered to all patients suspected of suffering from Stroke across Scotland.

The Pre-Hospital Stroke Bundle, adopted by the Service as the Key Performance Indicators (KPI) for Hyper Acute Stroke, shows continued improvement in the care Scottish Ambulance Service Clinicians deliver on a daily basis.

The Scottish Ambulance Service invested in an Ambulance Specific Stroke training video that allows for a concentrated and consistent approach to education ensuring that the content delivered is appropriate, current and relevant. Through funding and endorsement from Chest Heart and Stroke Scotland and The Stroke Association, the video has also been adapted to allow the public to understand the Clinical Pathway Scottish Ambulance Clinicians will follow when suspecting Stroke. This training resource is widely available on internal websites and through a range of publicly accessible social media platforms.

The Scottish Ambulance Service continues to work with Stroke MCNs across NHS Scotland to further enhance training and education by facilitating STAT training for Technicians and Paramedics.

1.2 Scottish Stroke Education Pathway

Priority 4 Action 1 Health and social care staff in hospital and community settings are trained to an appropriate level depending on whether their contact with people affected by stroke is: occasional (stroke awareness), regular (core competencies) or in the context of specialist services (specialist competencies).

There is robust evidence that treatment on a stroke ward improves outcomes, including survival, being independent, and living at home one year after a stroke compared to treatment on general wards[5]. Stroke unit care has also been proven to be both clinically and cost effective[6]. This relates to the specialist skills, knowledge and expertise of staff on stroke units compared to those without specialist skills on general wards. The main distinctions of stroke units are in education and training, as nurses in stroke units are required to undertake stroke specific education, e.g. swallow screening. Stroke education is fundamental to delivering specialist care and thus the improved outcomes in stroke units. The Stroke Education Pathway provides a consistent approach to education and training for healthcare staff within Stroke Units in NHS Scotland. It has been developed by the SSIP, Chest Heart & Stroke Scotland (CHSS), Scottish Stroke Nurses Forum (SSNF), and Scottish Stroke Allied Health Professionals Forum (SSAHPF) and supported by the National Advisory Committee for Stroke (NACS) and the Scottish Government.

1.2.1 The Stroke Education Pathway & National Education Facilitator

In February 2015, the Scottish Government funded a national stroke education facilitator post to support Health Boards across Scotland, their stroke MCNs and education groups in relation to priorities around education. Key education priorities were identified in each Health Board by collation of local and national data sets around the agreed education components. From this, local and national training priorities were identified for the nursing staff in each acute/integrated stroke unit. Support and facilitated training have been provided, particularly in those Health Boards without a local stroke education facilitator. Data for stroke education for the SSCA 2017 are now based on figures from the stroke education template submitted by each Health Board that accurately represent staff trained. Prior to this, data for education were self-reported. An in-depth understanding of stroke education nationally, as a result of this post, has also led to implementation of more appropriate benchmarking criteria detailed below.

Benchmarking criteria for SSCA priority 4 – trained workforce

Core training areas are defined as swallow screen, Stroke/Thrombolysis and TIA training (STAT), Intermittent Pneumatic Compression (IPC) and Core competencies.

Benchmarking criteria

Black – no process or pathway in place

Red – available but not implemented, 3 or more than 3 core areas are ‘red’ (‘red’ is defined as <50% of staff trained) STAT will be discounted as a ‘red’ area for stroke unit staff if STAT training is evidenced for appropriate staff along the pathway. So if thrombolysis is delivered at the front door (e.g. A&E, Emergency Receiving Unit) and training is prioritised to front door staff, this should be documented as the pathway and evidence of training provided, in terms of numbers/ percentage of front door staff STAT trained. STAT training would then ideally be extended to stroke unit staff)

Amber – plan to implement or partially implement, 2 or more core areas are ‘red’ (‘red’ is defined as <50% of staff trained)

Green – implemented but not consistently delivered, 1 core area ‘red’, or all core areas are delivered, (i.e. no core areas are red) (‘red’ is defined as <50% of staff trained)

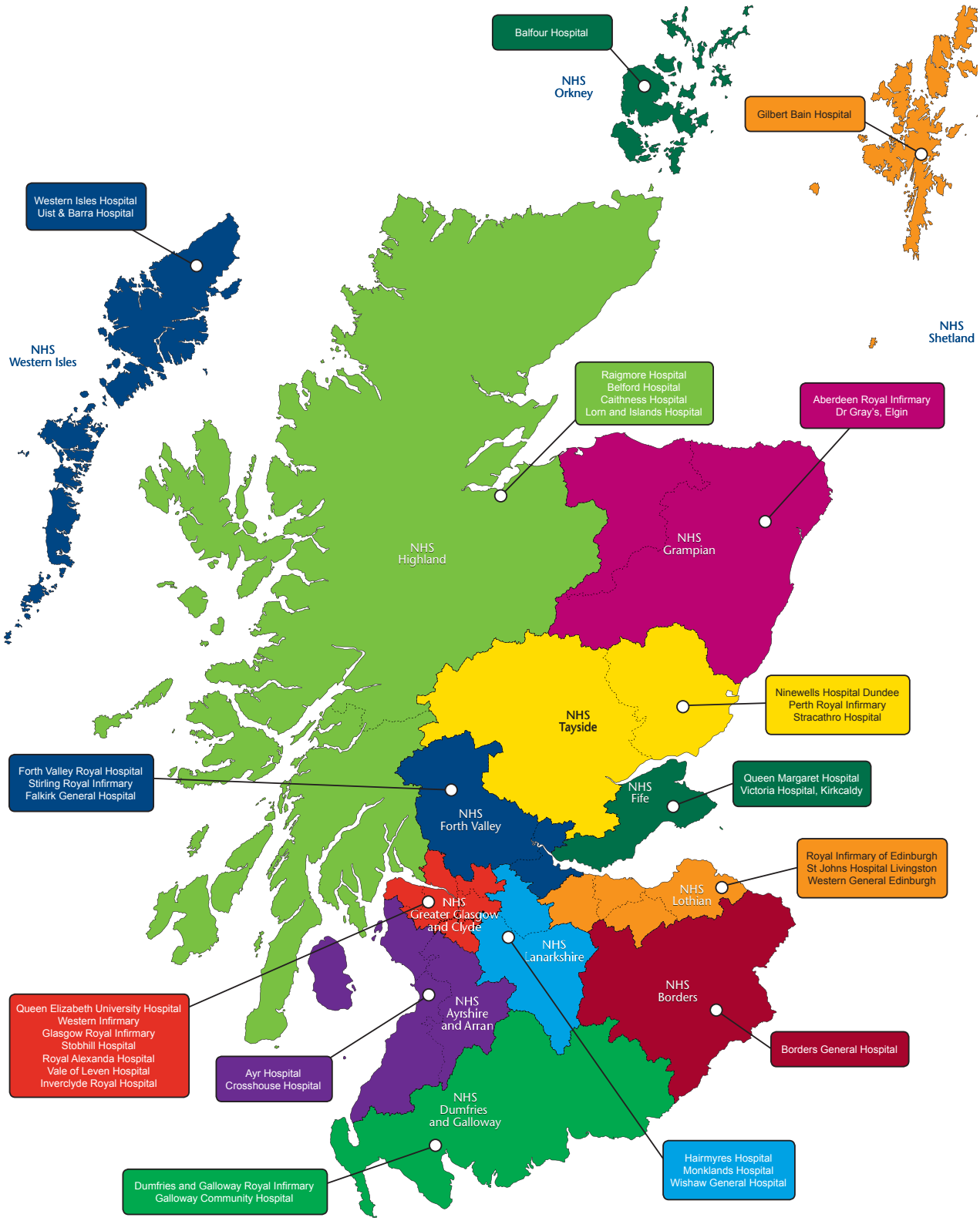
Blue – complete and embedded in practice, whole stroke education template achieved and evidenced

See Appendix C for further information on the education template. In March 2017 all territorial Health Boards in Scotland were reviewed in relation to the stroke education pathway and the results from this are illustrated below and on page 3 under Priority 4, Action 1.

Health Board	March 2017 Figures from Stroke Education Template (SET)
Ayrshire and Arran	Green
Borders	Green
Dumfries and Galloway	Green
Fife	Green
Forth Valley	Green
Grampian	Green
Greater Glasgow and Clyde	Amber
Highland	Amber
Lanarkshire	Blue
Lothian	Green
Orkney	Amber
Shetland	Red
Tayside	Green
Western Isles	Green

2 Scottish Stroke Care Audit

Map of Scotland showing all hospitals in NHS Boards contributing to the Scottish Stroke Care Audit



2.1 This Report

Stroke is a key health issue for the people of Scotland and the Scottish NHS. It is the third commonest cause of death in Scotland and the most common cause of severe physical disability amongst Scottish adults. More than 9000 stroke patients were discharged from Scottish hospitals in 2016. Stroke has a significant impact on NHS resources, accounting for approximately 5% of total NHS costs[7]. Societal costs are even higher. The economic cost of stroke to Scotland in terms of lost employment and the cost of support in the community are significant, whilst the impact on family members or friends who care for stroke survivors is massive.

There are interesting variations in the patients presenting with stroke depending on Health Board of residence (Table 1). For instance, in Glasgow, Ayrshire and Lanarkshire the majority of stroke admissions live in areas of higher deprivation. This is a different pattern from much of the rest of Scotland. Glasgow, Fife and Lanarkshire have a younger stroke population with a higher proportion of patients under the age of 60. These factors may represent particular social challenges and indicate a greater need in these areas, for instance for access to vocational rehabilitation. Table 1 also includes details on case mix. Case mix describes factors which may influence the chances of a stroke patient recovering well or surviving after their stroke. The raw data here may not be easy to interpret, but these figures can potentially be used to help compare outcomes between different health boards or even countries.

Table 1: Numbers of stroke patients by age, sex, case mix, deprivation category and NHS board of residence, 2016 data (final diagnosis)

NHS Board of Residence	Confirmed Strokes admitted during 2016	Crude rate per 100,000 residents	Mean Age Males (years)	Mean Age Females (years)	Males	Ischaemic Strokes	Case Mix						Scottish Index of Multiple Deprivation				
							Independent in Activities of Daily Living?	Lived alone at normal place of residence?	Can talk at first assessment?	Oriented to time, place and person at first assessment?	Can lift both arms off the bed at first assessment?	Can walk without help from another person?	SIMD 1 (Most deprived)	SIMD 2	SIMD 3	SIMD 4	SIMD 5 (Least deprived)
							Percentage of Confirmed Strokes										
Total	**9 331**	***173***	**71**	**75**	*50*	*86*	*82*	*38*	*76*	*65*	*63*	*49*	*24*	*22*	*19*	*16*	*16*
Ayrshire & Arran	848	*229*	71	74	*55*	*87*	*81*	*36*	*80*	*72*	*62*	*48*	*35*	*26*	*16*	*10*	*13*
Borders	232	*203*	72	80	*54*	*83*	*78*	*42*	*67*	*50*	*67*	*59*	*6*	*19*	*34*	*34*	*7*
Dumfries & Galloway	233	*156*	74	75	*54*	*87*	*87*	*39*	*64*	*64*	*61*	*29*	*9*	*30*	*33*	*20*	*8*
Fife	727	*196*	71	74	*50*	*88*	*82*	*35*	*84*	*63*	*67*	*44*	*23*	*26*	*22*	*16*	*12*
Forth Valley	506	*166*	71	75	*51*	*90*	*83*	*35*	*78*	*71*	*49*	*38*	*19*	*28*	*17*	*20*	*16*
Grampian	764	*130*	72	77	*52*	*85*	*84*	*39*	*70*	*65*	*58*	*41*	*6*	*19*	*21*	*27*	*28*
Greater Glasgow & Clyde	2 086	*180*	69	74	*49*	*87*	*81*	*39*	*78*	*66*	*72*	*67*	*44*	*17*	*13*	*11*	*16*
Highland	548	*170*	73	76	*47*	*85*	*80*	*38*	*74*	*65*	*55*	*41*	*7*	*25*	*35*	*25*	*9*
Lanarkshire	1 039	*158*	69	74	*51*	*86*	*79*	*34*	*74*	*64*	*66*	*54*	*30*	*31*	*18*	*12*	*8*
Lothian	1 365	*155*	71	78	*49*	*82*	*83*	*39*	*77*	*58*	*64*	*39*	*16*	*24*	*17*	*15*	*28*
Orkney	35	*160*	74	73	*43*	*74*	*91*	*29*	*69*	*71*	*43*	*46*	*0*	*17*	*34*	*43*	*6*
Shetland	37	*159*	75	82	*54*	*84*	*76*	*43*	*84*	*65*	*70*	*41*	*0*	*3*	*38*	*59*	*0*
Tayside	639	*154*	72	78	*47*	*84*	*84*	*39*	*79*	*72*	*52*	*38*	*17*	*19*	*23*	*26*	*15*
Western Isles	28	*104*	75	74	*46*	*89*	*71*	*46*	*64*	*39*	*50*	*39*	*0*	*21*	*75*	*4*	*0*
Outside Scotland/ Not Known/ Other	244	-	67	74	*59*	*84*	*87*	*33*	*76*	*69*	*62*	*47*	-	-	-	-	-

The evidence for the benefits of organised specialist stroke care in improving outcomes is clear. The Scottish Stroke Care Audit (SSCA) has been collecting information about stroke care since 2002 and now includes all hospitals managing acute stroke in Scotland. Since its inception the SSCA has helped to drive evidence-based improvements in stroke care which have contributed to falling mortality rates and improved outcomes for Scottish stroke patients.

The SSCA has moved its focus more towards service improvement and safety over the last few years. As improvements in performance against most of the Scottish Stroke Care Standards have occurred across Scotland, the focus has moved towards measuring stroke care ‘bundles’. Instead of measuring how an individual fares against any one stroke standard, bundles measure how that individual fares against all relevant Scottish Stroke Care Standards. Achieving this care bundle is associated with reduced mortality and increased likelihood of discharge to usual residence after[8].

Changes to the measurement of components of the Stroke Care Bundle this year (a new requirement for a swallow screen within 4 hours, as opposed to on the day of admission), means that we have no direct comparison with previous years' Stroke Care Bundle results. However, there have been significant improvements in time to stroke unit admission and percentage of stroke patients receiving a CT scan within 24 hours of admission over this time. Aspirin use within 1 day has been unchanged between the two years at 90%.

There remain areas of significant challenge:

The number of Scottish stroke patients receiving thrombolysis within 1 hour of hospital admission has improved from 51% to 55% but this is still a considerable distance from the Scottish Stroke Care Standard of 80%.

For Carotid Endarterectomy, there has again been modest (41%to 45%) improvement in performance against the 14 day Scottish Stroke Care Standard of 80%. Changes are planned to the reporting of this standard, to better reflect acute hospital performance, in next year's report.

Innovative service redesign is required in both these areas to improve patient care.

2.2 Scottish Stroke Care Bundle

The national standards are recommended by the SSCA steering committee and ratified by the National Advisory Committee for Stroke. The standards should not be used to guide the care of individual patients since there may be very legitimate reasons for NOT treating a patient according to the standard. The standards are used to assess the performance of stroke services, at a Scotland wide, Health Board or individual hospital level, not at the level of the individual patients.

Scottish Stroke Care Standards Implemented 1st April 2016 (Following review of Scottish Stroke Care Standards 2013)

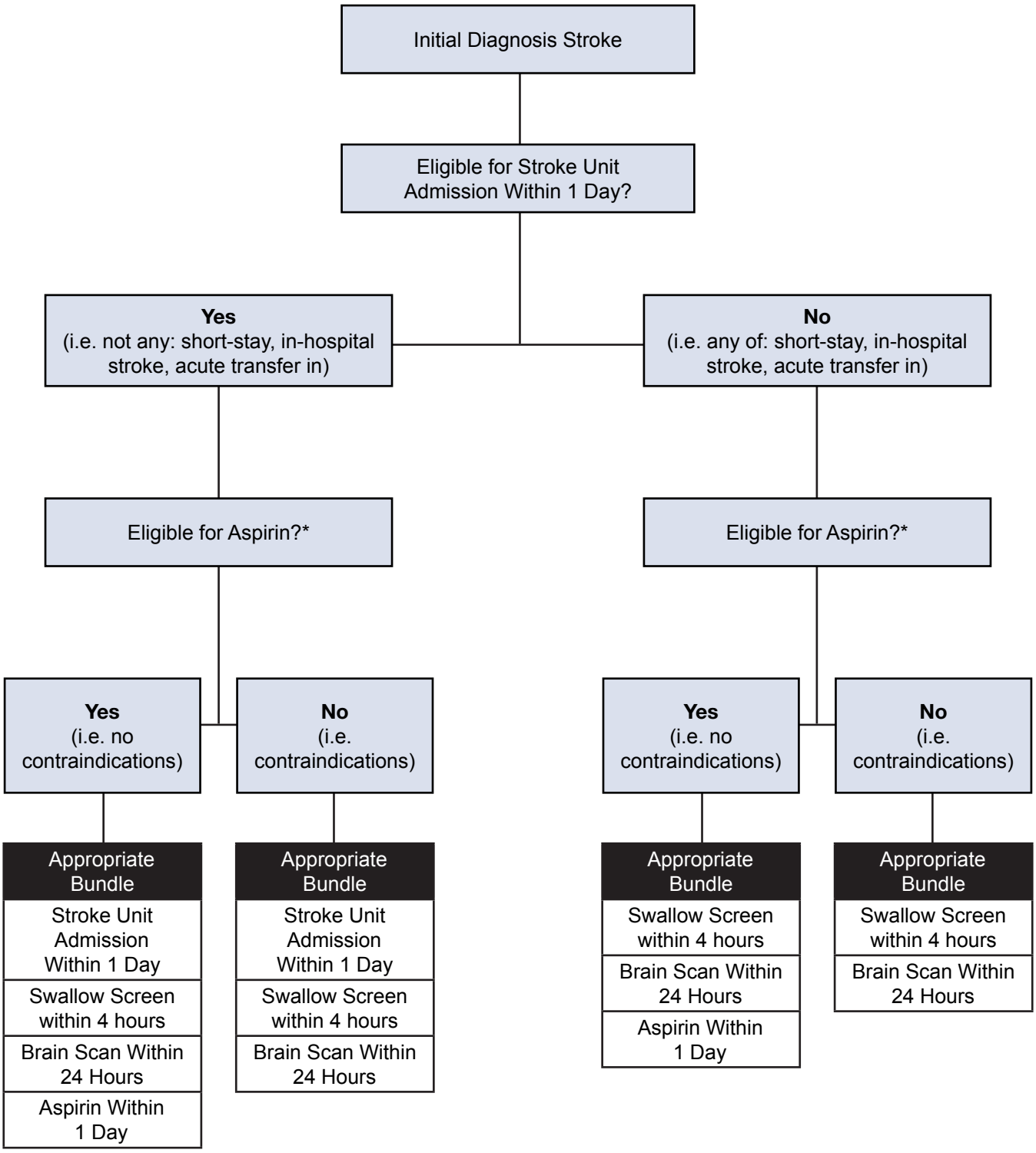
Topic	Standard
Access to Stroke Unit	90% within 1 day of admission (Day 0 and 1).
Brain imaging	95% within 24 hours of admission.
Swallow screen	100% within 4 hours of arrival at hospital
Aspirin administration	95% of ischaemic strokes within 1 day of admission (Days 0 and 1).
Delay from receipt of referral to specialist stroke/TIA clinic	80% are assessed within 4 days of receipt of referral (Day 0 being day of receipt of referral).
Thrombolysis	50% of patients receive the bolus within 30 mins of arrival. 80% of patients receive the bolus within one hour of arrival.
Carotid Intervention	80% undergoing carotid endarterectomy for symptomatic carotid stenosis have the operation within 14 days of the event that first led them to seek medical assistance.

The standards are set at a level which aims to be both challenging but potentially achievable by some hospitals. This is done to encourage improvements in performance. Once a standard is routinely exceeded by all hospitals then it is likely that the SSCA committee will recommend that the standard is raised, or if already at an ideal level, it may actually be removed from the audit. It is therefore inevitable that many stroke services will not meet some of the standards. Stroke services need to use appropriate Quality Improvement methods to optimise their own performance. The audit aims to focus its resources on those areas where improvement will enhance patient outcomes and experience.

Comparisons between 2015 – 2016:

Scottish Stroke Care Standard/ clinical area	2015 data	2016 data
Percentage admitted to a Stroke Unit within 1 day of admission	78	82
Percentage with swallow screen within 4 hours	N/A	72
Percentage with brain scan within 24 hours	91	93
Percentage of ischaemic stroke given aspirin within 1 day of admission	90	90
Percentage seen at specialist stroke/TIA clinic within 4 days of receipt of referral	83	82
Percentage thromboylsed within 30 mins of arrival at hospital	N/A	10
Percentage thrombolysed within one hour of arrival at hospital	51	55
Percentage receiving carotid intervention within 14 days of the event	41	45

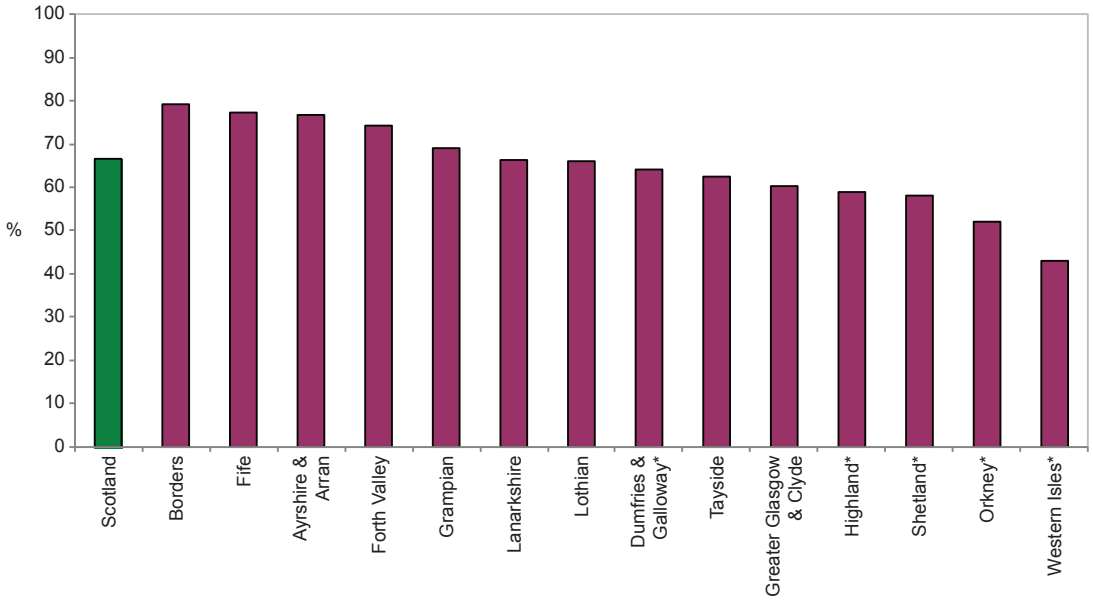
Figure 1 : Scottish Stroke Care Bundle flowchart



* Thrombolysed patients were removed from the aspirin calculation because it was recognised that aspirin use may be delayed up to 48 hours post thrombolysis to ensure there have been no ill effects from the thrombolysis.

Chart 1b : (Health Board) Percentage of stroke patients receiving an 'appropriate' Stroke Care Bundle (i.e. Stroke Unit admission, swallow screen, brain scan and aspirin) - indicative baseline performance, April - December 2016 data (based on *initial* diagnosis).

Note that the Scotland column in the chart is coloured dark green simply to differentiate it from the hospital columns and the colour is not indicative of performance.



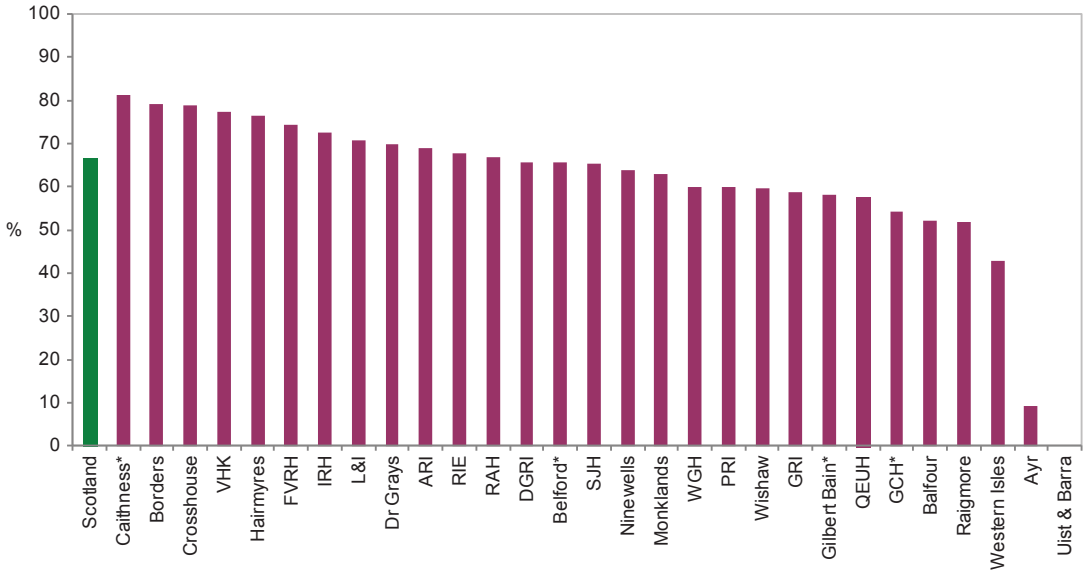
Notes regarding Chart 1b:

1. **A 'bundle' involves a group of specific interventions/ processes of care that significantly improve patient outcome if done together rather than separately and this also improves the consistency with which patients are managed.**
   The Stroke Care Bundle involves four components: admission to a Stroke Unit, swallow screen, brain scan and aspirin. Not all patients are eligible for all four components. An aspirin allergy, for example, would preclude the prescribing of aspirin, so the term 'appropriate' refers to patients receiving the components for which they were eligible. Figure 1 of this report describes the different categories of bundle depending on patients' eligibility.
   For the specific components, exclusions are as follows: (1) Stroke Unit admission excludes patients with in-hospital strokes, patients transferred in from another acute hospital or patients discharged within 1 day of admission to hospital (2) aspirin excludes patients with valid contraindications to aspirin and also those receiving a 'non-stroke' final diagnosis who are discharged within 1 day of admission to hospital. In measuring the proportion of patients receiving an 'appropriate' bundle, patients ineligible for, and therefore not receiving, specific components of the bundle are counted as having received their appropriate bundle provided they received the remaining components for which they were eligible.
2. Due to the number of beds within some hospitals in the Health Boards indicated (*) and the small numbers of stroke admissions to these hospitals **it is not practical to have a defined Stroke Unit**. We have confirmed however that a defined stroke pathway is in place in these hospitals and that the Scottish Stroke Care Standard criteria are established within that pathway.
3. **Uist & Barra Hospital, NHS Western Isles does not have a CT scanner** but patients are airlifted to Western Isles Hospital and a proportion may arrive in sufficient time to have brain imaging within 24 hours of admission.

Chart 1c : (Hospital) Percentage of stroke patients receiving an 'appropriate' Stroke Care Bundle (i.e. Stroke Unit admission, swallow screen, brain scan and aspirin), April - December 2016 data (based on *initial* diagnosis).

* The Scottish Stroke Care Standard for swallow screen within 4 hours was introduced from April 2016 and complete data are unavailable prior to this date because swallow screen time was only recorded from April 2016. Prior to April 2016 only swallow screen date was recorded.

Note that the Scotland column in the chart is coloured dark green simply to differentiate it from the hospital columns and the colour is not indicative of performance.



Notes regarding Chart 1c:

1. **A 'bundle' involves a group of specific interventions/ processes of care that significantly improve patient outcome if done together rather than separately and this also improves the consistency with which patients are managed.**
   The Stroke Care Bundle involves four components: admission to a Stroke Unit, swallow screen, brain scan and aspirin. Not all patients are eligible for all four components. An aspirin allergy, for example, would preclude the prescribing of aspirin, so the term 'appropriate' refers to patients receiving the components for which they were eligible. Figure 1 of this report describes the different categories of bundle depending on patients' eligibility.
   For the specific components, exclusions are as follows: (1) Stroke Unit admission excludes patients with in-hospital strokes, patients transferred in from another acute hospital or patients discharged within 1 day of admission to hospital (2) aspirin excludes patients with valid contraindications to aspirin and also those receiving a 'non-stroke' final diagnosis who are discharged within 1 day of admission to hospital. In measuring the proportion of patients receiving an 'appropriate' bundle, patients ineligible for, and therefore not receiving, specific components of the bundle are counted as having received their appropriate bundle provided they received the remaining components for which they were eligible.
2. Due to the number of beds within some hospitals in the Health Boards indicated (*) and the small numbers of stroke admissions to these hospitals **it is not practical to have a defined Stroke Unit**. We have confirmed however that a defined stroke pathway is in place in these hospitals and that the Scottish Stroke Care Standard criteria are established within that pathway.
3. **Uist & Barra Hospital, NHS Western Isles does not have a CT scanner** but patients are airlifted to Western Isles Hospital and a proportion may arrive in sufficient time to have brain imaging within 24 hours of admission.

3 Inpatients

During 2016 over 9000 patients were admitted to hospital with a final diagnosis of stroke and entered into the SSCA – a similar number to 2015 (Table 1). The characteristics of the patients admitted to hospital with a confirmed stroke are shown in Table 1. About 86% of patients had ischaemic strokes, 13% had haemorrhagic strokes and the remainder were of uncertain type. There were similar numbers of men and women and the mean age of patient was about 71 years for men and 75 years for women although this varied across Health Boards. Where the average age was lower, for instance in Greater Glasgow & Clyde and Lanarkshire, the percentage of stroke patients in the Scottish Index of Multiple Deprivation (SIMD) categories of 1 and 2 (greater deprivation) were highest. This reflects the known association between social deprivation and risk of stroke and underlines efforts to reduce variation in social deprivation as a key method to reduce the impact of stroke on the population.

The variations in case mix between health boards observed in previous years persist, but are perhaps less marked. This may reflect work done in the last year to reduce variation in coding of the case mix indicators, in particular those relating to ability to walk. Remaining differences probably reflect the different populations, provision of services and admission rates. For instance, in Glasgow, patients with minor stroke are often admitted for a short time, rather than being assessed in a clinic.

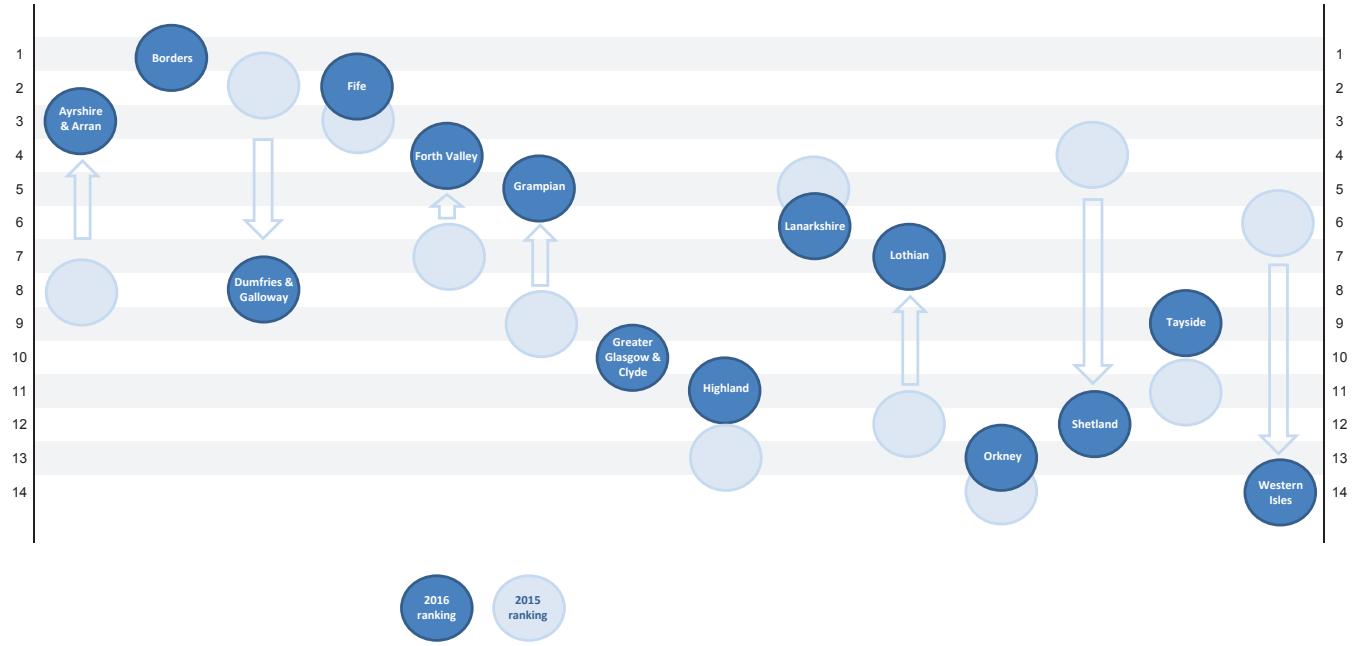
Table 2 shows the number of patients discharged from each hospital, along with the availability of specialist stroke unit beds in that hospital. Currently only Glasgow Royal Infirmary have adopted the Hyperacute Stroke Unit (HASU) model (i.e. a small number of beds with a very short length of stay aimed to facilitate early assessment, diagnosis and treatment before moving the patient on to another ward). Most hospitals have an integrated stroke unit which aims to provide both acute care and ongoing rehabilitation. Other hospitals separate the phases of care between acute and rehabilitation units, with the latter being either on the same, or a different hospital site.

3.1 Summary and key findings relating to inpatient data

The most important indicator of the performance of stroke services within a Health Board or hospital is their performance against the Stroke Care Bundle as described in Section 2.2.

The cumulative proportions of patients with an initial and final diagnosis of stroke managed in accordance with all four standards which comprise the Care Bundle is 67% and 61% respectively across Scotland. Performance varied considerably between Health Boards although the variation between the highest and lowest performing has reduced which is encouraging. No health board yet exceeds the 80% standard set in 2016. Because of the change to the swallowing standard we cannot directly compare the performance in 2016 with that in previous years. Chart N3 shows the ranking of the performance of NHS boards, and the change in ranking from 2015 to 2016 based on patients with both an initial and final diagnosis of stroke (i.e. highest = 1st, 2nd, 3rd etc). Borders has ranked highest in both years for patients with an initial and final diagnosis, but many other health boards have seen improvement and worsening in their ranking related to other NHS Boards. In previous years the NHS Boards including our major cities have been ranked low (9,10,11 & 12 in 2015) but this has improved in 2016 (5,7,9 & 10) which is important given the large numbers of patients managed by these hospitals.

Chart N3 Relative ranking of NHS board performance against inpatient bundle, 2015 and 2016 data (*initial* and *final* diagnosis).



Notes regarding Chart N3:

1. A 'bundle' involves a group of specific interventions/ processes of care that significantly improve patient outcome if done together rather than separately and this also improves the consistency with which patients are managed.
2. The Stroke Care Bundle involves four components: admission to a Stroke Unit, swallow screen, brain scan and aspirin. Not all patients are eligible for all four components. An aspirin allergy, for example, would preclude the prescribing of aspirin, so the term 'appropriate' refers to patients receiving the components for which they were eligible.
3. In measuring the proportion of patients receiving an 'appropriate' bundle, patients ineligible for, and therefore not receiving, specific components of the bundle are counted as having received their appropriate bundle provided they received the remaining components for which they were eligible.
4. The 'bundles' for 2015 and 2016 differ in terms of the swallow screen standard and are therefore not directly comparable with regard to bundle performance. The chart compares the relative rank of each NHS board in relation to other NHS boards for each year. In 2015 the swallow screen standard involved patients receiving their swallow screen on their day of admission. From April 2016, the standard was changed to measure those receiving a swallow screen within 4 hours of their admission to hospital.

The proportion of patients across Scotland, with a final diagnosis of stroke, who accessed a Stroke Unit on the day of admission, or the day after (82%), was significantly higher than in 2015 (78%) although below the standard of 90% (see chart 2a). This is important because early admission to a stroke unit has been associated with reduced likelihood of dying after a stroke. The only hospitals with defined stroke units to exceed the 90% standard were Crosshouse and Inverclyde Hospitals. Early access to stroke unit care has improved significantly in the Forth Valley Royal Hospital and the Royal Infirmary of Edinburgh. The apparent marked deterioration in the performance of Ayr hospital reflects a service reorganisation which means most patients in Ayrshire and Arran are admitted to Crosshouse, with very few going to Ayr Hospital. Small hospitals, such as those on the islands and in rural health boards perform well against this standard because their only medical ward fulfils our definition of a Stroke Unit although their poor performance against the bundle suggests that they are struggling to deliver other important aspects of stroke care (Chart N3).

For larger hospitals the standard is more challenging because stroke patients may be boarded and Stroke Unit beds may be filled with non-stroke patients during periods of high bed demand. The number of Stroke Unit beds is an important determinant of performance but it is clear that there is considerable variation in how well hospitals manage their stroke beds. It is still evident that the priority attached to achieving this important standard varies.

After a patient has been identified as having a possible stroke, a swallow assessment should be done early to allow the patient to receive oral medication, and to take food and fluids safely. In April 2016 a

revised standard was introduced that all patients should have a swallow screen within four hours of admission. Analyses of outcomes in the The Sentinel Stroke National Audit Programme (SSNAP) audit showed that the greater the delay to swallow screen the higher the risk of stroke associated[9]. The result of this swallow assessment needs to be clearly recorded to ensure that patients who cannot swallow safely are not put at risk of aspiration with potentially fatal consequences. Chart 2B shows the proportion of patients with a final diagnosis of stroke in Scotland who had a swallow screen within 4 hours of admission, with hospitals ranked from highest to lowest. Overall, 72% of patients were treated in accordance with this more challenging standard (i.e. had a swallow screen within 4 hours of arrival), with hospitals varying between 50% (Galloway Community Hospital) and 89% (Caithness). We cannot directly compare these data with those of previous years because of the change in swallow standard implemented in April 2016. Chart 3 shows the percentage of patients who had a swallow screen within 4, 12 and 24 hours of admission to give an indication of the margin by which hospitals are failing this standard.

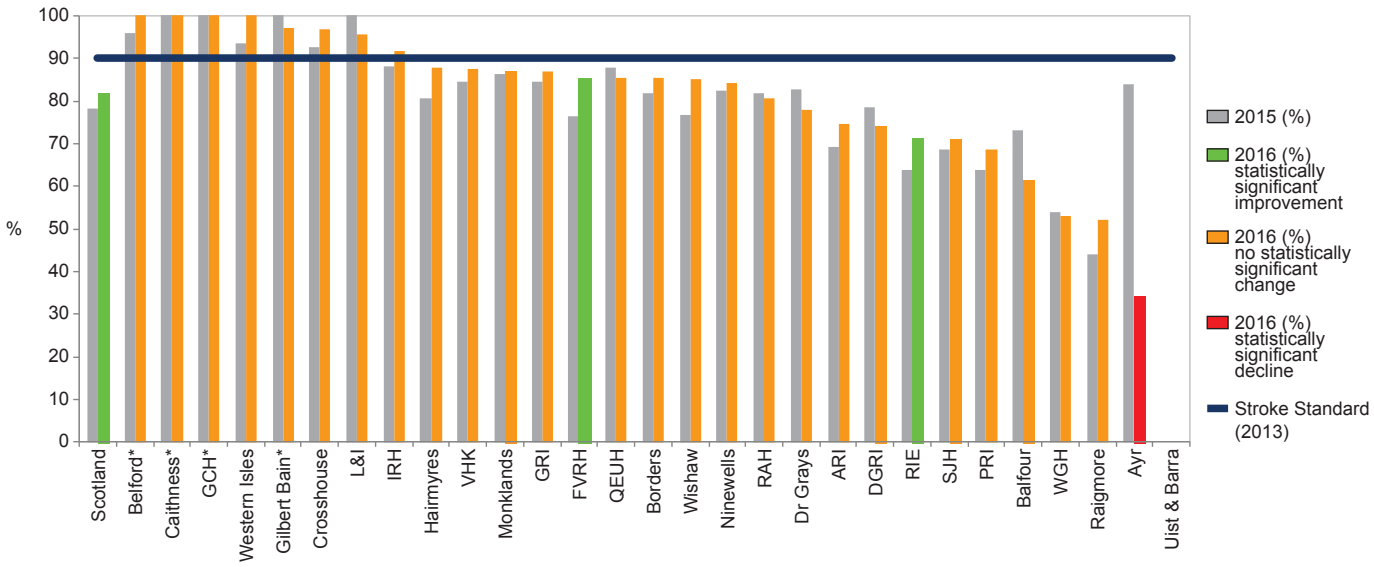
Early identification of stroke patients and having nurses trained to initiate a swallow screen and to record the result clearly in the notes in the A&E, medical assessment and Stroke Units is key to improving performance.

An early brain scan is required to exclude alternative causes of stroke symptoms, for example, brain tumours, and to distinguish strokes due to bleeding into the brain from those due to blocked arteries. This is important to allow thrombolysis, anticoagulants and antiplatelet drugs to be given safely. In 2016 the standard for brain scanning was made more challenging – 95%, rather than 90% to have a brain scan within 24 hours of admission. In 2016, 93% of patients across Scotland with a final diagnosis of stroke had a brain scan within 24 hours compared with 91% in 2015, a statistically significant improvement (Chart 2C). Seven of the 28 hospitals met or exceeded the new standard. In two hospitals there were statistically significant increases from 2015 in the percentage having a brain scan within 24 hours - Glasgow Royal Infirmary (88% to 94%) and Crosshouse (87% to 93%). The proportion being scanned within 4 hours of arrival rose from 56% in 2015 to 57% in 2015. Increases in the very early scanning of stroke patients will hopefully increase the numbers of patients who can benefit from thrombolysis and thrombectomy, and also reduce the delays to treatment (see Section 6).

Once a brain scan has excluded a bleed into the brain, patients should receive aspirin as soon as possible since this has been shown to improve outcomes. Exceptions are those who have been given thrombolysis, are taking an anticoagulant or an alternative antiplatelet drug or those who are allergic to aspirin. The standard for 2016 onwards is that 95% of patients without contraindications should receive aspirin on the day of admission, or the day after. In 2016, 90% of patients with a final diagnosis of ischaemic stroke, and no well-defined contraindication, received aspirin on the day of admission or the day after.

Chart 2a: Percentage of stroke patients admitted to a Stroke Unit within 1 day of admission to hospital, 2015 and 2016 data (based on *final* diagnosis).

Horizontal line reflects Scottish Stroke Care Standard (2013) of 90% of stroke patients admitted to a Stroke Unit within 1 day of admission.



Notes regarding Chart 2a:

1. **The denominator for the admission to Stroke Unit excludes**: in-hospital strokes, patients discharged within 1 day and transfers in from another hospital.
2. Due to the number of beds within some of the hospitals indicated (*) and the small numbers of stroke admissions to these hospitals **it is not practical to have a defined Stroke Unit**. We have confirmed however that a defined stroke pathway is in place in these hospitals and that the Scottish Stroke Care Standards criteria are established within that pathway.
3. **The data included in chart 2a were extracted from eSSCA on the 23rd March 2017.** Changes/ updates to the data following this date will therefore not feature in this analysis. The data relate to patients with final diagnosis of stroke and are for **calendar years 2015 and 2016** (i.e. 1 January - 31 December).
4. In some instances, **data entered into eSSCA are assigned to admitting hospitals other than the main acute hospitals** participating in the Scottish Stroke Care Audit. Data for these hospitals are combined with data for their respective main acute hospitals.
5. During 2016, NHS Ayrshire & Arran reorganised its services for acute stroke patients, transferring to Crosshouse Hospital the services previously provided in Ayr Hospital.

Chart 2b: Percentage of stroke patients with a swallow screening within 4 hours of admission, April - December 2016 data (based on *final* diagnosis).

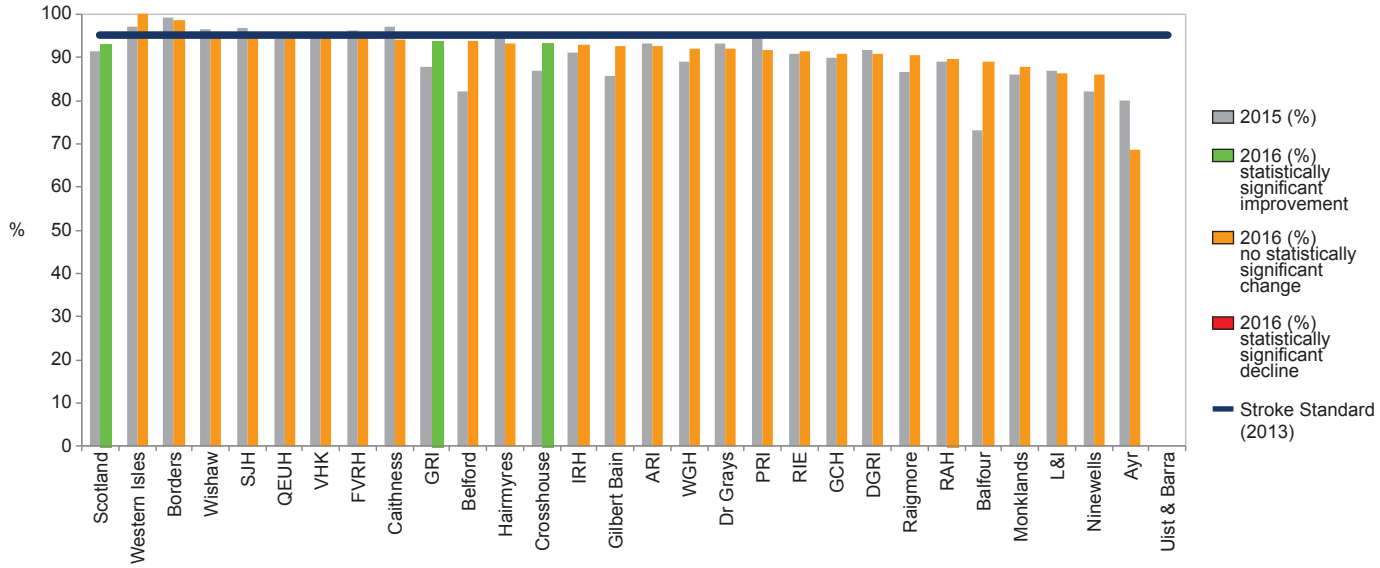
Horizontal line reflects Scottish Stroke Care Standard (2016) of 100% of stroke patients swallow screened within 4 hours of admission.
* The Scottish Stroke Care Standard for swallow screen within 4 hours was introduced from April 2016 and complete data are unavailable prior to this date because swallow screen time was only recorded from April 2016. Prior to April 2016 only swallow screen date was recorded.

Notes regarding Chart 2b:

1. **The data included in chart 2b were extracted from eSSCA on the 23rd March 2017.** Changes/ updates to the data following this date will therefore not feature in this analysis. The data relate to patients with ***final*** diagnosis of stroke and are for the nine month period 1 April - 31 December **in years 2015 and 2016**).
2. In some instances, **data entered into eSSCA are assigned to admitting hospitals other than the main acute hospitals** participating in the Scottish Stroke Care Audit. Data for these hospitals are combined with data for their respective main acute hospitals.
3. During 2016, NHS Ayrshire & Arran reorganised its services for acute stroke patients, transferring to Crosshouse Hospital the services previously provided in Ayr Hospital.

Chart 2c: Percentage of stroke patients with a brain scan within 24 hours of admission, 2015 and 2016 data (based on *final* diagnosis).

Horizontal solid line reflects Scottish Stroke Care Standard (2016) of 95% of stroke patients to receive brain imaging within 24 hours of admission.

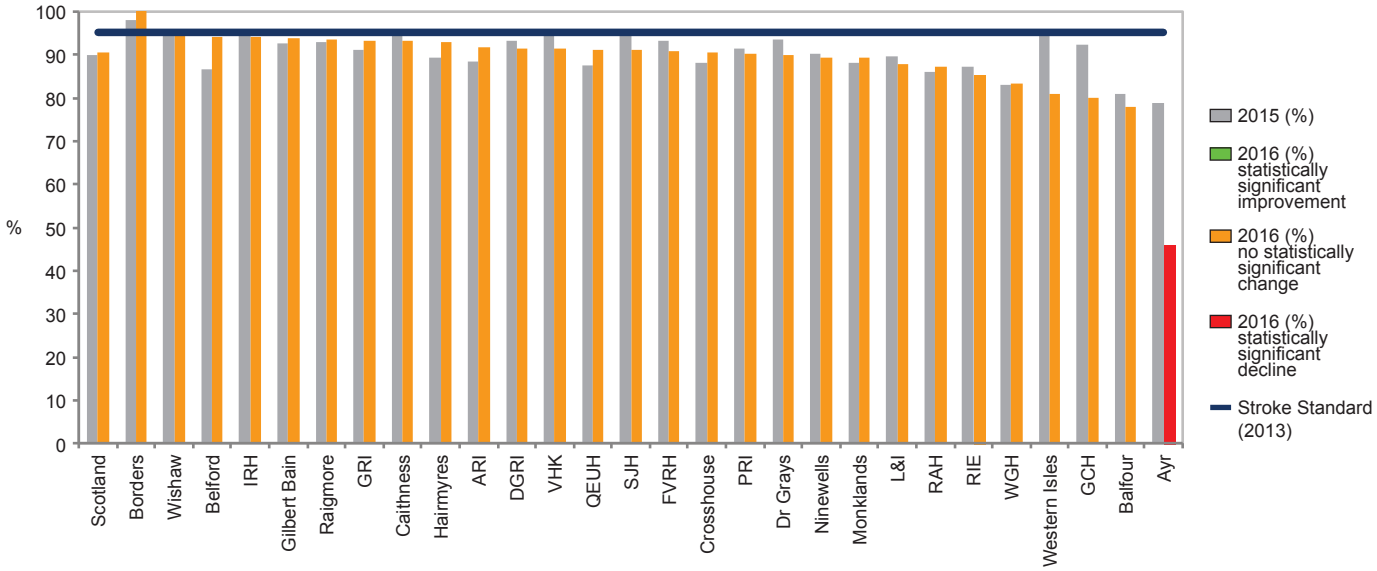


Notes regarding Chart 2c:

1. Balfour Hospital, NHS Orkney, implemented a CT scanning service during 2015. Prior to the introduction of this service, patients were airlifted to Aberdeen Royal Infirmary and a proportion may have arrived in sufficient time to have brain imaging within 24 hours of admission. This should be borne in mind when comparing brain imaging performance for NHS Orkney between 2015 and 2016.
2. **Uist & Barra Hospital, NHS Western Isles does not have a CT scanner** but patients are airlifted to Western Isles Hospital and a proportion may arrive in sufficient time to have brain imaging within 24 hours of admission.
3. **The data included in chart 2c were extracted from eSSCA on the 23rd March 2017.** Changes/ updates to the data following this date will therefore not feature in this analysis. The data relate to patients with ***final*** diagnosis of stroke and are for **calendar years 2015 and 2016** (i.e. 1 January - 31 December).
4. In some instances, **data entered into eSSCA are assigned to admitting hospitals other than the main acute hospitals** participating in the Scottish Stroke Care Audit. Data for these hospitals are combined with data for their respective main acute hospitals.
5. During 2016, NHS Ayrshire & Arran reorganised its services for acute stroke patients, transferring to Crosshouse Hospital the services previously provided in Ayr Hospital.

Chart 2d: Percentage of acute ischaemic stroke patients given aspirin in hospital within 1 day of admission, 2015 and 2016 data (based on *final* diagnosis).

Horizontal solid line reflects Scottish Stroke Care Standard (2013) of 95% of stroke patients to receive brain imaging within 24 hours of admission.



Notes regarding Chart 2c:

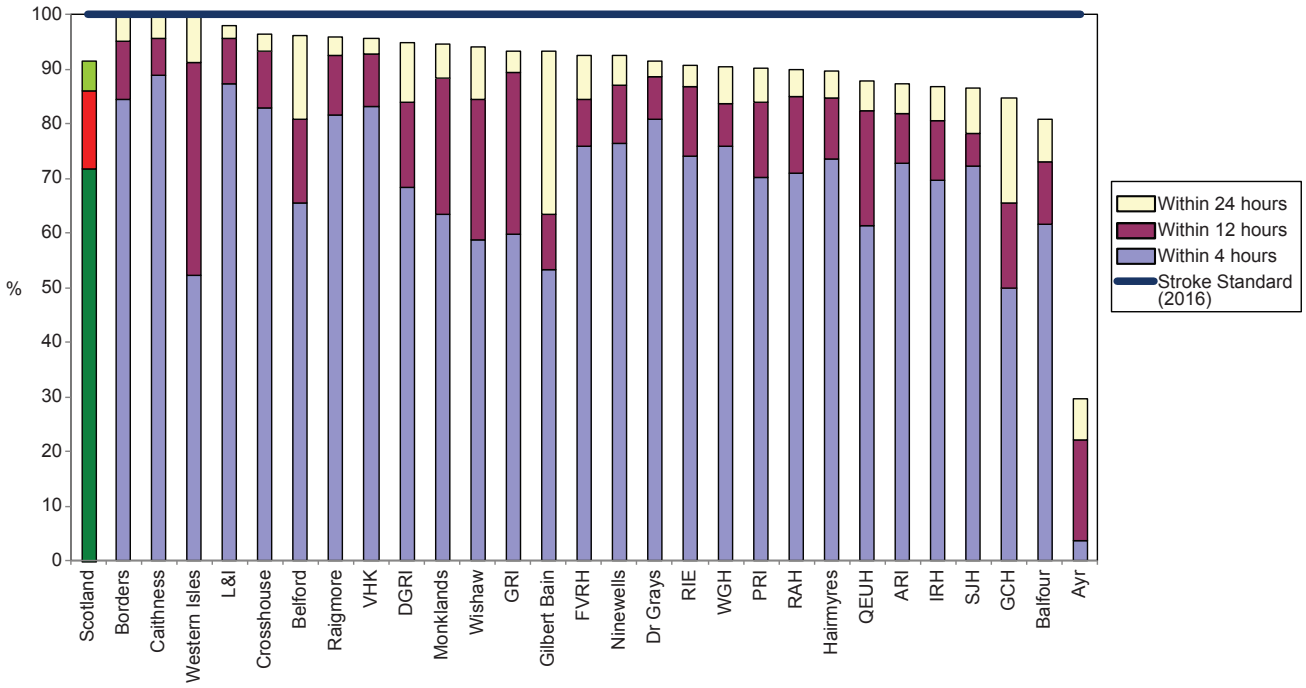
1. Balfour Hospital, NHS Orkney, implemented a CT scanning service during 2015. Prior to the introduction of this service, patients were airlifted to Aberdeen Royal Infirmary and a proportion may have arrived in sufficient time to have brain imaging within 24 hours of admission. This should be borne in mind when comparing brain imaging performance for NHS Orkney between 2015 and 2016.
2. **Uist & Barra Hospital, NHS Western Isles does not have a CT scanner** but patients are airlifted to Western Isles Hospital and a proportion may arrive in sufficient time to have brain imaging within 24 hours of admission.

Chart 3: Percentage of stroke patients with a swallow screen by number of hours to swallow screen, April - December 2016 data (based on *final* diagnosis).

Horizontal solid line reflects Scottish Stroke Care Standard (2016) of 100% of stroke patients to receive a swallow screen within 4 hours of admission.

* The Scottish Stroke Care Standard for swallow screen within 4 hours was introduced from April 2016 and complete data are unavailable prior to this date because swallow screen time was only recorded from April 2016. Prior to April 2016 only swallow screen date was recorded.

Note that the Scotland column in the chart is coloured light green and dark green simply to differentiate it from the hospital columns and the colours are not indicative of performance. Light green corresponds to 'Within 24 Hours' and dark green corresponds to 'Within 4 Hours'.



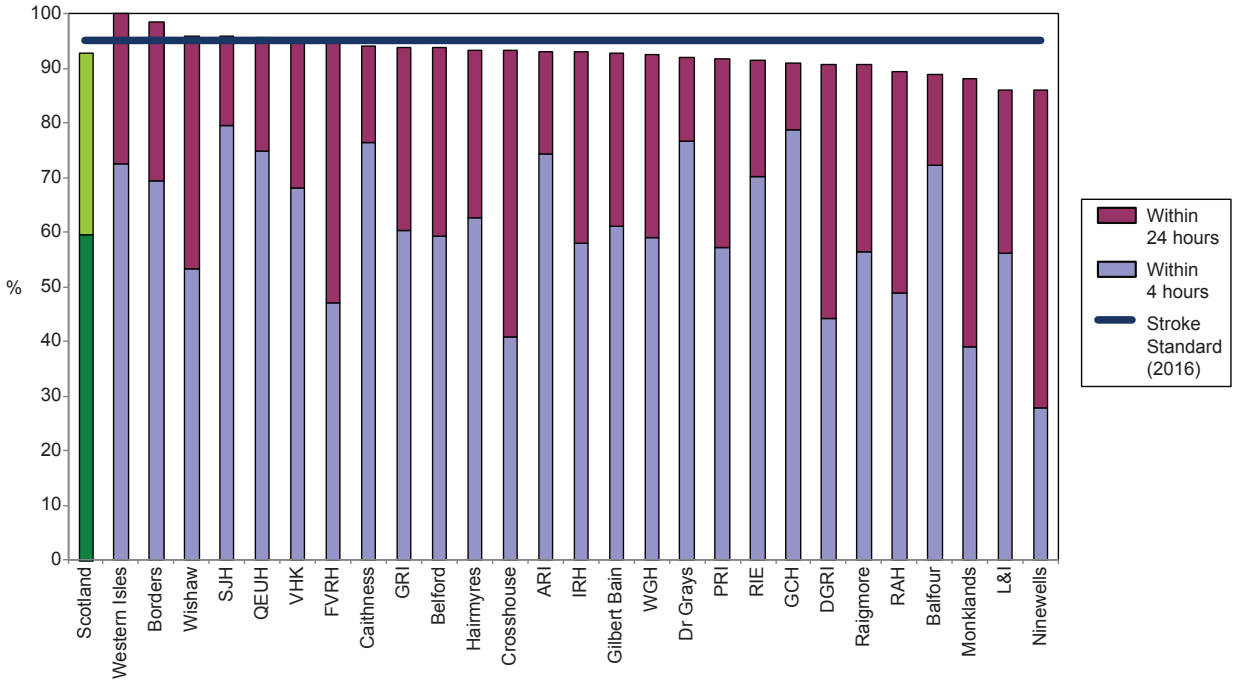
Notes regarding Chart 3:

1. The **data included in chart 3 were extracted from eSSCA on the 23rd March 2017**. Changes/ updates to the data following this date will therefore not feature in this analysis. The data relate to patients with final diagnosis of stroke and are for the nine month period 1 April - 31 December 2016).
2. In some instances, **data entered into eSSCA are assigned to admitting hospitals other than the main acute hospitals** participating in the Scottish Stroke Care Audit. Data for these hospitals are combined with data for their respective main acute hospitals.
3. During 2016, NHS Ayrshire & Arran reorganised its services for acute stroke patients, transferring to Crosshouse Hospital the services previously provided in Ayr Hospital.
4. The denominator for Chart 3 differs slightly from that of Chart 2b with regard to patients who have a stroke whilst already in hospital. Chart 3 includes those patients where it is definitely known that they did not wake from sleep with symptoms of stroke. Chart 2b excludes those patients where it is definitely known that they did wake from sleep with the symptoms of stroke. The latter approach includes a small proportion of patients where there is some ambiguity about whether they did or did not wake from sleep with the symptoms of stroke.

Chart 4: Percentage of stroke patients with a brain scan by number of hours to scan, 2016 data (based on *final* diagnosis).

Horizontal solid line reflects Scottish Stroke Care Standard (2016) of 95% of stroke patients to receive a brain scan within 24 hours of admission.

Note that the Scotland column in the chart is coloured light green and dark green simply to differentiate it from the hospital columns and the colours are not indicative of performance. Light green corresponds to 'Within 24 Hours' and dark green corresponds to 'Within 4 Hours'.



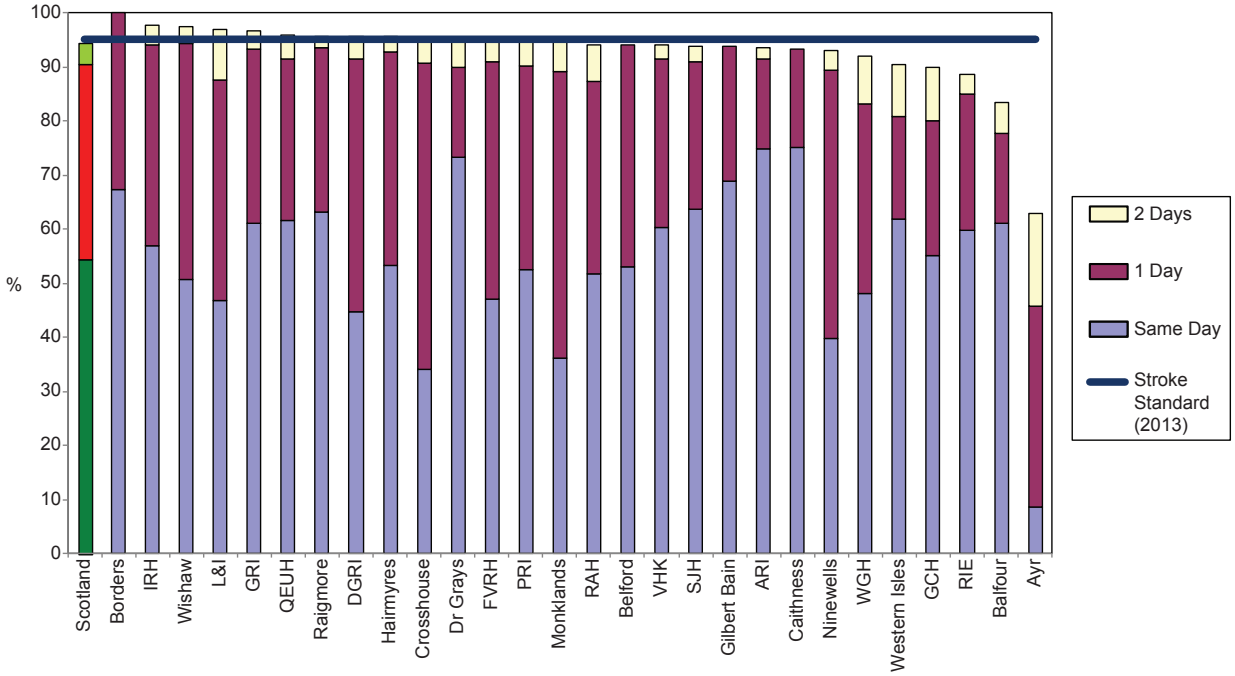
Notes regarding Chart 4:

1. In some instances, data entered into eSSCA are assigned to admitting hospitals other than the main acute hospitals participating in the Scottish Stroke Care Audit. Data for these hospitals are combined with data for their respective main acute hospitals.
2. During 2016, NHS Ayrshire & Arran reorganised its services for acute stroke patients, transferring to Crosshouse Hospital the services previously provided in Ayr Hospital.
3. The denominator for Chart 4 differs slightly from that of Chart 2c with regard to patients who have a stroke whilst already in hospital. Chart 4 includes those patients where it is definitely known that they did not wake from sleep with symptoms of stroke. Chart 2c excludes those patients where it is definitely known that they did wake from sleep with the symptoms of stroke. The latter approach includes a small proportion of patients where there is some ambiguity about whether they did or did not wake from sleep with the symptoms of stroke.

Chart 5: Percentage of acute ischaemic stroke patients given aspirin in hospital by number of days to receipt, 2016 data (based on *final* diagnosis).

Horizontal line reflects Scottish Stroke Care Standard (2013) of 95% of acute ischaemic stroke patients to receive aspirin within 1 day of admission.

Note that the Scotland column in the chart is coloured green and red simply to differentiate it from the hospital columns and the colours are not indicative of performance. Light green corresponds to '2 days', red corresponds to '1 day' and dark green corresponds to 'Same Day'.



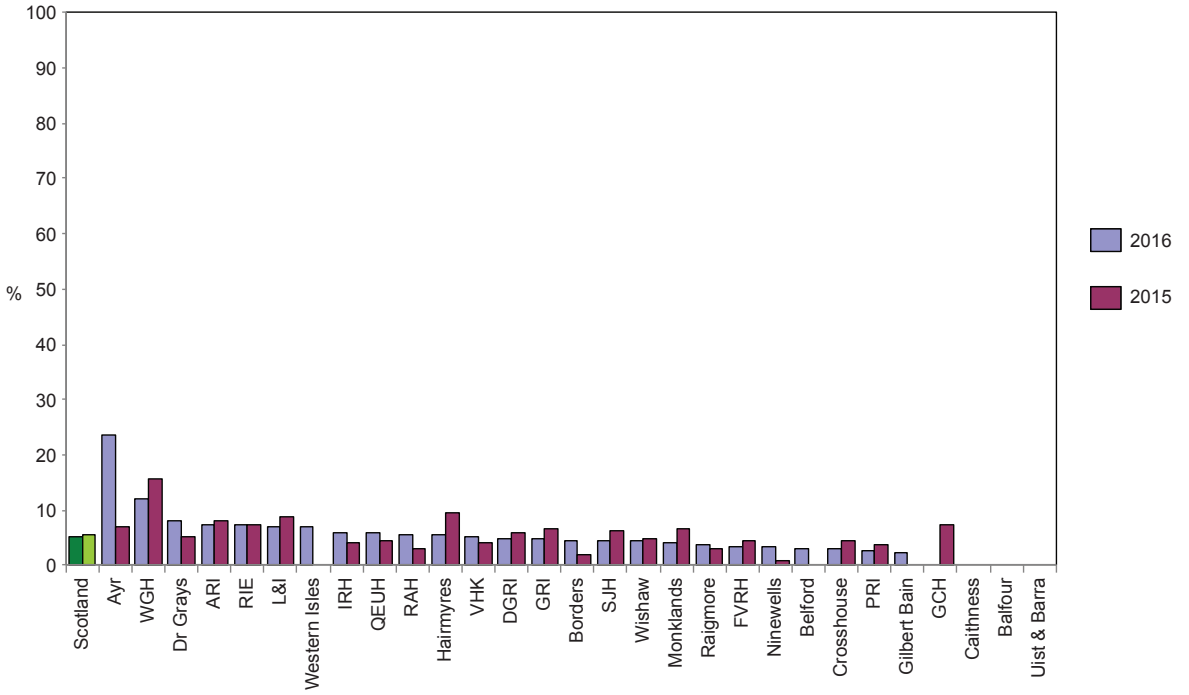
Notes regarding Chart 5:

1. In some instances, **data entered into eSSCA are assigned to admitting hospitals other than the main acute hospitals** participating in the Scottish Stroke Care Audit. Data for these hospitals are combined with data for their respective main acute hospitals.
2. The denominator for the percentages excludes patients with valid contraindications to aspirin.
3. During 2016, NHS Ayrshire & Arran reorganised its services for acute stroke patients, transferring to Crosshouse Hospital the services previously provided in Ayr Hospital.
4. The denominator for Chart 5 differs slightly from that of Chart 2d with regard to patients who have a stroke whilst already in hospital. Chart 5 includes those patients where it is definitely known that they did not wake from sleep with symptoms of stroke. Chart 2d excludes those patients where it is definitely known that they did wake from sleep with the symptoms of stroke. The latter approach includes a small proportion of patients where there is some ambiguity about whether they did or did not wake from sleep with the symptoms of stroke.

One group of patients in whom it is particularly challenging to meet the standards are the patients who have a stroke whilst an inpatient. Early recognition of the diagnosis is often difficult because patients may have the stroke whilst under anaesthetic, or during an intensive care admission, or on a background of complex co-morbidities. There are sometimes delays in referral to the stroke service. Chart N1 shows the proportion of patients with a final diagnosis of stroke. About 5% of strokes in Scotland occur whilst the patient is an inpatient but this varies between hospitals and probably reflects the services they provide.

Chart 1N: Comparison of *initial* diagnosis of stroke versus *final* diagnosis of stroke, 2016 data.

Note that the Scotland columns in the chart are coloured light green and dark green simply to differentiate them from the hospital columns and the colours are not indicative of performance. Light green corresponds to '2015' and dark green corresponds to '2016'.



Notes regarding Chart 14a:

1. Both initial diagnosis and final diagnosis may be recorded in the SSCA data relating, respectively, to whether a patient may be suspected of having had a stroke and whether the stroke diagnosis is confirmed on investigation. Chart 15a presents information on three groups of patients, those with:
   - an initial diagnosis of stroke i.e. possible stroke patients who may turn out to have another diagnosis once investigations are complete;
   - a final diagnosis of stroke i.e. patients confirmed as having had strokes when their initial diagnosis may have been considered as something else;
   - an initial diagnosis and final diagnosis of stroke i.e. patients suspected of having had a stroke who have this diagnosis confirmed on investigation.
2. In some instances, data entered into eSSCA are assigned to admitting hospitals other than the main acute hospitals participating in the Scottish Stroke Care Audit. Data for these hospitals are combined with data for their respective main acute hospitals.
3. During 2016, NHS Ayrshire & Arran reorganised its services for acute stroke patients, transferring to Crosshouse Hospital the services previously provided in Ayr Hospital.

There is considerable variation in performance against the individual Scottish Stroke Care Standards between hospitals. There is clearly scope for improving performance and SSCA continues to work with local teams to achieve this.

3.2 Stroke Unit Information

Table 2: Stroke Unit Information.

Hospital Name	Number of acute strokes discharged in 2016	Hyper Acute Stroke Unit (HASU) beds	Acute Stroke Unit (ASU) beds	Integrated Stroke Unit (ISU) beds	Stroke Rehabilitation Unit (SRU) beds on acute site	SRU beds off acute site	Comments (e.g. Off-site Locations)
Ayr Hospital	60	0	0	0	24	0	
Crosshouse Hospital, Kilmarnock	779	0	24	0	0	20	
Borders General Hospital, Melrose	225	0	0	12	0	0	
Dumfries & Galloway Royal Infirmary (DGRI)	205	0	0	9	0	0	DGRI - move to new hospital in December 2017 will see a 14 bedded acute stroke and rehab ward.
Galloway Community Hospital (GCH)	33	0	0	1	0	0	
Victoria Hospital, Kirkcaldy (VHK)	674	0	0	24	0	41	QMH Ward 6 - 15 beds within a general rehabilitation ward. Letham ward Cameron Hospital - 12 funded beds but currently operating 14 with increase to 15/16 beds as necessary (rehabilitation for over 65). Sir George Sharp Unit (rehabilitation for under 65) 6 to 7 out of 12 beds.
Forth Valley Royal Hospital, Larbert (FVRH)	521	0	0	30	0	10	
Aberdeen Royal Infirmary (ARI)	675	0	16	0	0	40	Currently operating as stroke unit with 8 additional winter ward beds and non stroke trained staff until end of March 2017. Woodend - SRU: 34beds. Fraserburgh - SRU: 6 beds.
Dr Gray's Hospital, Elgin	136	0	0	8	0	0	
Glasgow Royal Infirmary (GRI)	630	5	0	38	0	0	
Inverclyde Royal Hospital, Greenock (IRH)	198	0	0	17	0	0	
Queen Elizabeth University Hospital (QEUH), Glasgow	1 178	0	26	60	0	0	
Royal Alexandra Hospital, Paisley (RAH)	380	0	0	30	0	0	
Belford Hospital, Fort William	31	0	0	0	0	0	
Caithness General Hospital, Wick	65	0	0	0	0	0	
Lorn & Islands Hospital, Oban	60	0	0	6	0	0	
Raigmore Hospital, Inverness	315	0	0	22	0	0	
Hairmyres Hospital, East Kilbride	315	0	0	18	0	0	
Monklands Hospital, Airdrie	303	0	0	20	0	0	
Wishaw General Hospital	349	0	0	25	0	0	

Hospital Name	Number of acute strokes discharged in 2016	Hyper Acute Stroke Unit (HASU) beds	Acute Stroke Unit (ASU) beds	Integrated Stroke Unit (ISU) beds	Stroke Rehabilitation Unit (SRU) beds on acute site	SRU beds off acute site	Comments (e.g. Off-site Locations)
Royal Infirmary of Edinburgh at Little France (RIE)	961	0	0	44	0	0	SRU beds off site at Astley Ainslie Hospital.
St John's Hospital, Livingston (SJH)	278	0	0	22	0	0	
Western General Hospital, Edinburgh (WGH)	236	0	0	40	0	0	40 beds fulfilled definition of SU but shared with Medicine of the Elderly (MoE). From April 2017 planning to have a single integrated stroke ward for stroke.
Balfour Hospital, Orkney	30	0	0	0	0	0	No specific stroke beds but beds will be made available within Assessment and Rehabilitation Unit when needed.
Gilbert Bain Hospital, Shetland	40						
Ninewells Hospital, Dundee	477	0	18	0	0	10	Stracathro has 10 stroke rehab beds (has capacity for 12). CBIR, Royal Victoria Hospital has 10 beds for patients (16-65 yrs) with either brain injury or stroke. Plans are progressing to create a 14 bedded stroke rehab facility on Royal Victoria site.
Perth Royal Infirmary (PRI)	225	0	0	22	0	0	
Uist & Barra Hospital, Benbecula	1						
Western Isles Hospital (WIH)	26	0	0	6	0	0	
TOTALS	9 406	5	84	454	24	121	

Note regarding Table 2:

1. The column “Number of acute strokes discharged in 2016” is based on inpatients with a final diagnosis of stroke discharged during Jan-Dec 2016 and this cohort of patients differs slightly from the inpatient cohort reported upon elsewhere in this National Report. For inpatients, the report focuses principally on those patients with a final diagnosis of stroke admitted during Jan-Dec 2016. Some patients discharged in 2016 may have been admitted in 2015 or earlier. Some patients admitted in 2016 may have been discharged in 2017.

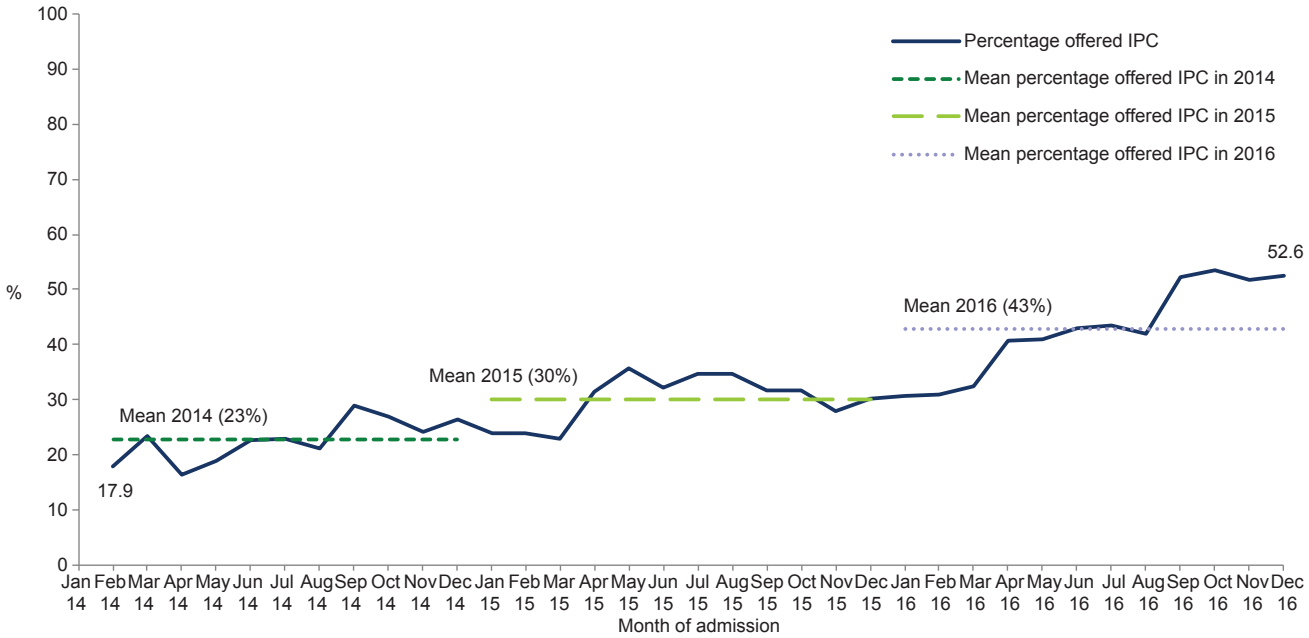
3.3 Intermittent Pneumatic Compression (IPC)

Patients admitted to hospital with stroke and who are unable to walk independently are at high risk of deep vein thrombosis (DVT) and pulmonary emboli (PE). These can be fatal. Recent large randomised trials[10,11] have shown that Intermittent Pneumatic Compression (IPC) reduces the risk of DVT and improves patients' chances of survival. Scottish Intercollegiate Guidelines Network (SIGN) The National Institute for Health and Care Excellence NICE and European guidelines now recommend that IPC should be considered in patients who are immobile after a stroke.

SSCA has been collecting information on the use of IPC in Stroke Units to monitor the extent to which this effective treatment is being implemented. Table 1 shows that about 50% of patients admitted to hospital are unable to walk at the time of admission in 2016 and therefore should be considered for treatment with IPC.

Since 31st January 2014 SSCA collected data on whether IPC was offered and documented in the medical records within one week of admission. In 2016, 43% of immobile patients were offered IPC, a statistically significant improvement over the 33% offered IPC in 2015. Chart N4 shows the increased implementation of IPC since Jan 2014 but this hides the huge differences (1% in Borders to 94% in Forth Valley) between NHS Boards in their success in implementing this effective form of prophylaxis. Chart N4 shows the percentage of immobile patients offered IPC in each NHS board from 2014 to 2016.

Chart N4: Intermittent Pneumatic Compression (IPC)
Percentage of immobile stroke patients offered IPC in Scotland
February 2014 - December 2016.



Barriers to achieving high levels of implementation include: lack of awareness of the problem of DVT/PE and of the effectiveness of IPC amongst nursing and medical staff. Also, lack of training in the sizing, fitting and monitoring of its use. This is clearly an area on which to focus quality improvement. Even in those boards who are offering IPC to large proportions of immobile patients there are challenges in optimising the adherence to the treatment whilst the patient remains at high risk of DVT – whilst immobile in the first 30 days of admission. Apart from the online training available via www.stroketraining.org, focused national training events have continued.

3.4 Rehabilitation audit update

Rehabilitation improves outcomes for people who have had a stroke. It should be provided in a stroke unit by a multidisciplinary team, with clear goals set by the team with the patient, and communicated to the patient and their family. Most impairments caused by a stroke can be improved or adapted to with rehabilitation. Research shows that outcomes improve if rehabilitation is provided as soon as possible after the stroke and multidisciplinary working achieves the best outcomes. The effect is 'dose related' so rehabilitation must be delivered with sufficient intensity.

Last year we sent the results of the first nationwide rehabilitation audit to all stroke services and presented it to stroke AHPs at the Scottish Stroke AHP Forum to enable discussion about plans for local improvement. Another cycle of the rehabilitation sprint audit ran in all acute and integrated stroke units from January to March 2017.

The audit questions were:

1. Were people admitted to hospital due to an acute stroke assessed by more than one Allied Health Professional (AHP) by day 4 of their hospital admission (Day of admission = Day 0).
2. Had multidisciplinary discussion about the person's rehabilitation needs been undertaken by day 4 of their hospital admission.
3. Was that multidisciplinary discussion recorded in a paper or electronic format, accessible to all health professionals involved in the person's care. and
4. Was there documented evidence that the rehabilitation plan had been agreed in discussion with the patient and/or their next of kin.

Short stay patients (i.e. with a hospital length of stay of less than two days), and patients who were on an end of life care pathway, were not included in this audit.

The results of the audit showed quite wide variation across Scotland. Some hospitals were performing very well. Documenting evidence that the rehabilitation plan had been agreed with the patient and / or their next of kin seemed the most challenging section.

Each stroke Managed Clinical Network (MCN) has been provided with its own local results. Services who are achieving the audit goals will be encouraged to share their methods with other hospitals. We don't plan to run this sprint audit again but will now include these criteria as a new section in the national stroke improvement plan so that each MCN can provide regular feedback about its own performance.

4 Outpatients

4.1 Summary and key findings relating to outpatient data

Twenty one hospitals were collecting TIA clinic data in SSCA during 2016 (Chart 6). Greater Glasgow & Clyde did not contribute outpatient data in 2016 but they are now piloting data capture at two of their clinics to establish whether they might contribute data to next year's report.

Data were collected on almost 3900 patients with acute cerebrovascular disease seen in the TIA clinics contributing data in 2016, similar numbers to 2015.

The Scottish Stroke Care Standard states that at least 80% should be seen within four days of receipt of referral. Early assessment can facilitate earlier diagnosis, investigation and help to optimise early introduction of treatments to reduce the risk of further vascular events. Chart 7 shows the proportion of patients seen on the day of referral, the following day, day 2-4 and 5-7. Across all the participating clinics the proportion of patients treated in accordance with this standard was 82%, similar to 2014 and 2015. Thirteen of the 21 hospitals met, or exceeded the four day standard. Some hospitals, Victoria Kirkcaldy, Dr Grays, Monklands and Royal Infirmary of Edinburgh assessed more than half of their patients on the day of the referral, or the following day.

Of course it is not only important to be able to rapidly assess the patients with TIA and minor stroke but also to complete their investigations quickly so that antiplatelet drugs, anticoagulants and carotid endarterectomy can be started as soon as possible in appropriate cases. This will minimise the risk of stroke. Chart 8 illustrates the average delays from the stroke/TIA which led to the referral, to the receipt of referral, first appointment offered, attendance and completion of imaging in 2015 and 2016.

The median delay from last event to referral to a clinic was about two days in 2015 and 2016 but there is marked variation between hospitals (1 to 4 days). The median delay between the event and completion of investigations is six days across all of the participating hospitals. The best performing clinics (e.g. Crosshouse) complete their assessments and investigations within a median of three days from the event. However, some have median delays of 10 days (e.g. Perth) suggesting that they cannot yet offer same day access to brain scanning and imaging of carotid arteries. On average it still takes 12 or 13 days from the patient's event to complete their investigations.

The risk of a recurrent stroke or TIA is known to be much higher in the first two days. Therefore, it is important to start aspirin or clopidogrel as soon as the diagnosis is made. Ideally those seeing patients in general practice or emergency departments will start these treatments before the patient is seen in the specialist clinic where the diagnosis can be confirmed and refined. The percentage in Table M0 will reflect the success of implementation of local protocols, education and in some areas TIA hotlines where the specialists can offer immediate advice on treatment by telephone.

Table M0: Patients with ischaemic diagnosis seen in specialist stroke/ TIA clinics and on anticoagulation at onset of current cerebrovascular event or on aspirin or another antiplatelet at first assessment, 2016 data.

Note that some percentages are based on very small numbers of records. Hospital	Denominator Number with ischaemic diagnosis	Patients with ischaemic diagnosis seen in specialist stroke/TIA clinics during 2016	
		Number on anticoagulation at onset of current cerebrovascular event or on aspirin or another antiplatelet at first assessment	Percentage on anticoagulation at onset of current cerebrovascular event or on aspirin or another antiplatelet at first assessment
Ayr Hospital	111	66	59
Crosshouse Hospital, Kilmarnock	215	103	48
Borders General Hospital, Melrose	153	103	67
Dumfries & Galloway Royal Infirmary (DGRI)	171	137	80
Queen Margaret Hospital, Dunfermline	175	135	77
Victoria Hospital, Kirkcaldy (VHK)	240	182	76
Forth Valley Royal Hospital (Larbert)	240	186	78
Aberdeen Royal Infirmary (ARI)	566	433	77
Dr Gray's Hospital, Elgin	47	26	55
Lorn & Islands Hospital, Oban	46	24	52
Raigmore Hospital, Inverness	264	221	84
Hairmyres Hospital, East Kilbride	226	172	76
Monklands Hospital, Coatbridge	122	92	75
Wishaw General Hospital	175	114	65
Royal Infirmary of Edinburgh at Little France	117	90	77
St John's Hospital, Livingston (SJH)	86	62	72
Western General Hospital, Edinburgh (WGH)	453	342	75
Balfour Hospital, Orkney	27	21	78
Ninewells Hospital, Dundee	189	165	87
Perth Royal Infirmary (PRI)	138	96	70
Western Isles Hospital (WIH)	7	6	86
Scotland	**3 768**	**2 776**	**74**

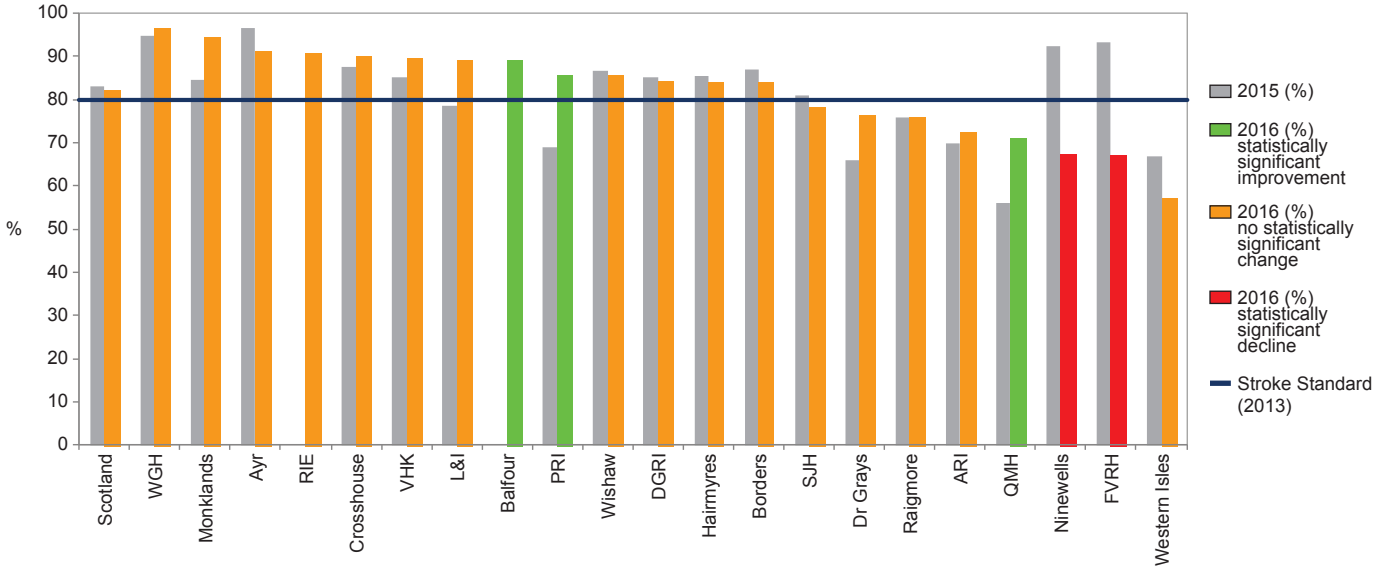
Note regarding Table M0:

1. The source database, eSSCA, captures information about stroke type for outpatients via a question on stroke pathology but also includes additional variables to indicate Transient Ischaemic Attack (TIA), transient monocular blindness (TMB) and retinal artery occlusion (RAO). The cohort of patients for Table M0 is based on outpatients with an ischaemic stroke, TIA, TMB or RAO. This group differs slightly from the outpatient cohort used elsewhere in this National Report because of its restriction to stroke patients with ischaemic events rather than patients with any type of cerebrovascular diagnosis.

4.2 Hospital data

Chart 6: Percentage of patients with definite cerebrovascular diagnosis seen in specialist stroke/TIA clinic with referral to examination time within 4 days, 2015 and 2016 data.

Horizontal line reflects Scottish Stroke Care Standard (2013) of 80% of TIA patients being seen in specialist stroke/TIA clinic within 4 days of receipt of referral.



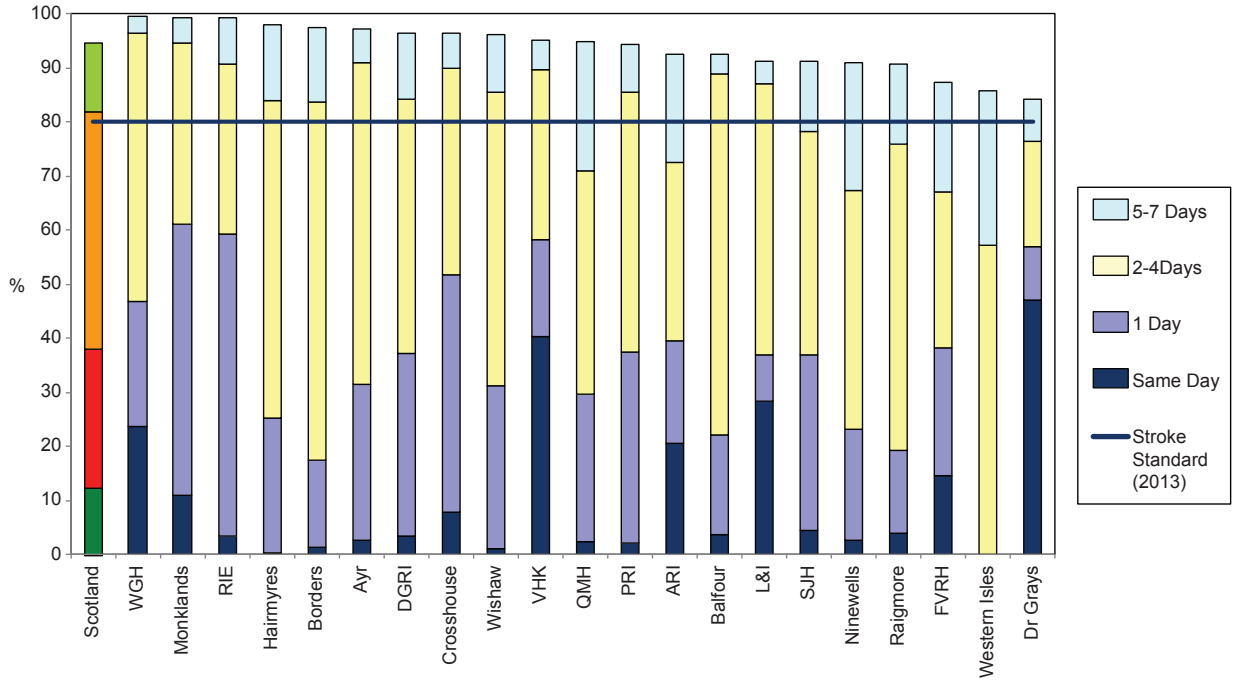
Notes regarding Chart 6:

1. **Data presented are for hospitals using eSSCA where all relevant dates** (last event, referral, referral-received, appointment and examination) **are present and ordered chronologically**.
2. The following **hospitals either do not hold specialist stroke/TIA clinics or do not collect and submit data to SSCA** – Caithness, QEUH, WIG, GCH, Belford, GRI, IRH, VI Glasgow, RAH, Gilbert Bain and Uist & Barra. The **omission of these data may affect the estimate of national performance** based on those hospitals contributing to SSCA.
3. For NHS Fife, the outpatient service for patients with suspected cerebrovascular conditions functions as a single service delivered across two sites, Queen Margaret Hospital and Victoria Hospital Kirkcaldy. Chart 7 separates the performance for these hospitals but they should be considered as a single NHS Fife service. The combined performance for 2015 and 2016 shows 74% and 82% respectively, an increase of 8% between the two years.
4. During 2016, NHS Ayrshire & Arran reorganised its services for acute stroke patients, transferring to Crosshouse Hospital the services previously provided in Ayr Hospital.

Chart 7: Percentage of patients with definite cerebrovascular diagnosis seen in specialist stroke/ TIA clinic with referral to examination time (days): same day and within 1, 2-4 and 5-7 days, 2016 data.

Horizontal line reflects Scottish Stroke Care Standard (2013) of 80% of TIA patients being seen in a specialist stroke/TIA clinic within 4 days of receipt of referral.

Note that the Scotland column in the chart is coloured green, amber and red simply to differentiate it from the hospital columns and the colours are not indicative of performance. Dark green corresponds to 'Same Day', red corresponds to '1 Day', amber corresponds to '2-4 Days' and light green corresponds to '5-7 Days'.

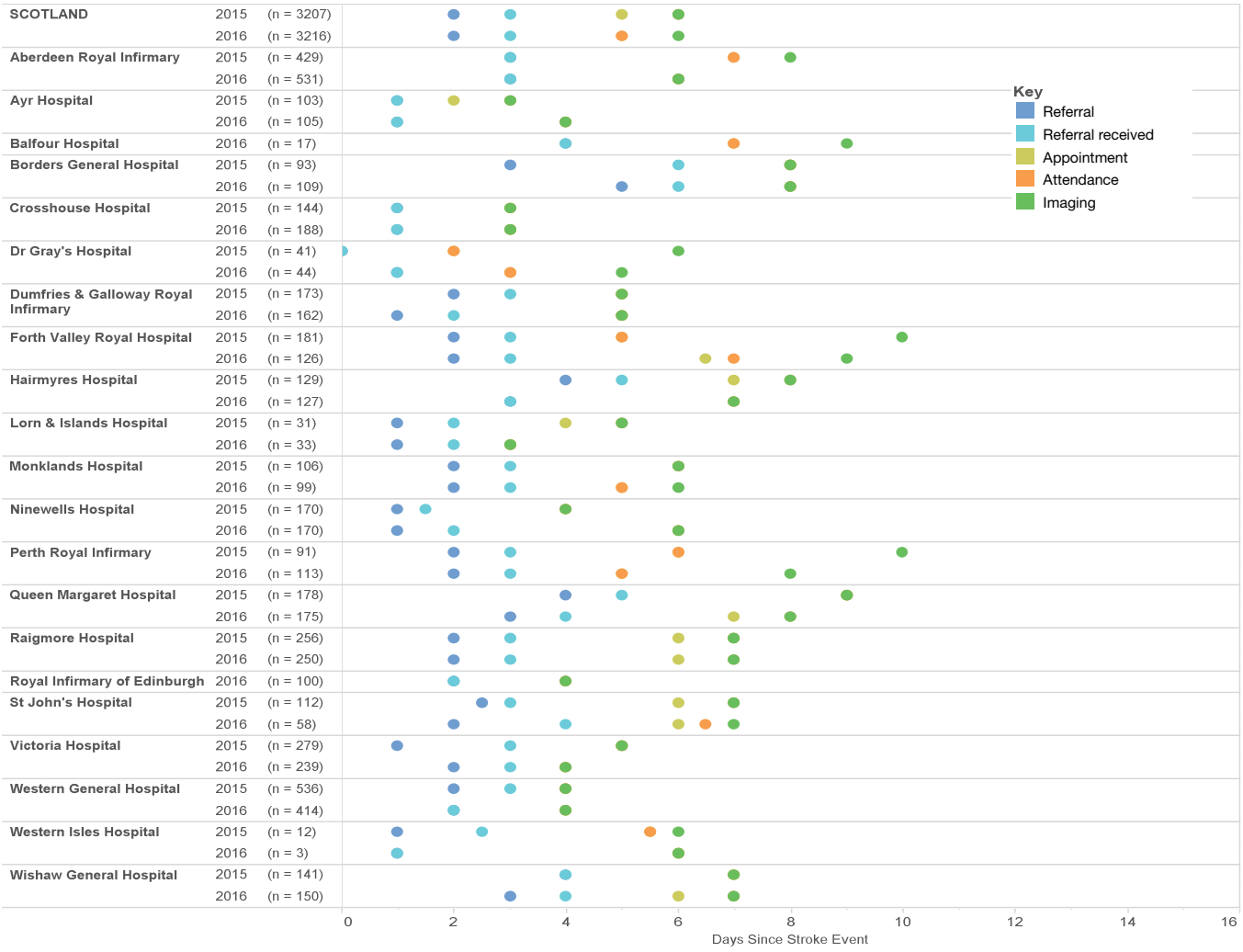


Notes regarding Chart 7:

1. In some instances, data entered into eSSCA are assigned to admitting hospitals other than the main acute hospitals participating in the Scottish Stroke Care Audit. Data for these hospitals are combined with data for their respective main acute hospitals.
2. The following hospitals either do not hold specialist stroke/TIA clinics or do not collect and submit data to SSCA – Caithness, QEUH, WIG, GCH, Belford, GRI, IRH, VI Glasgow, RAH, Gilbert Bain and Uist & Barra. The omission of these data may affect the estimate of national performance based on those hospitals contributing to SSCA.
3. During 2016, NHS Ayrshire & Arran reorganised its services for acute stroke patients, transferring to Crosshouse Hospital the services previously provided in Ayr Hospital.

Chart 8: Median waits since stroke event to points on the outpatient imaging timeline, 2015 and 2016 data.

There are instances where elements of the outpatient timeline share the same or similar data point and might not be visible. In these instances the most recent part of the timeline sits on top indicating that the elements have been delivered closely together.



Notes regarding Chart 8:

1. In some instances, data entered into eSSCA are assigned to admitting hospitals other than the main acute hospitals participating in the Scottish Stroke Care Audit. Data for these hospitals are combined with data for their respective main acute hospitals.
2. The following hospitals either do not hold specialist stroke/TIA clinics or do not collect and submit data to SSCA – Belford, GRI, IRH, QEUH, RAH,Gilbert Bain and Uist & Barra. The omission of these data may affect the estimate of national performance based on those hospitals contributing to SSCA. Balfour Hospital started outpatient services at the end of 2015 and RIE during 2016 and both have started recording data in eSSCA.
3. The chart only includes events where all relevant dates (last event, event to referral, referral received, appointment, attendance and imaging) are present and ordered chronologically.
4. Galloway Community Hospital and Caithness Hospital recorded only one outpatient imaging event each in 2016 and these have not been included in the chart. However, these events are included in calculating the median waits for Scotland.
5. Royal Infirmary of Edinburgh did not perform outpatient imaging in 2015.
6. During 2016, NHS Ayrshire & Arran reorganised its services for acute stroke patients, transferring to Crosshouse Hospital the services previously provided in Ayr Hospital.

5 Atrial Fibrillation and oral anticoagulation

Oral anticoagulation is recommended for patients with TIA or ischaemic strokes with permanent or paroxysmal (intermittent) atrial fibrillation. Atrial fibrillation, or AF for short, is a common arrhythmia of the heart which leads to an irregular pulse and is associated with a five-fold risk of stroke. In general the strokes associated with AF are more severe and are therefore more likely to lead to hospital admission, death or long term disability.

In suitable patients anticoagulation reduces the relative risk of recurrent stroke by at least 60%. This is about three times as effective as aspirin or clopidogrel. Put another way, if the risk of recurrent stroke without treatment was 10% over a given time period, anticoagulation would reduce the risk to about 4%, whilst antiplatelet medication would only reduce the risk to 8%.

For many years the only available oral anticoagulant was Warfarin. Warfarin requires to be closely monitored with regular blood tests. If the blood becomes too thick, then the patient's risk of ischaemic stroke increases. If it is too thin then the risk of bleeds, including haemorrhagic stroke, increases. In recent years new oral anticoagulants (NOACs) have become available which do not require blood monitoring, and which have been shown to be at least as effective and safe as Warfarin. There are variations in the guidance produced by different Health Boards with respect to which patients should be offered the new, and more expensive, oral anticoagulants.

Hospitals participating in the SSCA identify patients either admitted to hospital with a stroke, or who attend a specialist stroke/TIA clinic, who are known to have AF and record whether they are receiving oral anticoagulants. This provides an indicator of the level of use of anticoagulants for AF in the population served by that hospital.

Table M1 shows the number of patients who were known to have atrial fibrillation at the time of admission with an ischaemic stroke (2315 in Scotland), the number (689) and percentage (30%) who were on an anticoagulant in 2016. This compares with 27% in 2015 which might point to increasing use of anticoagulants in AF. The table also shows the number of patients discharged alive after admission with an ischaemic stroke in AF (1902), the number (1296) and percentage (68%) prescribed or recommended anticoagulants on discharge. This is an increase from 63% in 2015.

Of the 284 patients seen in clinics with TIA or stroke with AF, 141 (50%) were on oral anticoagulants at the time of their event in 2016, similar to 2015 (Table M2). Although, in many cases the AF may have been new, in many others this represents either a continued failure to identify patients with AF, or a failure to start patients on anticoagulants. Eighty-eight percent of patients with an ischaemic stroke or TIA who had AF were started on anticoagulants in 2015 and 2016.

These data appear to show that many patients with AF are still not receiving anticoagulants to help reduce their risk of future stroke. There is also considerable variation in the percentage receiving anticoagulation between hospitals. Plans are being drawn up by the National Advisory Committee for Cardiac Disease to enhance the detection of AF in the general population and facilitate better primary prevention of stroke with anticoagulants. In addition new standards have been agreed by the National Advisory Committee for Stroke which should enhance the detection of AF in those who have had an ischaemic stroke or TIA, and thus facilitate the greater use of anticoagulation in secondary prevention.

These standards are:

a. Stroke services should have written, locally agreed criteria to select those patients with stroke or TIA who should be offered prolonged ECG monitoring to detect paroxysmal AF.

b. Patients meeting those criteria should have prompt access to at least 72 hours of ECG monitoring to detect paroxysmal AF.

c. The results of the prolonged monitoring should be available within two weeks of referral for monitoring to facilitate early secondary prevention.

Criteria for selecting patients for prolonged monitoring might include:

Ischaemic stroke or TIA and

a. No known history of Atrial fibrillation and

b. No contraindication or definite indication for lifelong oral anticoagulation

with any one of the following:

a. History of frequent palpitations

b. Syncope or pre-syncope

c. Recent myocardial infarction

d. Recent cardiac surgery

e. Cardiac failure

f. Ischaemic stroke/TIA affecting more than one vascular territory

g. A cortical ischaemic stroke/TIA with no other explanation

Performance against these standards will be assessed by each stroke MCN as part of the Stroke Improvement Plan.

Table M1: Ischaemic stroke patients with current atrial fibrillation (AF) and anticoagulation on admission or discharge, 2016 data (*final* diagnosis).

Note that some percentages are based on very small numbers of records.	All ischaemic stroke patients			Ischaemic stroke patients discharged alive		
	With current AF on admission:			With current AF on discharge:		
Hospital	Number	Number on anticoagulation at onset of current cerebrovascular event	Percentage on anticoagulation at onset of current cerebrovascular event	Number	Number with anticoagulation prescribed or recommended at discharge	Percentage with anticoagulation prescribed or recommended at discharge
Ayr Hospital	14	3	21	11	3	27
Crosshouse Hospital	190	55	29	158	68	43
Borders General Hospital	76	23	30	61	33	54
Dumfries & Galloway Royal Infirmary	61	22	36	53	45	85
Galloway Community Hospital	10	4	40	10	4	40
Victoria Hospital Kirkcaldy	170	52	31	146	105	72
Forth Valley Royal Hospital (Larbert)	133	30	23	106	59	56
Aberdeen Royal Infirmary	186	60	32	151	121	80
Dr Gray's Hospital	44	17	39	38	25	66
Glasgow Royal Infirmary	179	50	28	152	106	70
Inverclyde Royal Hospital	51	19	37	42	16	38
Queen Elizabeth University Hospital	294	74	25	246	193	78
Royal Alexandra Hospital	104	34	33	86	46	53
Belford Hospital	3	0	0	3	2	67
Caithness General Hospital	12	1	8	12	9	75
Lorn & Islands Hospital	25	10	40	19	17	89
Raigmore Hospital	61	25	41	45	38	84
Hairmyres Hospital	69	19	28	57	36	63
Monklands Hospital	68	17	25	46	31	67

Note that some percentages are based on very small numbers of records.	All ischaemic stroke patients			Ischaemic stroke patients discharged alive		
	With current AF on admission:			With current AF on discharge:		
Hospital	Number	Number on anticoagulation at onset of current cerebrovascular event	Percentage on anticoagulation at onset of current cerebrovascular event	Number	Number with anticoagulation prescribed or recommended at discharge	Percentage with anticoagulation prescribed or recommended at discharge
Wishaw General Hospital	45	9	20	36	18	50
Royal Infirmary of Edinburgh at Little France	283	73	26	233	166	71
St John's Hospital	32	15	47	24	19	79
Western General Hospital	47	14	30	36	24	67
Balfour Hospital	4	2	50	2	1	50
Gilbert Bain Hospital	9	1	11	5	3	60
Ninewells Hospital	94	38	40	81	71	88
Perth Royal Infirmary	43	20	47	36	31	86
Uist & Barra Hospital	0	0		0	0	
Western Isles Hospital	8	2	25	7	6	86
Scotland	**2 315**	**689**	**30**	**1 902**	**1 296**	**68**

Note regarding Table M1:

1. The source database, eSSCA, captures information about stroke type for inpatients via a question on stroke pathology but also includes an additional variable to indicate a final diagnosis of Transient Ischaemic Attack (TIA). The cohort of patients for Table NN is based on inpatients with a final diagnosis of either ischaemic stroke or TIA. This group differs from the inpatient cohort used elsewhere in this National Report. The inpatient section of the National Report focuses on patients with any type of stroke (e.g. ischaemic, haemorrhagic), apart from the charts concerning aspirin which relate to ischaemic stroke only, excluding TIA.

Table M2: Patients with ischaemic diagnosis, seen in specialist stroke/ TIA clinics, with current atrial fibrillation (AF) and on anticoagulation, 2016 data.

Note that some percentages are based on very small numbers of records.	Denominator	Patients with ischaemic diagnosis seen in specialist stroke/TIA clinics during 2016		Patients with ischaemic diagnosis seen in specialist stroke/TIA clinics during 2016	
Hospital	Number with current AF	Number with current AF and on anticoagulation at onset of current cerebrovascular event	Percentage with current AF and on anticoagulation at onset of current cerebrovascular event	Number with current AF and anticoagulation continued, commenced or recommended at first assessment	Percentage with current AF and anticoagulation continued, commenced or recommended at first assessment
Ayr Hospital	8	2	25	7	88
Crosshouse Hospital, Kilmarnock	21	10	48	18	86
Borders General Hospital, Melrose	21	11	52	17	81
Dumfries & Galloway Royal Infirmary (DGRI)	21	10	48	20	95
Queen Margaret Hospital, Dunfermline	7	2	29	6	86
Victoria Hospital, Kirkcaldy (VHK)	11	5	45	11	100
Forth Valley Royal Hospital (Larbert)	31	14	45	28	90
Aberdeen Royal Infirmary (ARI)	48	25	52	45	94
Dr Gray's Hospital, Elgin	8	5	63	7	88
Lorn & Islands Hospital, Oban	6	4	67	5	83
Raigmore Hospital, Inverness	20	12	60	19	95

Note that some percentages are based on very small numbers of records.	Denominator	Patients with ischaemic diagnosis seen in specialist stroke/TIA clinics during 2016		Patients with ischaemic diagnosis seen in specialist stroke/TIA clinics during 2016	
Hospital	Number with current AF	Number with current AF and on anticoagulation at onset of current cerebrovascular event	Percentage with current AF and on anticoagulation at onset of current cerebrovascular event	Number with current AF and anticoagulation continued, commenced or recommended at first assessment	Percentage with current AF and anticoagulation continued, commenced or recommended at first assessment
Hairmyres Hospital	16	9	56	14	88
Monklands Hospital, Coatbridge	11	8	73	9	82
Wishaw General Hospital	10	4	40	8	80
Royal Infirmary of Edinburgh at Little France	10	6	60	10	100
St John's Hospital, Livingston (SJH)	6	1	17	3	50
Western General Hospital, Edinburgh (WGH)	26	12	46	24	92
Balfour Hospital, Orkney	2	1	50	2	100
Ninewells Hospital, Dundee	11	3	27	8	73
Perth Royal Infirmary (PRI)	16	12	75	14	88
Stracathro Hospital, Brechin	**0**	**0**	**..**	**0**	**..**
Western Isles Hospital (WIH)	**0**	**0**	**..**	**0**	**..**
Scotland	**310**	**156**	**50**	**275**	**89**

Note regarding Table M2:

1. The source database, eSSCA, captures information about stroke type for outpatients via a question on stroke pathology but also includes additional variables to indicate Transient Ischaemic Attack (TIA), transient monocular blindness (TMB) and retinal artery occlusion (RAO). The cohort of patients for Table NN is based on outpatients with an ischaemic stroke, TIA, TMB or RAO. This group differs slightly from the outpatient cohort used elsewhere in this National Report because of its restriction to stroke patients with ischaemic events rather than patients with any type of cerebrovascular diagnosis.

6 Thrombolysis

Key findings

The total number of patients receiving recombinant tissue plasminogen activator (rtPA) decreased slightly from 951 in 2015 to 910 in 2016.

This equates to approximately 10% of stroke patients (17 per 100,000 of population).

In 2016, 55% of patients were thrombolysed within one hour (51% in 2015).

The standard of 80% treated within 1 hour has not been achieved by any hospital.

Median door to needle times vary between hospitals.

Treatment of ischaemic stroke patients within 4.5 hours of symptom onset using the clot dissolving treatment rtPA is known to be effective for selected patients. Clinical research suggests that between 5-10 extra people per 100 treated with thrombolysis will regain independence by six months after their stroke. The earlier the treatment can be administered the more likely the patient is to make a good recovery.

Data on all patients thrombolysed in Scotland have been entered into the SSCA prospectively since January 2010 (with retrospective data collected for 2009). This section includes an overview of the delivery of rtPA in 2015 and 2016.

Table 3: Thrombolysis - numbers thrombolysed, 2015 & 2016 data.

Hospital	Number of patients receiving thrombolysis in 2015	Number of patients receiving thrombolysis in 2016
Scotland summary	**951**	**910**
Ayrshire & Arran	**42**	**69**
Ayr Hospital	11	0
Crosshouse Hospital, Kilmarnock	31	69
Borders	**10**	**9**
Borders General Hospital, Melrose	10	9
Dumfries & Galloway	**40**	**32**
Dumfries & Galloway Royal Infirmary (DGRI)	32	25
Galloway Community Hospital (GCH)	8	7
Fife	**60**	**75**
Victoria Hospital, Kirkcaldy (VHK)	60	75
Forth Valley	**40**	**54**
Forth Valley Royal Hospital, Larbert (FVRH)	40	54
Grampian	**164**	**142**
Aberdeen Royal Infirmary (ARI)	156	120
Dr Gray's Hospital, Elgin	8	22
Greater Glasgow & Clyde	**230**	**204**
Glasgow Royal Infirmary (GRI)	1	18
Inverclyde Royal Hospital, Greenock (IRH)	0	0
Queen Elizabeth University Hospital, Glasgow (QEUH)	227	186
Royal Alexandra Hospital, Paisley (RAH)	2	0

Hospital	Number of patients receiving thrombolysis in 2015	Number of patients receiving thrombolysis in 2016
Highland	**40**	**33**
Belford Hospital, Fort William	3	2
Caithness General Hospital, Wick	11	4
Lorn & Islands Hospital, Oban	3	9
Raigmore Hospital, Inverness	23	18
Lanarkshire	**112**	**79**
Hairmyres Hospital, East Kilbride	26	24
Monklands Hospital, Airdrie	39	23
Wishaw General Hospital	47	32
Lothian	**122**	**137**
Royal Infirmary of Edinburgh at Little France (RIE)	85	102
St John's Hospital, Livingston (SJH)	26	25
Western General Hospital, Edinburgh (WGH)	11	10
Orkney	**2**	**5**
Balfour Hospital, Orkney	2	5
Shetland	**2**	**2**
Gilbert Bain Hospital, Shetland	2	2
Tayside	**79**	**66**
Ninewells Hospital, Dundee	52	43
Perth Royal Infirmary (PRI)	27	23
Western Isles	**8**	**3**
Uist & Barra Hospital, Benbecula	0	0
Western Isles Hospital (WIH)	8	3

Notes regarding Table 3:

1. Note that this table is not directly comparable with Table 4 because it is based on hospital/ NHS board of treatment rather than Health Board of residence, upon which Table 6 is based. Health Boards may treat patients from outside their board area or may treat non-Scottish residents.
2. Records are included if a thrombolysis date is present; a small proportion of these records will not have an associated thrombolysis time recorded. This table also includes a small proportion of patients who were thrombolysed for a non-index event. This differs slightly from Chart 9 where measurement of the 60 minute thrombolysis door-to-needle time standard focuses on patients thrombolysed for index events only.
3. Data for this table are derived from the 'admission hospital' field (inpatient dataset).
4. The thrombolysis figures may include a small number of thrombectomy cases, involving the physical removal of the clot from the blood vessel, because the data collection system, eSSCA, cannot always capture the complexity of the patient pathway for this intervention. There are fewer than 10 thrombectomy cases recorded for each of 2015 and 2016.

There has been a small drop in the total number of patients receiving thrombolysis in 2016 compared with 2015 (910 versus 951). There was no consistent pattern across Health Boards with some showing a modest increase and others a modest decrease. This may reflect a plateauing of activity possibly indicating what is achievable with current service organisation. In order to view these data in the context of local demand (in particular, in relation to population size and likely clinical need) we have also expressed these results in terms of the population in each region (table 4). The crude rate of treatment per 100,000 population dropped slightly from 17 in 2015 to 16.2 in 2016. This is well above the original standard of 5 thrombolysis treatments per 100,000 population which was exceeded in 2009 and has increased steadily over subsequent years.

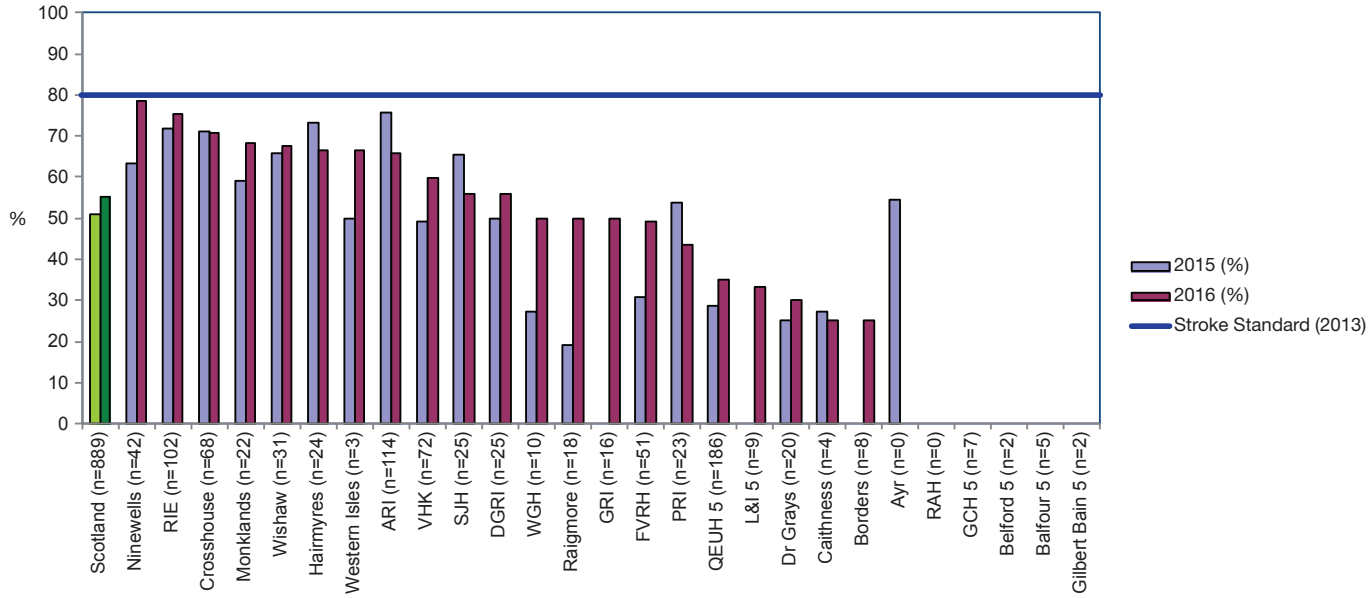
The thrombolysis figures may include a small number of thrombectomy (which involves the physical removal of the clot from the blood vessel rather than using clot dissolving drugs). The current data collection system cannot always capture the complexity of the patient pathway for this intervention but we believe there are fewer than 10 thrombectomy cases recorded for each of 2015 and 2016.

Over the past few years regional variation has reduced reflecting service expansion and increased use of tele-medicine and clinical confidence. However, service provision is not yet fully equitable across Scotland. It is hoped that ongoing initiatives including pre-alert policies for the Scottish Ambulance Service, public awareness campaigns, and staff education should help address these differences.

Chart 9: Percentage of patients with door-to-needle times for thrombolysis within 1 hour, 2015 and 2016 data.

Horizontal line reflects Scottish Stroke Care Standard (2013) of 80% of stroke patients thrombolysed within 1 hour of arrival at first hospital.

Note that the Scotland columns in the chart are coloured light green and dark green simply to differentiate them from the hospital columns and the colours are not indicative of performance. Light green corresponds to '2015' and dark green corresponds to '2016'.

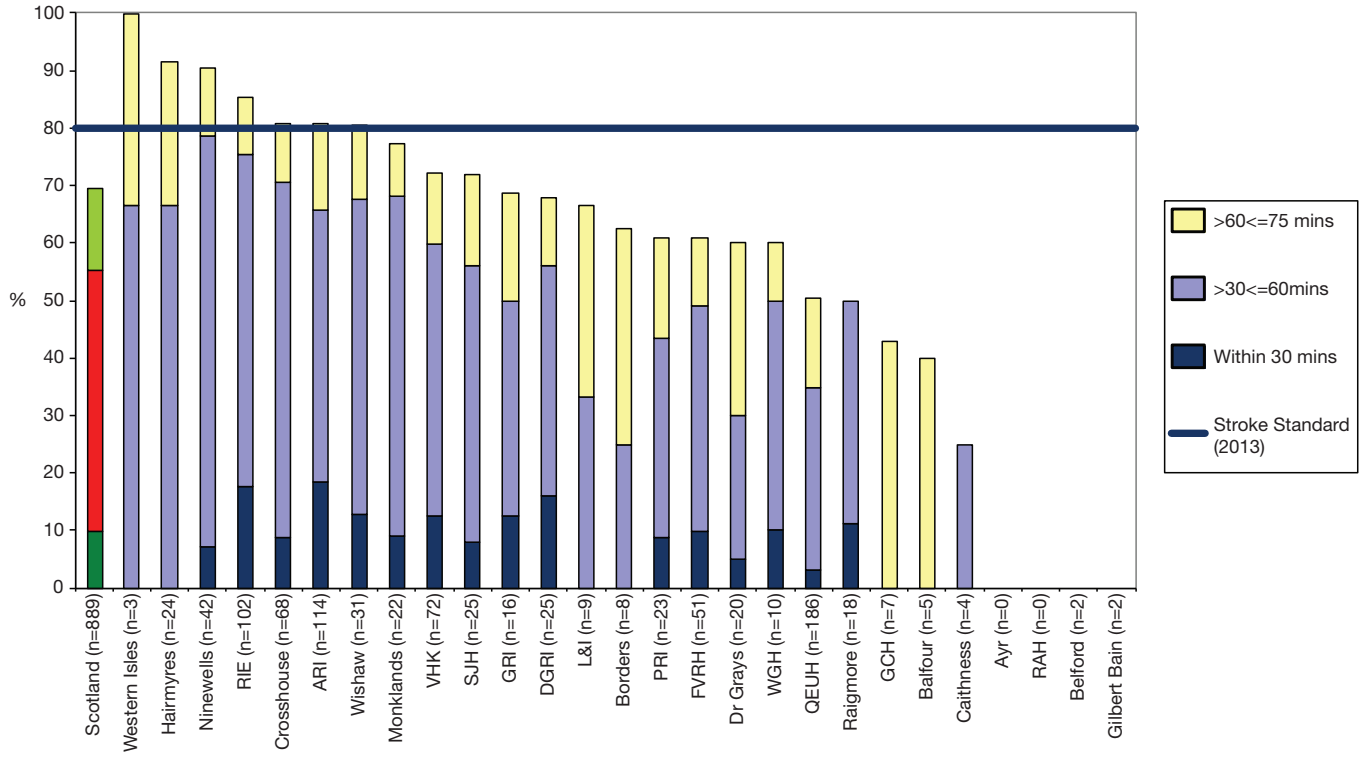


For notes regarding Chart 9 please see notes regarding Chart 10.

Across Scotland, in 2016 only 55% of patients were treated with rtPA within one hour of arrival at hospital (Chart 9). This is a further modest improvement on 2015 (51%). No hospital is yet achieving the standard of 80% treated within one hour of admission and average door to needle times vary considerably between hospitals (Chart 10). As patients have a better outcome with earlier delivery of treatment this is an area which requires ongoing attention nationally with a review of service delivery pathways.

Chart 10: Percentage of patients receiving thrombolysis within 30, 60 & 75 minutes of arrival at first hospital, 2016 data.

Note that the Scotland column in the chart is coloured green and red simply to differentiate it from the hospital columns and the colours are not indicative of performance. Light green corresponds to '>60<=75 mins', red corresponds to '>30<=60 mins' and dark green corresponds to 'Within 30 mins'.

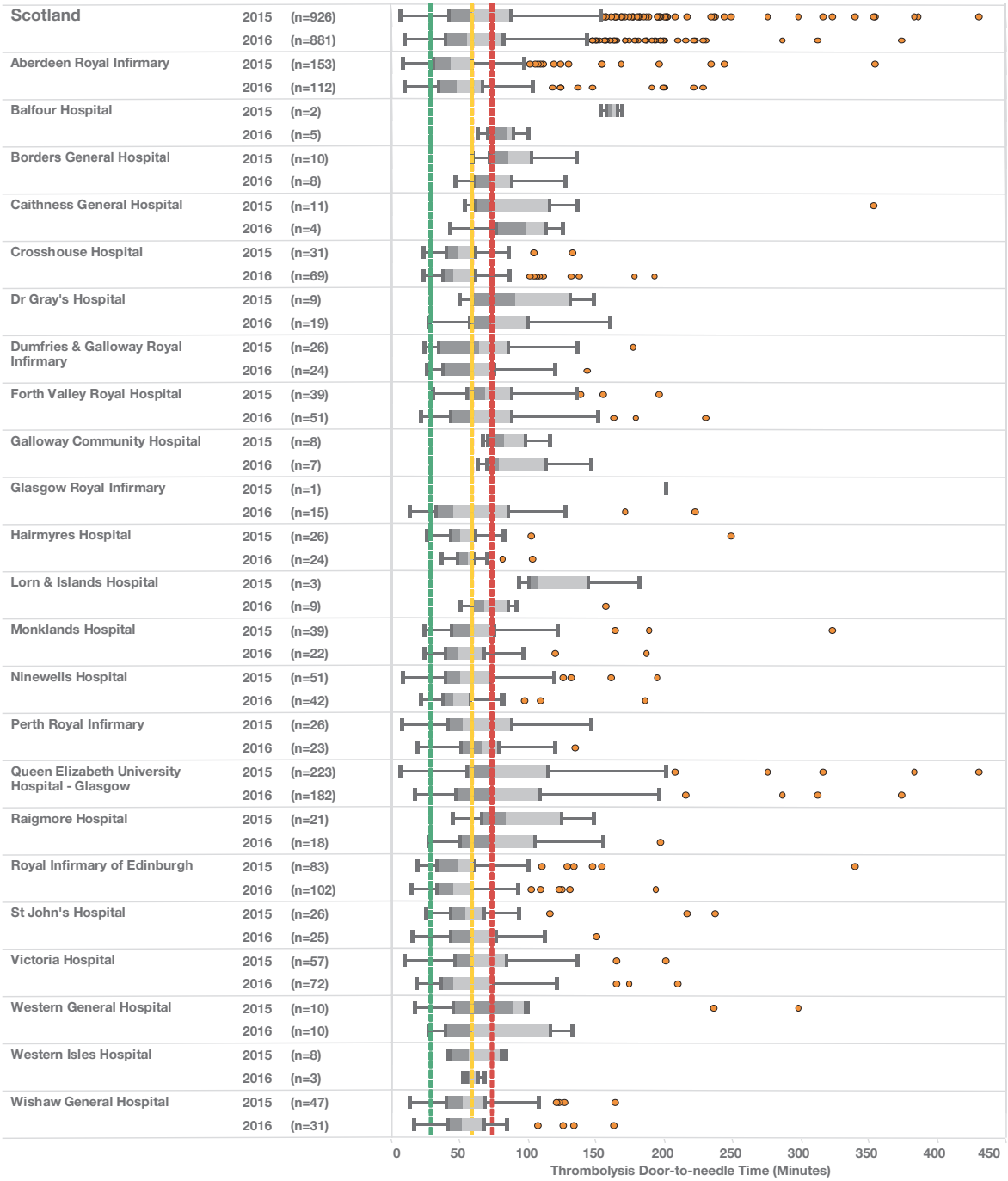


Notes regarding Charts 9 and 10:

1. Hospitals shown are those that provide a thrombolysis service. See Table 3 for further details. Records included must have date and time of arrival at first hospital and date and time of thrombolysis to permit the calculation of time to thrombolysis and a small proportion of records are missing these data items.
2. Some percentages are based on very small numbers (see numbers in brackets on axis) and should be interpreted with caution.
3. Some hospitals (e.g. QEUH) receive a small number of patients transferred from neighbouring Health Boards which may affect their onset-to-needle time performance.
4. In some instances, data entered into eSSCA are assigned to admitting hospitals other than the main acute hospitals participating in the Scottish Stroke Care Audit. Data for these hospitals are combined with data for their respective main acute hospitals.
5. Some hospitals admitted ischaemic stroke patients for thrombolysis but did not thrombolyse any patients within the time spans included in this chart. These hospitals are included in the chart denominator but show as zero percent with regard to the time spans analysed.
6. A small proportion of records have thrombolysis date recorded but no thrombolysis time. These records are included in the denominator because the presence of a date indicates thrombolysis occurred. The absence of a thrombolysis time, however, prevents the calculation of door-to-needle time so these cases cannot be measured against the 60 minute standard and cannot be confirmed as having achieved it and are assumed not to have done so. This is a slightly different approach from Chart 11 where inclusion in the chart requires both a thrombolysis date and thrombolysis time. As a result, the Chart 9 and Chart 10 denominators, for individual hospitals, may be slightly higher than those in Chart 11.
7. A small proportion of records may involve admission dates at the end of one year and thrombolysis dates at the beginning of the next year.
8. The thrombolysis figures may include a small number of thrombectomy cases, involving the physical removal of the clot from the blood vessel, because the data collection system, eSSCA, cannot always capture the complexity of the patient pathway for this intervention. There are fewer than 10 thrombectomy cases recorded for each of 2015 and 2016.
9. During 2016, NHS Ayrshire & Arran reorganised its services for acute stroke patients, transferring to Crosshouse Hospital the services previously provided in Ayr Hospital.

When exploring door to needle times in more detail we can see that across Scotland the number and percentage receiving thrombolysis was 492 (55%) within 60 minutes of arrival at hospital and 620 (70%) within 75 minutes. There remains further scope for improvement and this emphasises the need for systems such as thrombolysis pre-alerts to reduce delays in hospital. Data from the audit and exception reporting procedures allow each centre to reflect on individual performance and identify any specific problems causing delay.

Chart 11: Thrombolysis door-to-needle time distributions (minutes) by hospital, 2015 and 2016 data.



Notes regarding Chart 11:

1. Hospitals shown are those that provide a thrombolysis service. Records included must have date and time of arrival at first hospital and date and time of thrombolysis to permit the calculation of time to thrombolysis and a small proportion of records are missing these data items. These records have been excluded from Chart 11. This is a slightly different approach from the denominators used in Chart 9 and Chart 10 where records with a thrombolysis date but no thrombolysis time may be included. As a result, the Chart 11 denominators, for individual hospitals, may be slightly lower than those in either Chart 9 or Chart 10.
2. Four hospitals (Balfour Hospital, Gilbert Bain Hospital, Glasgow Royal Infirmary and Royal Alexandra Hospital) did not thrombolyse a sufficient number of patients to be displayed meaningfully as a box plot.
3. In some instances, **data entered into eSSCA are assigned to admitting hospitals other than the main acute hospitals** participating in the Scottish Stroke Care Audit. Data for these hospitals are combined with data for their respective main acute hospitals.
4. Some hospitals (e.g. Queen Elizabeth University Hospital) receive **a small number of patients transferred from neighbouring Health Boards** which may affect their onset-to-needle time performance.
5. The central boxes display the middle 50% of the data which is any data point within the 2nd and 3rd quartiles. The meeting point of the the two boxes is the median. Data outside this is included in the whisker unless the data point is greater than 1.5x the interquartile range (the two grey boxes). These data points are deemed to be outliers and are reported as a point separate from the box and whisker plot.

Thrombectomy

Thrombectomy is a recent development for the treatment of ischaemic stroke that involves the physical removal of the blood clot causing the stroke using a catheter device. It is now known that in some cases thrombectomy can provide substantial additional benefit over thrombolysis alone and it is most effective when given as soon as possible after the stroke event. This treatment has only rarely been used in Scotland and if it is to be successfully implemented, our services must strive to minimise their door to needle times. With this in mind, a challenging new standard of 50% of thrombolysis patients to receive their treatment within 30 minutes of arrival at hospital was introduced for 2016. Unfortunately, across Scotland only 88 (10%) achieved this standard.

7 Carotid Endarterectomy

There are good clinical reasons to perform carotid endarterectomy as soon as possible after the clinical event that precipitated referral. The standard remains that at least 80% of carotid interventions for symptomatic disease should be done within 14 days of the clinical event. The risk of further, more serious ischaemic event, is greatest during this period and therefore a greater number of strokes will be prevented by an earlier operation. The risk of the surgery maybe a little higher at this time, but the net gain is greater.

The number of carotid interventions performed across Scotland has remained largely unchanged, 409 in 2014, 392 in 2015 and 387 in 2016. There remains considerable variation in the rates of interventions per 100,000 population. While local variation in service delivery and practice may be one important factor, there are other possible explanations: Where there are delays to surgery, the benefits of surgery are smaller, and therefore decisions may be taken that delayed surgery is not worthwhile. Also, there may be an impact of social deprivation. The association between poverty, lifestyle choices and health, including occlusive vascular disease is well documented. There is wide variation in the rates of deprivation between the Scottish health boards.

A well-attended service improvement event took place in the autumn of 2015. Representatives from all over Scotland met to explore changes that might lead to reductions in the delays to surgery. The data for 2015 showed an overall modest improvement from 37% to 41% of procedures meeting the 14 day target. The 2016 data again show further modest improvement with 45% of procedures across Scotland being performed with 14 days. Although the overall change may have been positive, there were several centres where this was not the case. The reasons for delay vary – in some places it relates to delays in patients being seen in a TIA clinic, or delays in completing non-invasive imaging to detect severe carotid stenosis whilst in other areas there are delays in obtaining a vascular surgical opinion, or delays to admission for surgery. Managed clinical networks, working with their local vascular surgical service need to continue to identify the barriers to early intervention and to redesign their processes to overcome these.

Table 6: Carotid Endarterectomy - number of patients receiving a carotid endarterectomy in acute hospitals in Scotland during Jan-Dec 2016.

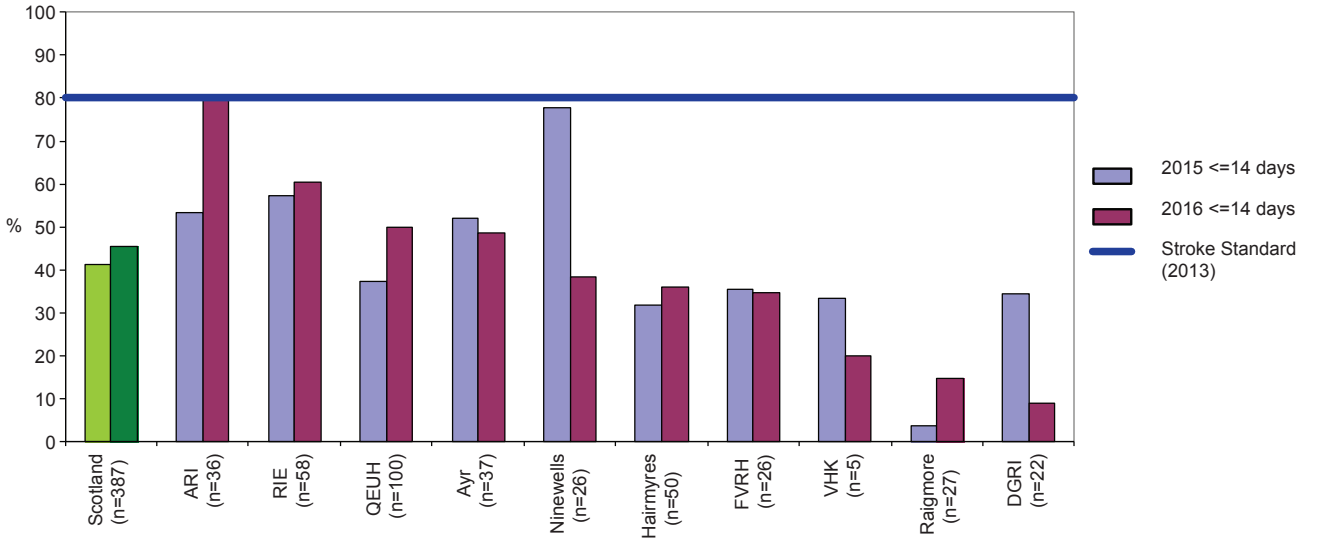
NHS board of hospital	Hospital providing carotid intervention service	Total	Residents	Rate per 100,000 residents	Non-residents	Non-resident NHS Boards (ranked on number of events, high-to-low)
Ayrshire & Arran	Ayr Hospital	37	33	8.9	4	Outside Scotland/ Not Known/ Other; Greater Glasgow & Clyde
Dumfries & Galloway	Dumfries & Galloway Royal Infirmary	22	22	14.7	0	
Fife	Victoria Hospital, Kirkcaldy	5	5	1.4	0	
Forth Valley	Forth Valley Royal Hospital (Larbert)	26	25	8.2	1	Lanarkshire
Grampian	Aberdeen Royal Infirmary	36	34	5.8	2	Highland; Orkney
Greater Glasgow & Clyde	Queen Elizabeth University Hospital, Glasgow	100	82	7.1	18	Lanarkshire; Highland; OutsideScotland/ Not Known/ Other; Ayrshire & Arran
Highland	Raigmore Hospital, Inverness	27	24	7.5	3	Outside Scotland/ Not Known/ Other; Greater Glasgow & Clyde
Lanarkshire	Hairmyres Hospital, East Kilbride	50	48	7.3	2	Greater Glasgow & Clyde; Outside Scotland/ Not Known/ Other
Lothian	Royal Infirmary of Edinburgh at Little France	58	45	5.1	13	Borders; Forth Valley
Tayside	Ninewells Hospital, Dundee	26	20	4.8	6	Fife
Scotland	**Scotland**	**387**	**338**	**6.3**	**49**	

Notes regarding Table 6:

1. Hospitals shown are those that provide a carotid intervention service and have submitted data to eSSCA for 2016.
2. A small proportion of records could not be assigned to a Health Board of residence because they were either for non-Scottish residents or there was insufficient information to allow their assignment to a Health Board (e.g. partial or incorrect postcode).
3. Health Board boundary changes occurred from April 2014. SSCA data use the revised Health Board boundaries. The issue primarily affects NHS Greater Glasgow & Clyde and NHS Lanarkshire.

Chart 12: Percentage of patients undergoing a carotid intervention within 14 days of the event that led the patient to first seek medical assistance, 2015 and 2016 data.

Horizontal line reflects Scottish Stroke Care Standard (2013) of 80% of patients undergoing carotid endarterectomy for symptomatic carotid stenosis have the operation within 14 days of the stroke event.
Note that the Scotland columns in the chart are coloured light green and dark green simply to differentiate them from the hospital columns and the colours are not indicative of performance. Light green corresponds to '2015' and dark green corresponds to '2016'.



Notes regarding Chart 12:
Bracketed number on chart x-axis indicates number of patients in denominator for 2016.

1. **Hospitals shown are those that provide a carotid intervention service and have submitted data to eSSCA for 2016.**
2. Patients in Borders, Orkney, Shetland & Western Isles are treated in other Health Boards as part of their respective carotid intervention pathways.
3. A small proportion of records have a carotid intervention date but no date recorded for the event that led to the first medical assessment. These records are included in the denominator because the presence of an intervention date indicates that a carotid intervention was performed. The absence of a date for the event that led to the first medical assessment, however, prevents the calculation of days to carotid intervention so these cases cannot be measured against the 14 day standard and cannot be confirmed as having achieved it and are assumed not to have done so. This is a slightly different approach from Chart 16b where inclusion in the chart requires both a carotid intervention date and date recorded for the event that led to the first medical assessment. As a result, the Chart 12 denominators, for individual hospitals, may be slightly higher than those in Chart 16b.

8 Using SSCA data for research

Among the benefits of collecting data on strokes through the Scottish Stroke Care Audit is the potential to link with other national datasets held within ISD, such as mortality data, hospital admission data and medication dispensing data. These linked datasets can then be used to explore the effect of other conditions and treatments on stroke outcomes and may help to provide more evidence for best care for stroke.

Supported by funding from Chest Heart and Stroke Scotland and the Stroke Association, we have Ethics Committee and Public Benefit Privacy Panel (PBPP) approvals to obtain a linked, pseudo-anonymised dataset which will be held within a data Safe haven. This will help ensure that individuals are not identifiable and that data is held securely.

Our aim is to explore important areas of stroke care, which include the following:

The effect of both general and specific co-existing health conditions on stroke management, secondary prevention and outcomes (including recurrent events and readmission). Dr Melanie Turner will then develop and validate a clinical prediction model to estimate the probability of recurrent stroke within one year.

How prescribing of specific medications affects stroke outcomes and risk of recurrent strokes, including which drug classes are the most important

The effect of age, gender, social deprivation, stroke severity and other health conditions on prescribing secondary prevention drugs.

Across Scotland, other researchers are including SSCA data in projects which aim to identify best practice and improve overall patient care in Scotland. All requests by researchers to use data are reviewed by the SSCA Research Sub-Group, and obtain appropriate permissions from PBPP. A list of current projects is available on the SSCA website, along with a link to publications from previous linkage projects.

9 Where Next?

It is essential that the Scottish Stroke Care Standards remain current to provide healthcare professionals in Scotland with advice and guidance to support the provision of high quality care for patients with stroke and transient ischaemic attack (TIA). Moreover, as performance improves, it is necessary to set a standard which is closer to the 'ideal' or 'optimal' performance to continue to encourage services to strive for improvement. With this in mind the Scottish Stroke Care Audit Steering Group will continue to review the standards that we set. The Steering Group are delighted that so many of the standards are being embedded in practice, but it may be time to move the focus to other important areas.

Recent trials have shown that mechanical thrombectomy carried out within the first few hours of an ischaemic stroke due to a large artery occlusion can allow a patient to make an excellent recovery, where they would otherwise suffer permanent disability. Over the next few years this treatment needs to be made available to as many patients who are eligible for it, as possible. The SSCA will need to monitor its implementation.

For those patients who are left with difficulties, rehabilitation, and longer term care can greatly enhance their quality of life. However, it is clear that the delivery of these aspects of care varies greatly between areas and is often not ideal. Although challenging SSCA needs to find methods to reliably measure the performance of health and social care in delivering these aspects of care to patients.

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Appendix A: List of Tables and Charts

Note

The list of tables and charts above excludes additional content that is only available from the Excel file which supplements this report. The Excel file is available from the Scottish Stroke Care Audit web site at http://www.strokeaudit.scot.nhs.uk. The additional content provides extra detail and covers the topics: length of stay for stroke patients, comparison of initial diagnosis and final diagnosis, the proportion of thrombolysed patients receiving repeat scans, the distribution of time between stroke event and carotid intervention and trends in the annual performance of Health Boards for the main inpatient stroke standards.

Appendix B: Stroke Improvement Plan Priorities & Actions RAG

	Action	Aim	NAC Lead	Benchmark Criteria	
Priority 1. Early recognition of Transient Ischaemic Attack (TIA) and stroke by the general public, Scottish Ambulance Service (SAS), NHS 24, primary care hospital front door services and social care staff.					
1	**Public campaign to raise awareness of stroke symptoms [(Face Arm Speech Time (to call 999) (FAST)]**	Deliver public education to increase awareness of common symptoms of stroke and TIA, and the need to seek emergency medical care.	David Clark	BLACK	No evidence of a FAST campaign.
				RED	No plan for an annual FAST campaign.
				AMBER	MCN has considered a further campaign using the available funding but as yet has no delivery plan.
				GREEN	MCN has run a further campaign using the available funding.
				COMPLETE	MCN delivers annual campaigns which are evaluated.
2	**Improve early identification of stroke and TIA by engagement with SAS, primary care and hospital emergency departments.**	Establish links to the MCN with all of these staff groups, SAS, primary care and hospital emergency departments and develop a mechanism to deliver education.	Katrina Brennan / SAS	BLACK	No FAST training delivered with any of these staff groups
				RED	Adhoc training delivered to some of these staff groups,
				AMBER	Adhoc training delivered to most of these staff groups,
				GREEN	Established training programme underway with some of these staff groups.
				COMPLETE	Established training programmes with all staff groups and evidence of a rolling programme of education which is evaluated.
Priority 2. Appropriate pre-hospital protocols to ensure rapid admission, early diagnosis and treatment.					
1	**Pre-alert by SAS**	The SAS should pre alert Emergency Departments of the arrival of FAST positive stroke patients with an onset time of < 4 ½ hours or an unknown onset time. ***This element will be monitored using pre alert data soon to be available from SAS.***	Katrina Brennan/ SAS	BLACK	No pre-alerts made from SAS to Emergency Departments.
				RED	Inconsistent pre-alerts made from SAS to Emergency Departments.
				AMBER	Pre-alerts normally made but no record of consistency.
				GREEN	Pre-alert consistently made.
				COMPLETE	Audit data evidences consistent pre-alert.
2	**Early imaging**	Imaging services should work with stroke services, Emergency Departments, and other services where patients with stroke/ TIA may present, to provide rapid access to CT or MR brain imaging (as appropriate) for all patients with suspected stroke, and those patients with TIA in whom brain imaging is clinically indicated; timely access to carotid imaging for patients with TIA and minor stroke should also be provided.	Joanna Wardlaw	**This Element measured by SSCA Data**	

	Action	Aim	NAC Lead	Benchmark Criteria	
3	**Thrombolysis Process and pathway**	Develop effective processes and pathways to ensure that the national Scottish Stroke Care Standard for thrombolysis is met. ***Validation of this element will be supported using thrombolysis data from SSCA.***	Peter Langhorne	BLACK	No process or pathway in place .
				RED	Emergency Department or Stroke team process or pathway available for potential thrombolysis patient but not utilised.
				AMBER	Emergency Department or Stroke team process or pathway available for potential thrombolysis patient but utilised only on an ad hoc basis.
				GREEN	Emergency Department or Stroke team process or pathway available for potential thrombolysis patients and used consistently in some departments and the SSCA thrombolysis standard is being achieved. This element will be validated using SSCA data.
				COMPLETE	Emergency Department or Stroke team process or pathway available for potential thrombolysis patients and used consistently in all departments across the Board Area and the SSCA thrombolysis standard is being consistently achieved. This element will be validated using SSCA data.
Priority 3. Delivery of Stroke Bundle – (The fourth element of the Stroke Care Bundle (CT scan) is listed under Priority 2, Action 2.)					
1	**Ensure early access to stroke unit**	Acute stroke patients will be admitted rapidly to a stroke unit and remain in that care setting for as long as is clinically necessary.	Peter Langhorne	**This element measured by SSCA data**	
2	**Swallow screen**	• Stroke services should ensure swallow screening is part of the stroke admission protocol and provide a programme of education to support delivery. • Swallow screening is a pass/fail procedure to rapidly identify patients who require referral for comprehensive swallowing assessment to inform appropriate management; • Keeping patients nil by mouth for extended periods pending screening reduces patient satisfaction and may present other health risks such as missed medications; and • The swallow screening procedure requires close observation of both non-swallowing and swallowing behaviours that require sound clinical judgement and competence to practice.	Sheena Borthwick	**This element measured by SSCA data**	
3	**Evidence based interventions: Intermittent Pneumatic Compression (IPC)**	• Ensure that protocols are in place and effectively implemented to guide the appropriate use of:**Intermittent Pneumatic Compression (IPC)** for venous thromboembolism prophylaxis offering sequential compression in patients who are immobile after a stroke. ***Validation of this element will be supported using IPC (User Defined Field) data from SSCA.***	Martin Dennis	BLACK	IPC not available in any stroke unit.
				RED	IPC only available in some stroke units.
				AMBER	IPC available in all stroke units.
				GREEN	IPC available in all stroke units but not consistently offered as a treatment This element will be validated using SSCA data.
				COMPLETE	IPC available in all stroke units and are consistently offered as a treatment This element will be validated using SSCA data.
		• Thrombolysis		**This element measured by SSCA data**	
		• Aspirin		**This element measured by SSCA data**	

	Action	Aim	NAC Lead	Benchmark Criteria	
Priority 4. Developing a skilled and knowledgeable workforce					
1	Health and social care staff in hospital and community settings are trained to an appropriate level.	• Utilise the education training template to accurately record training requirements and delivery and demonstrate appropriate levels of training; and NHS Boards use the information collated from the education template to identify and address training needs at all levels. **Core training areas** are defined as swallow screen, STAT (thrombolysis), IPC and Core competencies. (NB-STAT will be discounted as a 'red' area for stroke unit staff if STAT training is evidenced for appropriate staff along the pathway. So if thrombolysis is delivered at the front door (e.g. A&E, Emergency Receiving Unit) and training is prioritised to front door staff, this should be documented as the pathway and evidence of training provided, in terms of numbers/ percentage of front door staff STAT trained. This STAT training would then ideally be extended to stroke unit staff).		BLACK	No process or pathway in place
				RED	Available but not implemented, 3 or more than 3 core areas are 'red' ('red' is defined as <50% of staff trained).
				AMBER	Plan to implement or partially implement, 2 or more core areas are 'red' ('red' is defined as <50% of staff trained).
				GREEN	Implemented but not consistently delivered, 1 core area 'red', or all core areas are delivered, (i.e. no core areas are red) ('red' is defined as <50% of staff trained).
				COMPLETE	Complete and embedded in practice, whole stroke education template achieved and evidenced.
Priority 5. Early diagnosis & treatment for non-admitted patients					
1	**A specialist service to deliver immediate specialist advice suspected for TIA and stroke patients.**	Stroke services should provide GPs, Emergency Departments and other services, where patients with TIA/stroke may present, with immediate access to advice from a stroke specialist.	Martin Dennis	BLACK	No plan to provide same day access to advice from specialist and no TIA pathway for Primary Care in place.
				RED	Plan to provide access to advice from specialist on day of request and / or shared protocols for appropriate interventions.
				AMBER	Specialist advice only available on some days and pathways not consistently adhered to.
				GREEN	7 day / week but daytime only access to stroke specialist service.
				COMPLETE	24/7 access to stroke specialist service for advice.
2	**Service to provide early access to confirmatory clinical assessment**	A specialist service should be available to confirm the diagnosis of TIA/stroke, to differentiate these from mimics and to provide early access to brain and vascular imaging. ***Validation of this element will be supported using outpatient data from SSCA.***	Martin Dennis	BLACK	No service providing rapid assessment of patients with possible TIAs and minor strokes.
				RED	A service which provides rapid assessment but does not exceed the national standard for access.
				AMBER	A service which provides rapid assessment which exceeds the national standard for access but cannot demonstrate that it offers same day brain or carotid imaging.
				GREEN	A service which provides rapid assessment which exceeds the national standard for access and can demonstrate that it provides same day brain or carotid imaging.
				COMPLETE	A service which provides rapid assessment which exceeds the national standard for access and can demonstrate that it provides same day brain and carotid imaging.

	Action	Aim	NAC Lead	Benchmark Criteria	
Priority 6: Appropriate Secondary Prevention					
1	**Anti-coagulation for patients in AF**	To develop and implement a local protocol to: • Identify persistent and paroxysmal AF in patients with ischaemic stroke and TIA; and • Identify people with atrial fibrillation and assess their risk of ischaemic stroke and bleeding to determine whether they would benefit from anti-coagulation; • Ensure that stroke/TIA patients' risks of recurrent ischaemic stroke/TIA and bleeding on anti-coagulants are assessed to maximise the number of appropriate patients with AF receiving anti-coagulants.	Christine McAlpine	BLACK	No protocol in place.
				RED	Basic ECG detection screening but no other investigation or risk assessment protocol in place.
				AMBER	Ad hoc availability of prolonged ECG and delay in commencing Warfarin or new anticoagulant.
				GREEN	Protocol for ECG / Prolonged ECG in place. Has-Bled/CHADS VASc score used, however delay in commencing Warfarin or new anticoagulant.
				COMPLETE	Protocol for ECG / prolonged ECG in place. Has-Bled / CHADS VASc score routinely used. Commencement of Warfarin or new anticoagulant in a timely manner.
2	**Carotid endarterectomy for patients with recently symptomatic carotid stenosis**	To modify the patient pathway to ensure that at least 80% of patients undergoing carotid endarterectomy for symptomatic carotid stenosis have the procedure within 14 days of their index TIA/stroke event (see details of Scottish Stroke Care Standards in Annex 2).	Martin Dennis	**This element measured by SSCA data**	
Priority 7. Transition to the community					
1.1	**Access to stroke therapy services.**	Acute therapy assessment is provided by stroke specialists by day 3 of admission following a stroke. ***Once available, data from the SSCA Rehab sprint audit will be used to support this benchmarking.***	Thérèse Jackson / Mark Smith	BLACK	No acute therapy assessment is available or plan to develop services.
				RED	Plan in place to develop stroke specialist acute therapy assessment provision by day 3 following admission.
				AMBER	Acute therapy assessment is carried out by generic staff but not routinely by day 3.
				GREEN	Acute therapy assessment is carried out by stroke specialists but not routinely by day 3 following admission.
				COMPLETE	Acute therapy assessment is carried out by stroke specialists and by day 3 of admission following a stroke.
1.2	**Access to Stroke Rehabilitation Services**	Stroke rehabilitation services including In-patient stroke rehabilitation unit (SRU), early supported discharge (ESD) teams and community rehabilitation (CR) teams should be available in each health board.	Thérèse Jackson / Mark Smith	BLACK	No In-patient SRU, ESD or Community Rehabilitation available.
				RED	Plan to develop SRU, ESD & Community Rehabilitation is in place and implementation plan agreed by MCN.
				AMBER	SRU, ESD & Community Rehabilitation available but not consistently across MCN area and is often generic in nature.
				GREEN	SRU, ESD and Community Rehabilitation is available across MCN area but levels of input are insufficient to provide daily input (Mon-Fri) on the SRU and according to patient need for ESD & CR.
				COMPLETE	SRU, ESD or Community Rehabilitation are available across the MCN area on a needs led basis (i.e., daily for SRU and according to patient need for ESD and CR).

	Action	Aim	NAC Lead	Benchmark Criteria	
2	**Person-centred approach**	Stroke services should implement a person-centred approach including goal setting in hospital and community services to ensure an individualised approach.	Thérèse Jackson / Mark Smith	BLACK	No goal setting in place, or plan to establish goal setting process.
				RED	Plan to develop goal setting process in hospital stroke services and community rehabilitation services.
				AMBER	Goal setting process is used in some hospital stroke services & community settings, but approaches are inconsistent.
				GREEN	Goal setting is used across MCN area, but process is not multidisciplinary.
				COMPLETE	Goal setting is established across the MCN area and is available in a multidisciplinary format in SRU, ESD and community rehabilitation services.
3.1	**Specialist visual assessment and rehabilitation**	Specialist visual assessment and rehabilitation services are available to all people with visual impairment following stroke across the MCN area.	Thérèse Jackson	BLACK	No referral process or documented pathway is available, or plan to develop one for people with visual problems following stroke.
				RED	Plan to develop referral process & pathway for people with visual problems following stroke.
				AMBER	Documented referral process and pathway for specialised visual assessment services but availability limited and referral is ad hoc across MCN area.
				GREEN	Documented referral process and pathway with provision and availability of specialised visual services in selected MCN areas.
				COMPLETE	All those across the MCN area with identified visual problems after stroke have access to specialised visual assessment and rehabilitation services as required.
3.2	**Access to specialist clinical/neuro psychological services**	Clinical/Neuro Psychological services are available to all patients across the MCN area who require specialised psychological assessment and intervention for the emotional and cognitive consequences of stroke.		BLACK	No specialised neuro psychological services are available for people who have had a stroke or plan to establish them.
				RED	Plan to develop referral process & pathway for neuro psychological services for people who have had a stroke.
				AMBER	Documented referral process and pathway for specialised neuro psychological services but availability limited and referral is ad hoc across MCN areas.
				GREEN	Documented referral process and pathway with provision and availability of specialised neuro psychological services and consistent referral in selected MCN areas.
				COMPLETE	All individuals (patients and family/ carers) with identified emotional and/ or cognitive problems after stroke have access to specialised neuro psychological assessment and intervention as required across all MCN areas (prevention, acute, post acute rehabilitation and community).

	Action	Aim	NAC Lead	Benchmark Criteria	
3.3	**Specialist Driving Assessment**	Specialist advice with regards to return to driving following stroke is available to all patients across the MCN area.		BLACK	No local protocol or access to specialised advice is available, for return to driving following stroke.
				RED	Plan to develop local protocol & access to specialised advice regarding the referral process & pathway for return to driving following stroke.
				AMBER	Local protocol for return to driving assessment & access to specialised advice is available but not documented, and referral for assessment at a specialised driving assessment service is ad hoc across the MCN area.
				GREEN	There is a documented referral process and pathway available, with provision of specialist advice for return to driving in some MCN areas.
				COMPLETE	Clear, documented protocol for accessing specialist advice and referral to driving assessment at an accredited driving assessment service is evident across MCN area.
Priority 8. Living with stroke					
1	**Self management post discharge support**	Multidisciplinary stroke teams provide a range of supported self management approaches including individual, group, written and online resources and can evidence the use of these.	Thérèse Jackson	BLACK	No self management approaches or resources are available.
				RED	Plan in place to develop self management approaches.
				AMBER	Only written and online self management resources are available and are used locally and evidence of their use available.
				GREEN	Individual or group self management options (as well as written and online) are available to some patients across the MCN area and evidence of their use available.
				COMPLETE	Facilitated individual or group self management options (as well as written and online) are available to all patients across the MCN area and evidence of their use available.
2	**Exercise**	People being discharged home following stroke should have access to exercise after stroke services and given advice about increasing their physical activity levels where appropriate.	Mark Smith	BLACK	Exercise after stroke services or advice regarding increasing physical activity are not available.
				RED	Advice regarding increasing physical activity is available but an exercise after stroke service is not available.
				AMBER	Advice regarding increasing physical activity is available and limited exercise after stroke services are available across some parts of the MCN area.
				GREEN	Advice regarding increasing physical activity is available and exercise after stroke services are available across the MCN area.
				COMPLETE	An established system to ensure advice regarding increasing physical activity is delivered and a clear process of referral into an exercise after stroke pathway is evident across the entire MCN area.

	Action	Aim	NAC Lead	Benchmark Criteria	
3	**Living with stroke – vocational rehabilitation**	Vocational rehabilitation services are available to people who wish to return to paid, unpaid or voluntary work.	Thérèse Jackson	BLACK	No vocational rehabilitation services available for people who have had a stroke or plan to establish them .
				RED	Plan to develop referral process & pathway for vocational rehabilitation services for people who have had a stroke.
				AMBER	Vocational rehabilitation services exist for people who have had a stroke, however availability and referral is ad hoc across the MCN area.
				GREEN	There is a documented referral process and vocational rehabilitation pathway available, with provision of specialist services in some MCN areas.
				COMPLETE	All those across the MCN area with identified vocational rehabilitation needs after a stroke have access to specialised assessment and intervention services as required.
4	**Access to stroke spasticity management services**	Stroke services should implement a documented programme for prevention and management, including self-management, of post stroke spasticity. All staff should have completed training on prevention and management of post stroke spasticity (STARs). Patients and carers should receive information on spasticity management both verbally and in written/ online format. Timeous stroke spasticity services are available to all patients across the MCN area who require specialist assessment and intervention.		BLACK	No documented pathway or referral process for post stroke spasticity management is available, or plan in place to develop one.
				RED	Plans in place to develop referral process or documented pathway for spasticity management, including staff training and patient/carer information.
				AMBER	Spasticity management pathway in place in some parts of the MCN area but approach is inconsistent. No specialist stroke spasticity services available.
				GREEN	Spasticity referral process and documented pathway in place. Access to specialist, multidisciplinary spasticity services for some patients, but on an ad hoc basis throughout the MCN area.
				COMPLETE	Spasticity referral process and documented management pathway in place. Timely specialist multidisciplinary stroke spasticity services, which include a specialist clinic and appropriate therapy follow up, are available across the entire MCN area.

Appendix C: Stroke Education Template

A national stroke education template has been developed which lists the skills/training requirements for staff working with stroke patients. This includes:

- Swallow screening;
- Stroke core competencies - via stroke courses or STARS* online (Stroke Training Awareness Resource) and STARS advancing;
- SCoT** online core and specialising; and
- Thrombolysis, STAT training or equivalent

***STARS** (Stroke Training Awareness Resource) is an e-learning resource/learning tool available to health and social care staff to enable them to become more knowledgeable in stroke care. The resource is based on the Stroke Core Competencies which were published by NHS Education Scotland (NES) in 2005. The STARs website is a nationally recognised stroke training resource. Attaining the website's Core Competency Test Certificate will provide evidence of a minimum standard of training as set out in the draft NHSQIS standards.

****SCoT**, the Stroke Competency Toolkit (SCoT) is a free Continuing Professional Development (CPD) resource, specific to stroke care and is based on the NES Stroke Core Competencies (2005). It provides a format which enables health and social care staff to evidence their learning and demonstrate their knowledge of the stroke core competencies through reflective practice.

Thrombolysis/Stroke and TIA Assessment Training (STAT) is aimed at staff who are involved in clinical decision making around thrombolysis treatment/management. It covers all aspects of assessment, delivery and monitoring.

Appendix D: Organisational Structure of SSCA

The Scottish Stroke Care Audit is a national audit within the Scottish Healthcare Audits of the Consultancy Knowledge and Research Service and Public Health Intelligence at the Information Services Division (ISD) of NHS National Services Scotland (NSS).The audit has its own Steering Committee reporting directly to the National Advisory Committee for Stroke (NACS) at the Scottish Government and providing strategic direction and clinical input to the audit team, optimising the use of the data. See the SSCA website (http://www.strokeaudit.scot.nhs.uk/about/SteerGp.htm) for details of the Steering Committee.

The organisational structure of the SSCA is:

Professor Martin Dennis	Chairman of the Steering Committee/ Lead Clinician
Neil Muir	National Clinical Co-ordinator
Pamela Maclean	Regional Clinical Co-ordinator
David Murphy	Senior Information Analyst
Iain McDermid	Information Analyst
Martin O'Neill	Principal Analyst
Gillian Gillespie	Data Support Officer

Moranne MacGillivray (National Clinical Co-ordinator) left the SSCA during 2016 to take up a new position within the NHS. The SSCA team would like to take this opportunity to thank Moranne for her contribution and wish her well in her new venture.

Funding of £167k for the central coordination of the SSCA for 2016/17 was provided by NACS. Funding for the SSCA data collection has been included in each Health Board's general allocation. Each Health Board is expected to continue to collect the audit data. Auditors are employed in each Health Board and are supported by their Stroke MCN. Staffing levels vary widely between hospitals. Auditors' responsibilities include case ascertainment, data collection, completion of forms and data entry. Since June 2012 all Health Boards have entered data into eSSCA. Prior to this all Health Boards data were entered into the Scottish Stroke Care Audit System (SSCAS) other than NHS Lanarkshire. In NHS Lanarkshire a locally developed system (Stroke Audit In Lanarkshire (SAIL)) was used to collect inpatient and outpatient data. Data from SAIL (up to June 2012) were sent directly to ISD on a monthly basis and are included in National Reporting. Data validation is built into the computer systems, with additional local validation at point of data entry and centrally during analysis.

The information presented in this report highlights the variation in the quality of stroke services across Scotland.

Appendix E: Additional Information

Additional information is available on the SSCA website:

- Aims, objectives and methods of the audit.
  http://www.strokeaudit.scot.nhs.uk/about.htm

- Audit documentation, e.g. data collection forms`.
  http://www.strokeaudit.scot.nhs.uk/about/Resources.html

- Core dataset definitions.
  http://www.strokeaudit.scot.nhs.uk/about/Resources.html

- Current Steering Group members.
  http://www.strokeaudit.scot.nhs.uk/about/SSCA_Steering_Committee_Members_2015.pdf

- Contact details of Project Team.
  http://www.strokeaudit.scot.nhs.uk/contact.htm

- Previous Annual National Reports.
  http://www.strokeaudit.scot.nhs.uk/Reports/Reports.html

- Information on requesting SSCA data for research purposes.
  http://www.strokeaudit.scot.nhs.uk/Research.html

- Information on Quality Improvement and the Scottish Stroke Care Standards.
  http://www.strokeaudit.scot.nhs.uk/Quality.html

- Information for patients and carers.
  http://www.strokeaudit.scot.nhs.uk/Patients.html

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The SSCA Audit Team and ISD Publications Team as part of the Information Services Division of NHS National Services Scotland who co-ordinate and collate the necessary information to produce the report and support the publication of the National Report;

Members of the Report Writing Sub-Group of the SSCA Steering Committee who have contributed to the writing of and commented on drafts of this report; and

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This Annual National Report was prepared by Dr Mark Barber, Katrina Brennan, Professor Martin Dennis, Professor Peter Langhorne, Neil Muir, Dr Mary-Joan Macleod, Pamela Maclean, Iain McDermid, David Murphy, Mr Wesley Stuart, with contributions from Health Boards and partner organisations.

Scottish Stroke Care Audit logo designed by Definitive Studio® Graphic Design and Communication.

This report is also available as an Easy Access Public Summary, this version of the report can be found on the SSCA website (http://www.strokeaudit.scot.nhs.uk/reports.html).

We are grateful to the Stroke Association and Chest Heart & Stroke Scotland patient/ carer groups who provided feedback on the 2015 Public Summary.

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Website
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Any questions about the SSCA should be referred to the co-ordinating centre. Please refer questions on this report to Neil Muir, David Murphy or Iain McDermid.

For general questions about the audit please contact Neil Muir National Clinical Coordinator for the SSCA.

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Better outcomes.

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