Public Health Scotland

Scottish Stroke Improvement Programme 2025, with data from the Scottish Stroke Care Audit: national report

A Management information release for Scotland

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Foreword

Stroke continues to have a significant impact on many people and their families across Scotland. As outlined in this report the number of strokes in Scotland in 2024 was 11,341 which is an increase on the previous year. We know that delivering evidence-based treatments consistently and in appropriate timescales increases people's chances of making the best recovery possible from a stroke. Getting stroke care delivery right also has the potential to help relieve some of the wider pressures on the NHS by reducing care need and removing unnecessary steps in people's care that add no value to their treatment.

The Annual Scottish Stroke Improvement Plan Report, including data captured in the Scottish Stroke Care Audit, is an important element in demonstrating how well care is delivered to people having a stroke across Scotland. Alongside Annual Review meetings with all NHS boards and the Scottish Audit Programme Governance Process, this report is a key tool to highlight where great care is being delivered and sharing good practice but also holding NHS boards to account where care delivery needs to improve.

As you will see the report this year shows a "mixed bag" of delivery of stroke care. There are areas of excellent or significantly improved stroke care delivery but frustratingly there remains significant variation in delivery between different boards and hospitals and also between different hours of the day and days of the week. I know that stroke teams across Scotland are passionate about the care they deliver and are working tirelessly to improve. 24/7 delivery of stroke care is complex and has many interactions and dependency on multiple services including the ambulance service, Emergency Departments and radiology departments. Treatment is becoming more complex as evidence evolves and there is more we can do for those who have had a stroke. All of these services are under significant pressure and subject to competing priorities of which stroke is just one which means the ability of stroke teams themselves to make improvement is often constrained. Additionally, the ability to discharge people from hospital when they no longer require inpatient care is a well

known challenge and has an impact on the ability of all patients to access the care they need by freeing up capacity of teams and beds in hospitals.

The recent requirement for all Boards to have an Executive Officer responsible for stroke care aims to provide a voice at an appropriately senior level in NHS boards to be able to represent the needs of people with stroke, see this alongside other priorities, and influence decision making to try and unlock some of these systemic blocks. We are also in the process of making changes to the Board annual review process to ensure this vital tool for improvement in stroke care continues to be fit for purpose.

Improvement in stroke care is a collaborative effort between stroke teams, the Boards in which they work and the Scottish Government with all playing their part in influencing and changing the aspects of the healthcare system that they have control over. Some of the challenges we continue to face and will face in the future will need some innovative solutions and different ways of working, which are already being explored nationally, to overcome some of the blocks to improvement that we find. I look forward to continuing to work with colleagues across Scotland as we endeavour to deliver the stroke care that stroke survivors and their loved ones deserve.

Dr Matthew Lambert, National Clinical Lead for Stroke and Stroke Specialty Advisor to the CMO

1. Introduction

The Scottish Stroke Care Audit measures quality of stroke care against the Scottish Stroke Care Standards (2016) and the Scottish Stroke Improvement plan (SSIP 2014, updated 2023). The four key components of the stroke care bundle are: admission to a stroke unit on the same day or day after admission (90% of patients), swallow screen within four hours of admission (100%), brain imaging within 12 hours (90%) and for those with no contraindication, administration of aspirin either on the day of admission or the following day (95% of eligible patients). These components are easy to measure and achieving them is associated with improved outcomes. Targets for each component of the bundle allow NHS boards to work with their stroke managed clinical networks (MCNs) and the Scottish Stroke Improvement Team to deliver optimum care for stroke patients.

A description of the 2024 performance of Health Boards against each standard are presented in the following sections with commentary.

The 2024 patient data relate to standards which have not been updated since 2016 despite the revised Stroke Improvement Plan (2023) and publication of the National Stroke Guideline (2023). It is intended that more rigorous standards will be introduced in January 2026 to reflect changes in evidence and clinical practice.

We would also like to take the opportunity to recognise the vital contribution of the local audit coordinators (LACs) working across NHS boards in Scotland and capturing the high-quality data that is used for the audit.

Main points

- In Scotland in 2024, 11,341 people had a final diagnosis of stroke, compared to 11,137 in 2023. Of these, 9,625 (84.9%) were ischaemic, a clot in the brain, while 1,560 (13.8%) were due to intracerebral haemorrhage, a bleed, while 156 (1.4%) were cause unknown.

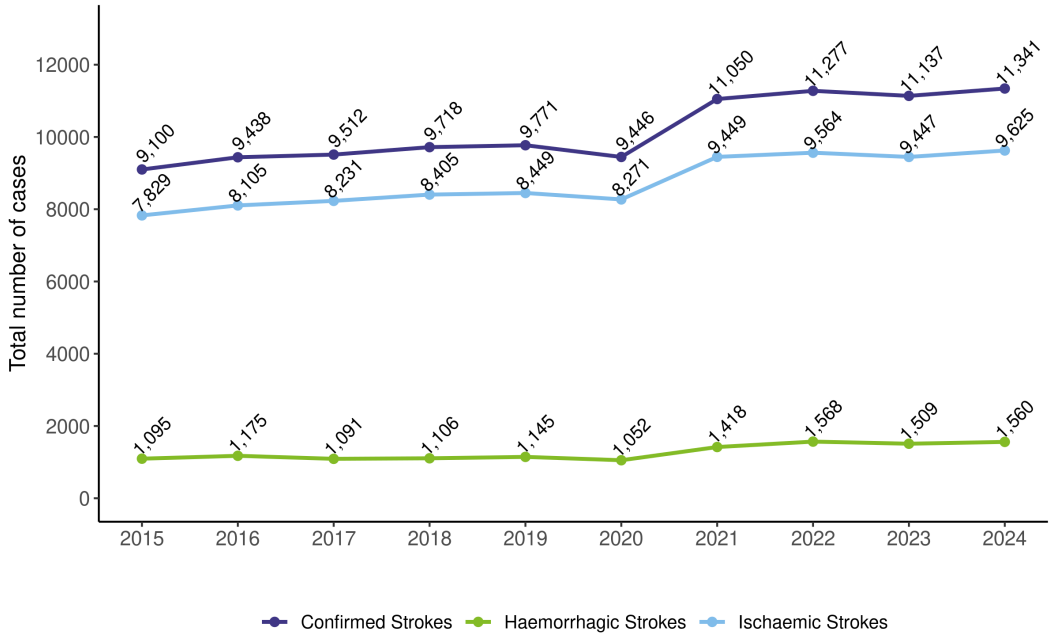
- Between 2023 and 2024 there has been a small improvement in bundle performance across Scotland (50.4% versus 52.9%), but results have not recovered to levels before 2020.

- Of the 9,625 ischaemic strokes in Scotland 1,045 patients (10.8%) received thrombolysis, a clot bursting medication that restores blood flow in vessels blocked by clots, a similar rate to 2023 (11.3%).

- In 2024, 212 patients received a thrombectomy, a procedure to remove a blood clot from a blood vessel, across Scotland. This is an increase from 153 in 2023 and 112 in 2022 but still represents only 2.2% of the total number of people who had an ischaemic stroke in 2024.

- The national percentage of outpatients with stroke or Transient Ischemic Attack (TIA) reviewed by a stroke specialist within 4 days remains unchanged at 76%, short of the target of 80%

Figure 1. Total confirmed strokes in Scotland, 2015 to 2024



Since 2021, some cases initially missed by the audit but identified in SMR01 have been included in the audit. This partially explains the increase in number of cases.

2. Results and commentary: Inpatients, outpatients, carotid intervention, thrombolysis and thrombectomy.

2.1. Inpatients

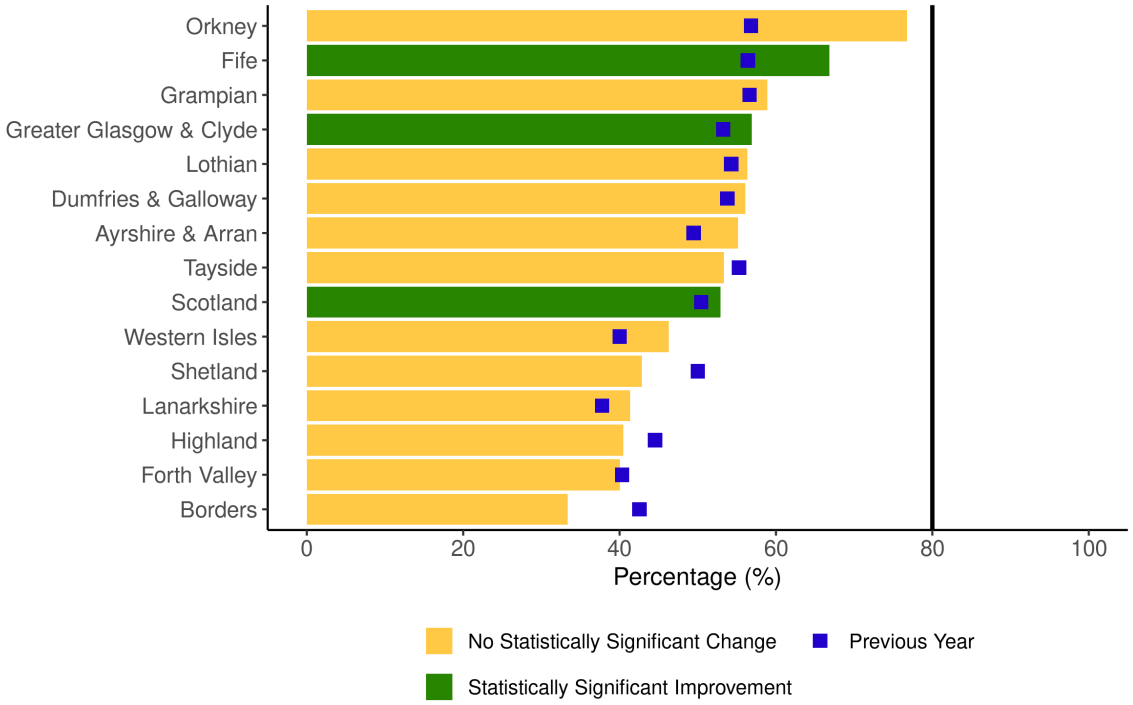
Details on inpatient performance against stroke care standards are described in the following section. The Scottish stroke care standards include the proportion of patients with a final diagnosis of stroke who were managed in accordance with all four standards comprising the stroke care bundle. These care bundle items comprise the prompt delivery of a) screening for swallowing problems; b) brain imaging; c) administering of aspirin (unless contraindicated) and d) admission to a stroke unit

Previous research has shown that these items are associated with improved patient outcomes, particularly admission to a stroke unit.

Further information on these standards is available **here.**

As demonstrated in recent years, NHS board performances tend to be consistently better for the aspirin and brain imaging standards (which simply require access to a computerised tomography (CT) scanner and good medical management pathways). The standards most affected by suboptimal overall hospital performance and patient flow, specifically the completion of a swallow screen within 4 hours and admission to a stroke unit on the day of or the day following admission, continue to be challenging. These standards exhibit significant variability and generally poor performance.

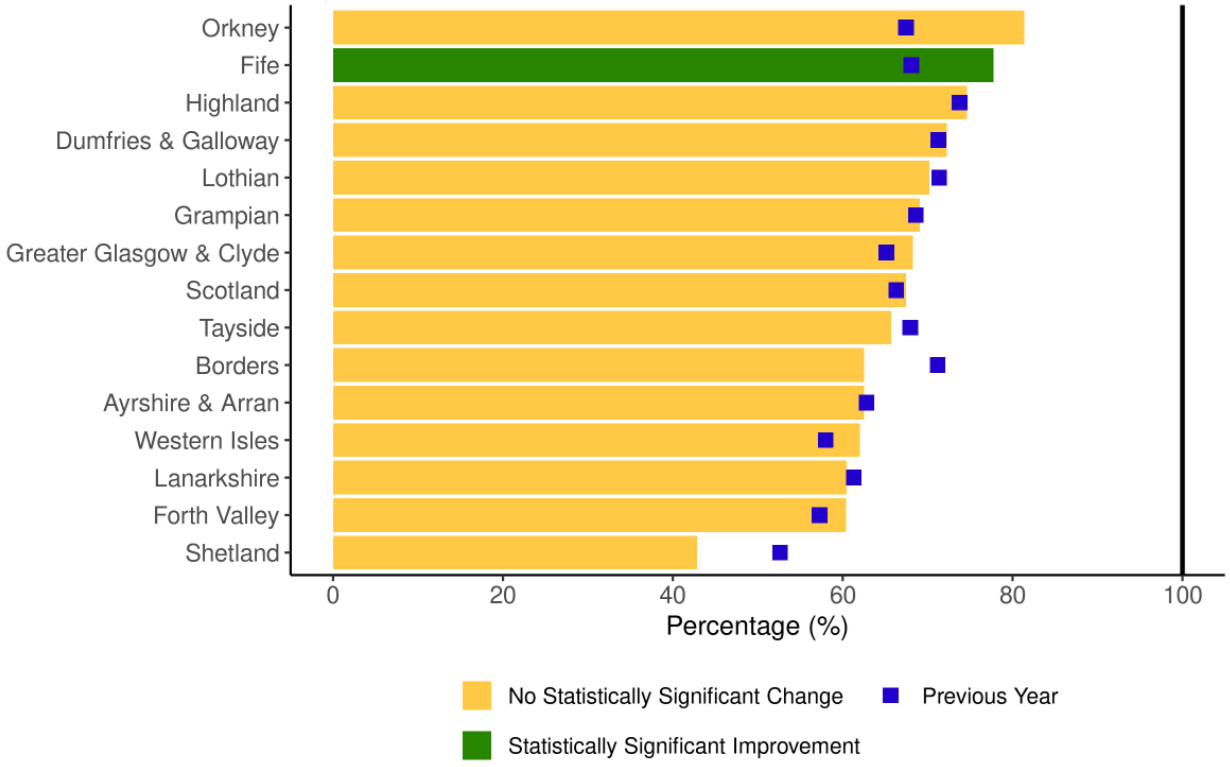
Figure 2.1: Stroke patients receiving the appropriate stroke care bundle by NHS board: 2024 (bar) compared to 2023 (square).



Between 2023 and 2024 there has been statistically significant change in bundle performance across Scotland (50.4% v 52.9%). The only NHS board areas where significant progress has been made are in NHS Fife and NHS Greater Glasgow and Clyde. No NHS board, with a stroke unit, is close to achieving the 80% standard for bundle performance. NHS Borders, where performance fell from 42.6% to 33.3% is a particular concern, albeit this deterioration is not statistically significant. Detailed health board responses to the Scottish National Audit Programme are available **here**.

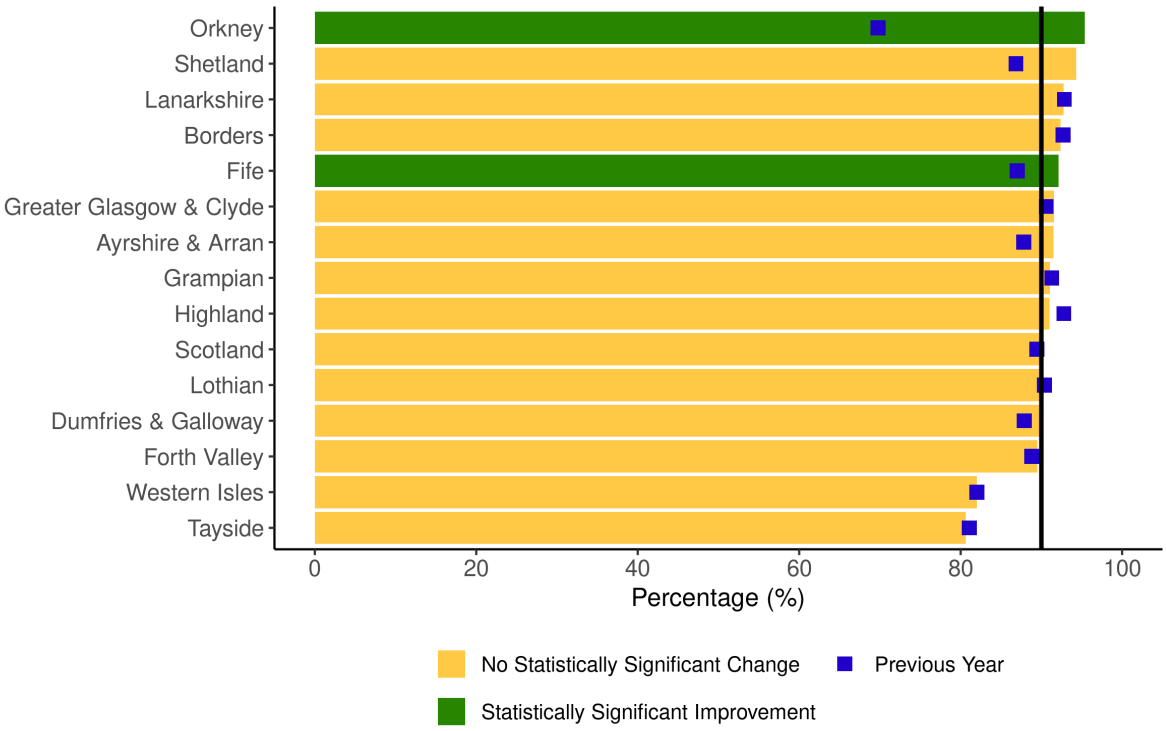
The four components of the stroke care bundle are further described in figures 2.2. – 2.5.

Figure 2.2: Stroke patients receiving a swallow screen within 4 hours of admission by NHS board: 2024 (bar) compared to 2023 (square).



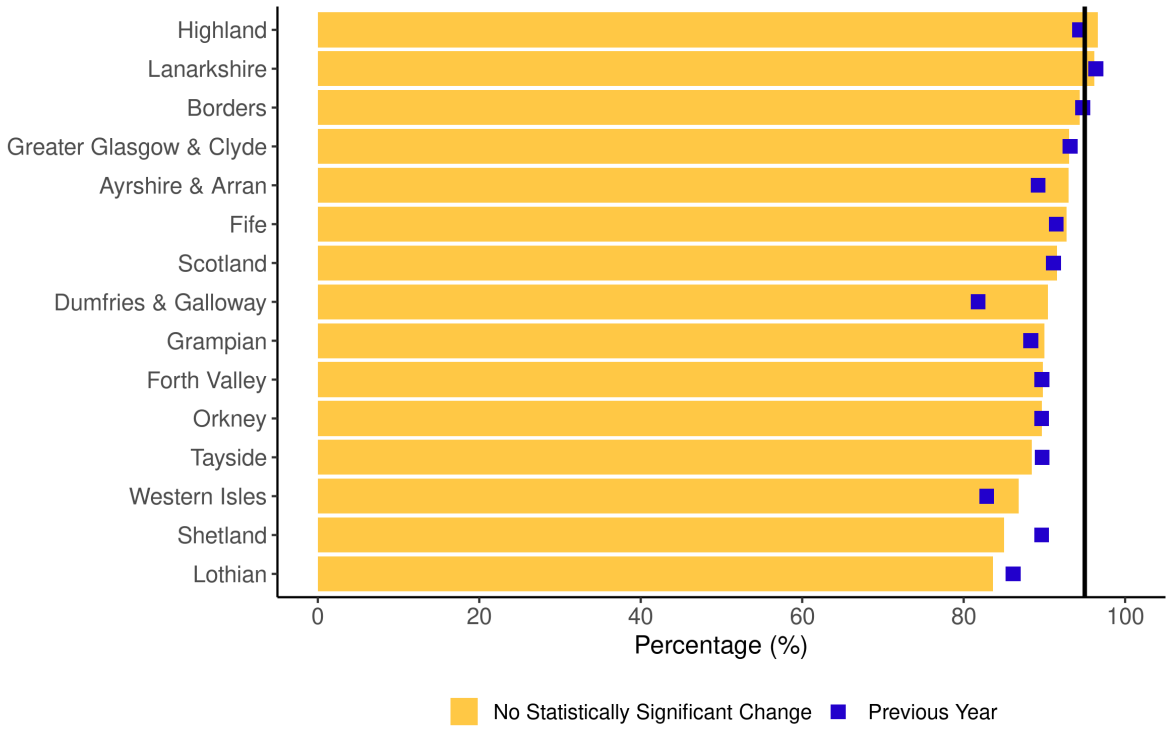
Performance varies across the country, with no NHS board achieving high standards. The Scottish average of 67.4% remains nearly unchanged from the 2023 figure. NHS Fife is the only Board to significantly improve in swallow screen performance between 2023 and 2024 (68.1% v 77.8%). NHS Fife and NHS Orkney are the best performing Boards in Scotland against this stroke care standard.

Figure 2.3: Stroke patients receiving brain imaging within 12 hours by NHS board: 2024 (bar) compared to 2023 (square).



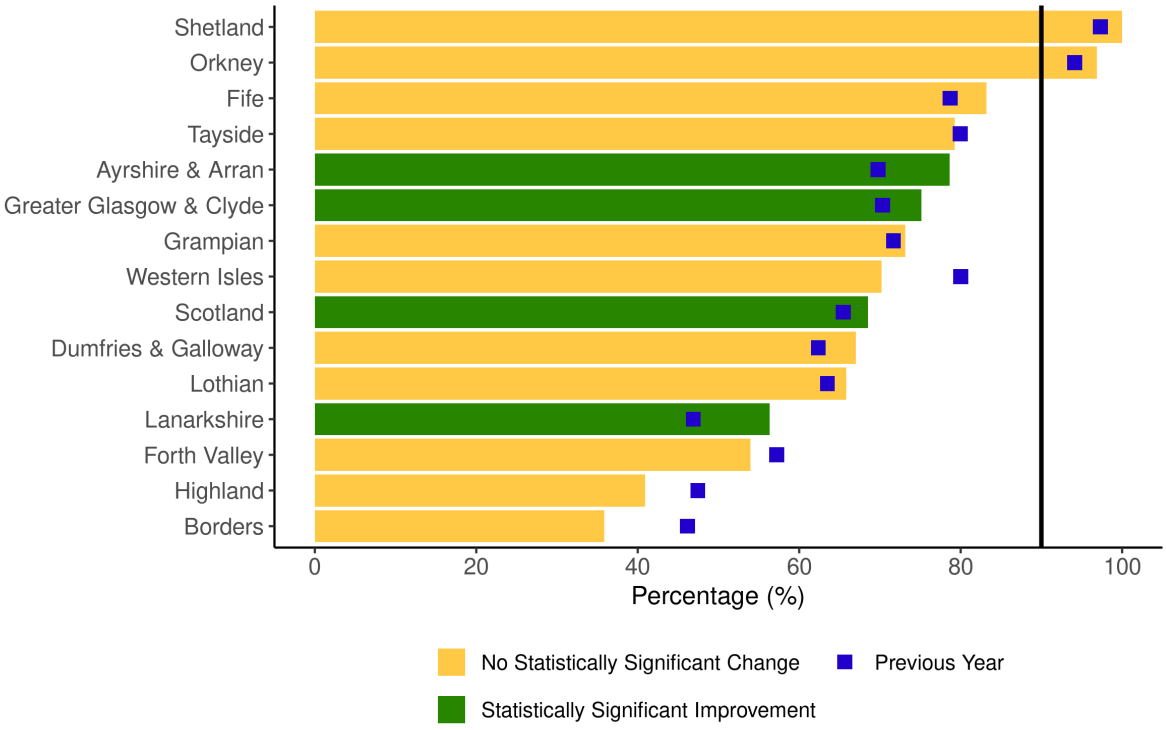
Performance against the brain imaging standard has been achieved (on average) across Scotland at 90.3%. NHS Tayside (80.6%) and NHS Western Isles (82%) performance for this national standard has been below expectations and contrasts with, what appears to be, a generally achievable standard for other NHS boards. Detailed health board responses to the Scottish National Audit Programme are available **here**.

Figure 2.4: Stroke patients receiving aspirin within 1 day by NHS board: 2024 (bar) compared to 2023 (square).



Performance against the aspirin standard is static across Scotland at 91.6%. Only two NHS boards (Lanarkshire and Highland) achieved the standard in 2024. This should be a straightforward standard to achieve, given the ready access to brain scanning and the less complex process of medication administration.

Figure 2.5: Stroke patients being admitted to a stroke unit within 1 day by NHS board: 2024 (bar) compared to 2023 (square).



The stroke unit admission standard remains very challenging. Much of the poor performance reflects larger issues with hospital flow but is also a marker that stroke is, perhaps, not given the same priority as other specialties within our hospitals. Overall, most areas have improved against this standard (NHS Ayrshire and Arran, NHS Greater Glasgow and Clyde and NHS Lanarkshire have seen statistically significantly improvement), with Scottish performance improving from 65.5% to 68.5%. However, performance in NHS Borders and NHS Highland appears to be falling to very low levels (35.9% and 40.9% respectively). NHS Orkney and NHS Shetland do meet the standard. This is primarily because their designated stroke unit' beds are integrated into an admitting ward area, making it challenging not to meet this standard.

2.2. Thrombolysis

There were 9,625 ischaemic strokes overall in Scotland in 2024 of which 1,045 (10.8%) received thrombolysis. This is in comparison to the previous year where out of 9,447 ischaemic strokes, 1,071 (11.3%) patients received thrombolysis.

Thrombolysis therapy is often referred to as "clot-busting" therapy, where medication is given as an intravenous injection to dissolve blood clots that block blood flow to the brain, causing an ischaemic stroke. This aim is to restore blood flow to the affected area of the brain, reducing brain damage and improving the chances of recovery. Stroke thrombolysis is a time dependent treatment and the sooner it is delivered to eligible patients the probability of achieving a better outcome is higher. It is therefore essential to have timely thrombolysis available to as many eligible patients as possible. There are no national clinical standards for the proportion of patients to be thrombolysed but there is a significant variation across Scotland from just over 6% in several health boards to 19.7% in NHS Grampian. Some patients proceed directly to thrombectomy without thrombolysis, but these numbers are too small to significantly affect these proportions.

Figure 2.6: Stroke patients receiving thrombolysis in 30 minutes by NHS board: 2024 (bar) compared to 2023 (square).

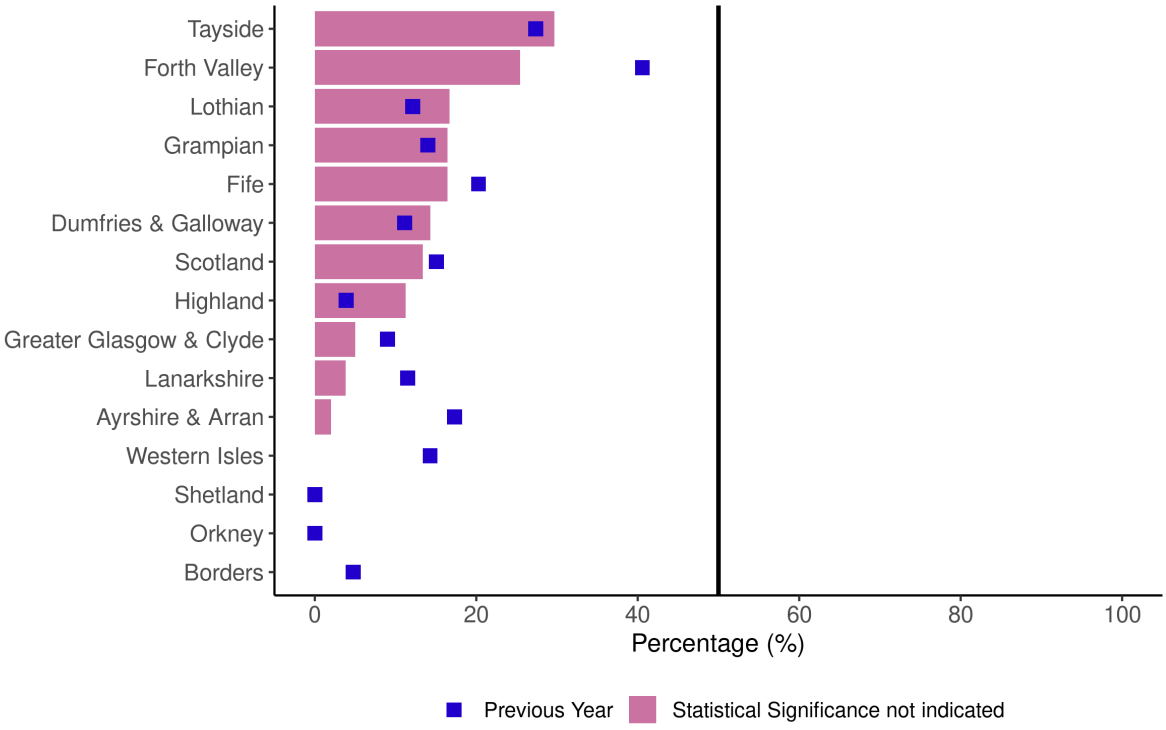
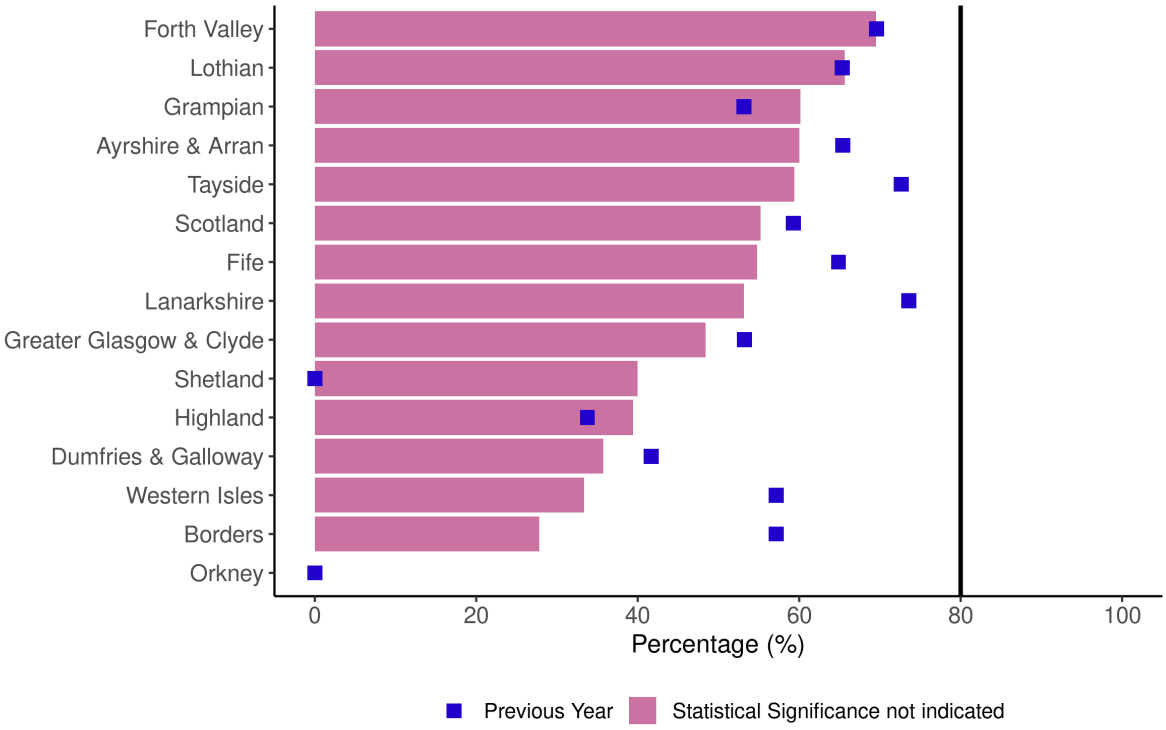
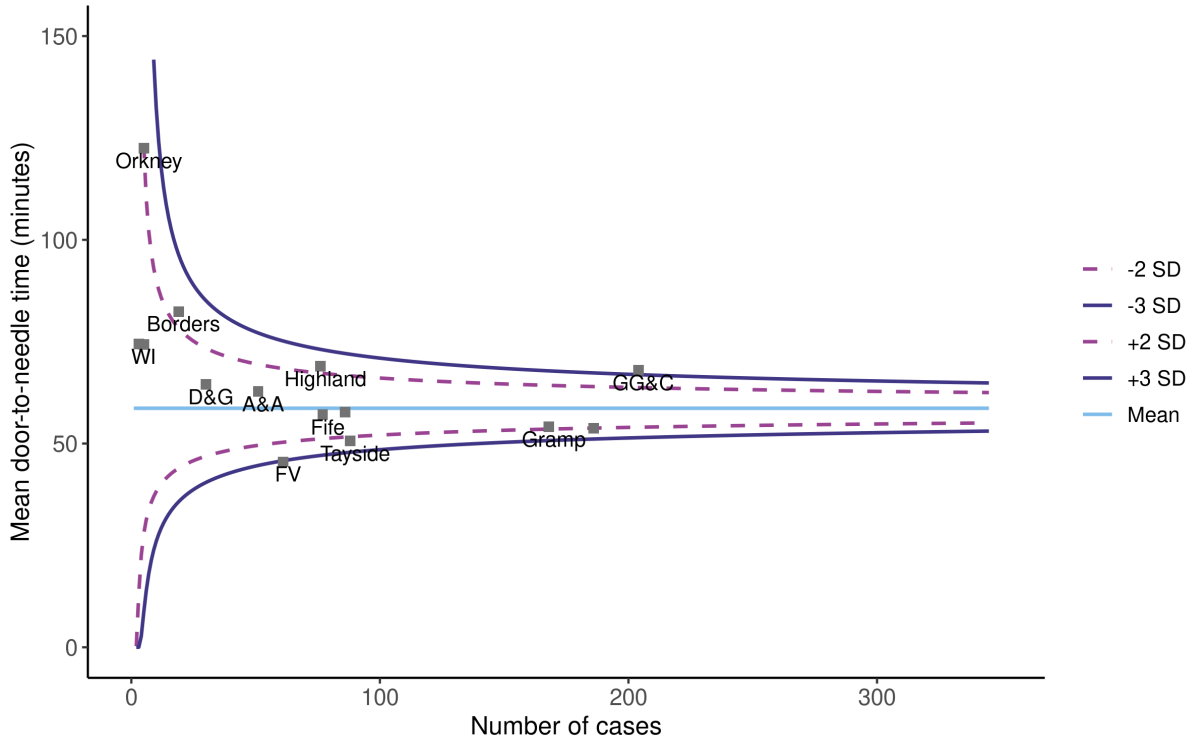


Figure 2.7: Stroke patients receiving thrombolysis in 60 minutes by NHS board: 2024 (bar) compared to 2023 (square).



National standards hold an expectation that at least 50% of patients be treated within 30 minutes, and 80% within 60 minutes. Earlier treatment can be the determining factor between remaining dependent due to a disabling stroke or achieving functional independence.

Chart 2.8 Thrombolysis door to needle, from arrival at first hospital, by NHS board (anytime), 2024



The best performing health board in mean door to needle time (DTN) is NHS Forth Valley with mean time of 45.51, with just under half of the health boards sitting under 60 min and just over half between 62 and 120 minutes.

During weekday working hours, the performance of health boards in meeting the standard ranges from 32.6 minutes in NHS Forth Valley to 54 minutes in NHS Greater Glasgow and Clyde.

Within the same health board, different hospitals have significantly different DTN times in and out of hours. Generally, health boards that use telemedicine for remote assessment of patients and provide advice to the local team on delivering thrombolysis have better DTNs then the health boards where eligible patients are transferred to the thrombolysing centres after assessment for suitability. Whilst remote telemedicine support is available, it is dependent on adequate IT support, awareness of pathways and robust local protocols. Rural areas may face challenges in ensuring timely CT scanning due to the availability of onsite staff

We expect to see an improvement in thrombolysis times as the Scottish Government has funded specialist stroke nurse posts to lead thrombolysis teams in and out of hours and to help deliver this important treatment in a timely fashion. This is important not only for improving thrombolysis times but also as part of developing a thrombectomy service.

2.3. Thrombectomy

Thrombectomy is the physical removal of a thrombus (clot) which is blocking a large artery and causing a stroke. If a person is clinically suitable, the treatment can significantly increase their chance of improving or recovering from an ischaemic stroke. Like thrombolysis, the sooner the procedure can be performed the better the chance of a recovery will be. Often, but not always, thrombolysis will be delivered in addition to thrombectomy. It is performed by interventional neuroradiologists, and interventional radiologists supported by anaesthetists, radiographers, radiology nurses and stroke teams.

Thrombectomy in Scotland is delivered using a hub and spoke model. The procedure itself and the immediate post-procedure care is carried out in the Queen Elizabeth University Hospital, Glasgow, Royal Infirmary of Edinburgh and Ninewells Hospital, Dundee (the hubs). Teams in the other hospitals in Scotland that receive patients with strokes (the spokes) assess the patient clinically and with appropriate imaging, and the patient is deemed suitable for treatment with thrombectomy they are then transferred to their linked hub for treatment.

In 2024, 212 patients received thrombectomy treatment across Scotland (43 in Ninewells Hospital, Dundee, 73 in The Royal Infirmary of Edinburgh and 96 in Queen Elizabeth University Hospital, Glasgow). This is an increase from 153 in 2023 and 112 in 2022, but is still only 2.2% of the total number of people who had an ischaemic stroke. Whilst not everyone who has a stroke is suitable to receive thrombectomy, the evidence suggests that about 10-15% of those with acute ischaemic stroke can potentially benefit from treatment.

Most of the population of Scotland now have access to thrombectomy at some time during the week. However, there are still significant periods of time when people are

not able to get treatment. This is the most significant issue leading to lower treatment rates than we should be delivering and means the current access is very inequitable. Currently there is extremely limited treatment at weekends and no access to treatment overnight anywhere in Scotland. The reasons for this differ in the various regions of Scotland but include a combination of availability of enough suitably trained people to set up sustainable 24/7 rotas, availability of facilities where the treatment can be delivered rapidly, availability of financial resource to deliver the service, competing priorities on key teams involved in the treatment (such as radiology and anaesthetic teams) and the organisation and resourcing of stroke specialist teams across Scotland to be able to assess patients for suitability of treatment and manage their out of hours care after treatment.

Efforts are ongoing within all NHS boards in Scotland to extend the availability of treatment hours and increase the number of hospitals capable of referring patients for treatment. The goal is to ensure that every clinically suitable patient can receive treatment, regardless of where or when they experience a stroke. This includes exploring more joint working across Scotland.

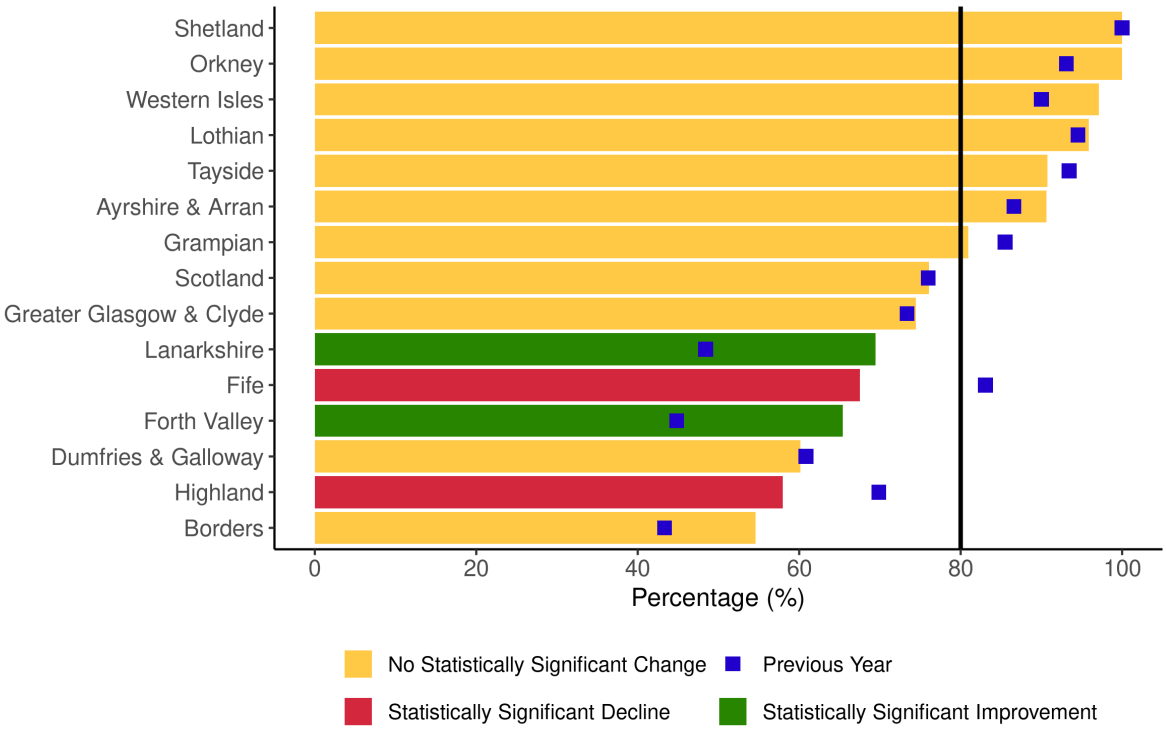
Thrombectomy is just one part of hyperacute stroke treatment. It does not work in isolation and builds on the foundations of hyperacute stroke assessment including delivery of thrombolysis. As outlined in previous sections, there is still significant variation in delivery of thrombolysis (both in terms of numbers of people treated and time taken to treat) particularly outside weekday daytime hours, indicating that pathways in many hospitals are not as effective as they could be. As thrombectomy becomes more widely available, it will be even more important to ensure hyperacute stroke pathways with rapid access to appropriate brain imaging and specialist decision making are optimised so that all suitable people are quickly identified and receive treatment.

Another important factor to identify all people who may benefit from thrombectomy is access to appropriate imaging and support with its rapid interpretation. Currently artificial intelligence (AI) tools are being trialled in a few hospitals in Scotland to help with patient selection. A tender process is under way to procure a brain imaging AI tool for the whole of Scotland with the aim of this being universally available towards the end of 2025/early 2026.

2.4. Access to specialist stroke/ transient ischaemic attack (TIA) outpatient services

Timely secondary prevention in patients with transient ischemic attack (TIA) or minor stroke is proven to reduce the risk of early recurrent events. Evidence base, and options for treatment and prevention, have increased. Urgency around identification and commencing treatment remain paramount. Atrial fibrillation exclusion and identification of carotid stenosis remain key factors at the TIA clinic, as do the medicolegal aspects, such as driving advice.

Figure 2.9 Percentage of stroke/TIA patients being reviewed at a specialist stroke/ TIA service within 4 days of initial referral by NHS board: 2024 (bar) compared to 2023 (square).



The national percentage of patients reviewed in Scotland within 4 days remains unchanged at 76%, with a target of 80%.

Two health boards have seen a statistically significant improvement in time to clinic review; these were NHS Lanarkshire and NHS Forth Valley. NHS Highland and NHS Fife have seen a deterioration in performance. Notably, whilst the other boards are

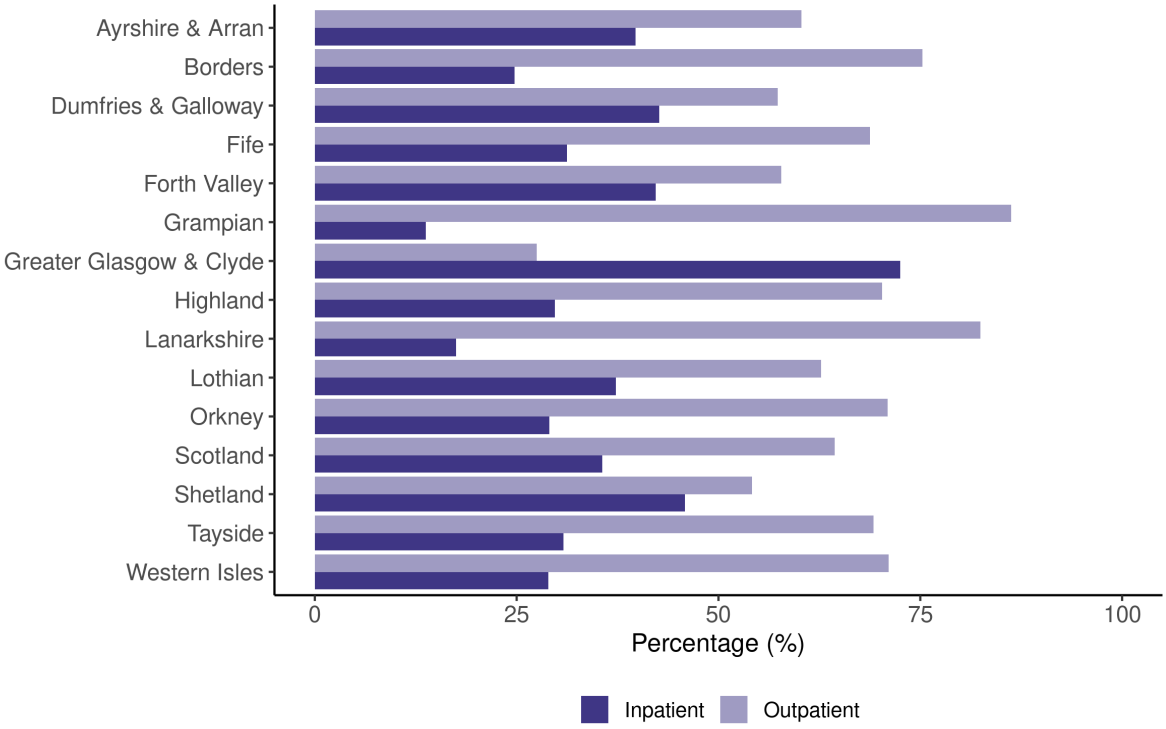
unchanged in position, half of Scottish health boards do not achieve the 80% standard.

Those health boards that find this standard challenging to achieve have indicated that workforce planning and capacity remain significant obstacles. Other factors include the challenge of phoning a patient on the day of referral, if this modality is used. Patients sometimes refuse early review, delaying the clinic visit. Boards have also highlighted the challenge of seeing a patient referred on a Friday within 4 days, if there is no Monday clinic. They identify the benefit of a spread of clinics across the week.

2.4.1.1 Final diagnosis TIA; variation between inpatient and outpatient diagnoses

There is great variability across Scotland in the percentage of patients visiting clinic who have a final diagnosis TIA or minor stroke. For example, 86.2% of patients with a diagnosis of TIA are seen at an outpatient clinic in NHS Grampian, whilst in NHS Greater Glasgow and Clyde the percentage is 27.5%. Conversely, within the context of inpatients, the opposite is true. 13.7% of patients in NHS Grampian and 72.5% in NHS Greater Glasgow and Clyde have a final diagnosis of TIA. This demonstrates how different health boards design their investigatory TIA services and outpatient facilities, in different ways.

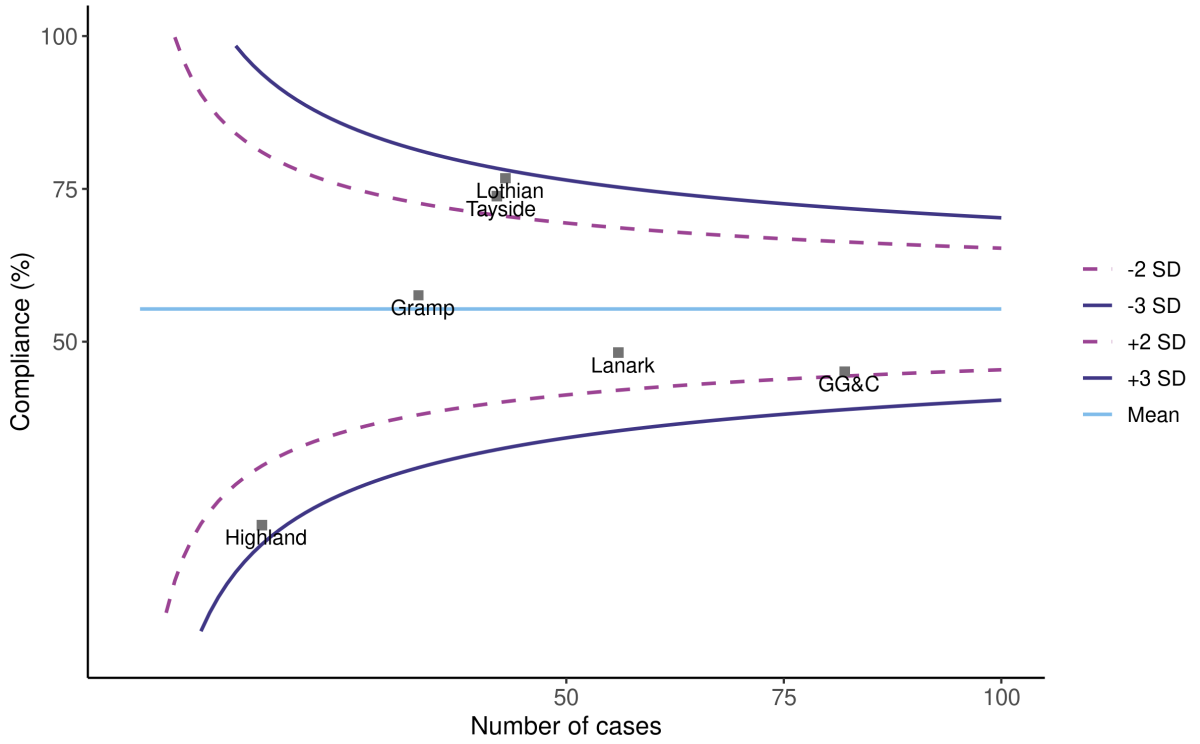
Figure 2.10 Percentage of all patients with a final diagnosis of transient ischemic attack (TIA) in outpatient and inpatient settings



2.5. Carotid Intervention

Identifying carotid stenosis requiring surgical intervention is a focus at the TIA clinic, with clinics organised to accommodate early carotid imaging and onward referral for carotid endarterectomy (CEA).

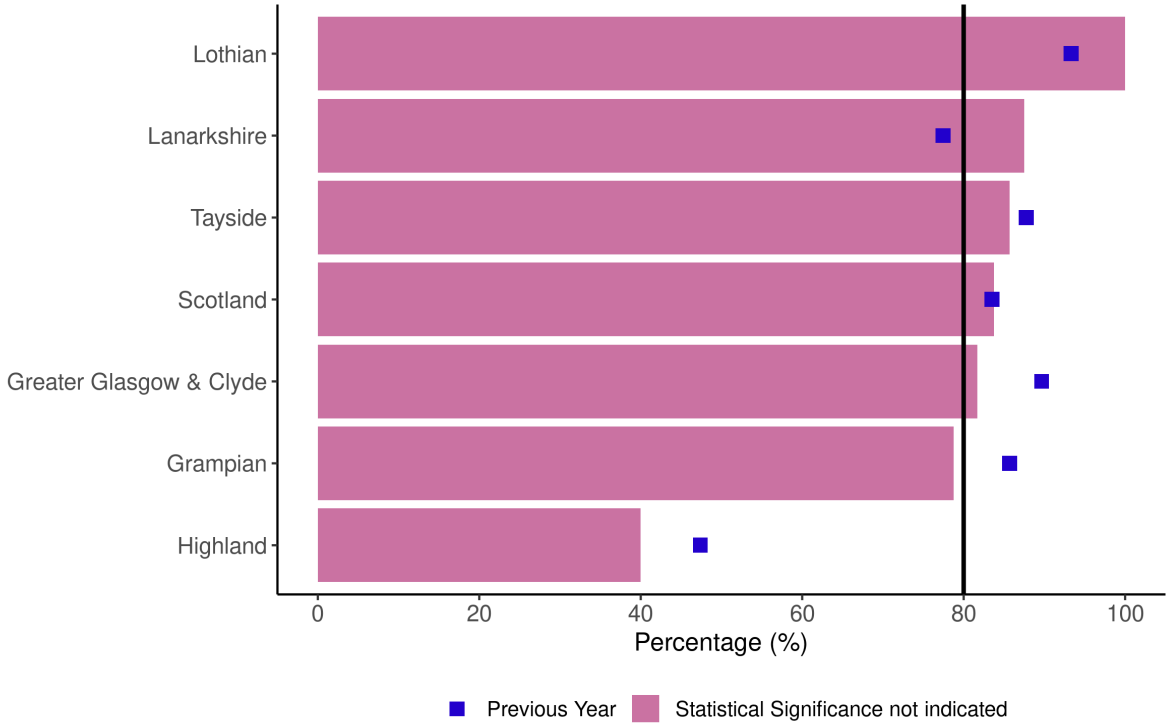
Figure 2.11 Percentage of patients undergoing carotid endarterectomy for symptomatic carotid stenosis who have an operation within 14 days of event.



The standard for CEA is that 80% have surgery within 14 days of the stroke/TIA event.

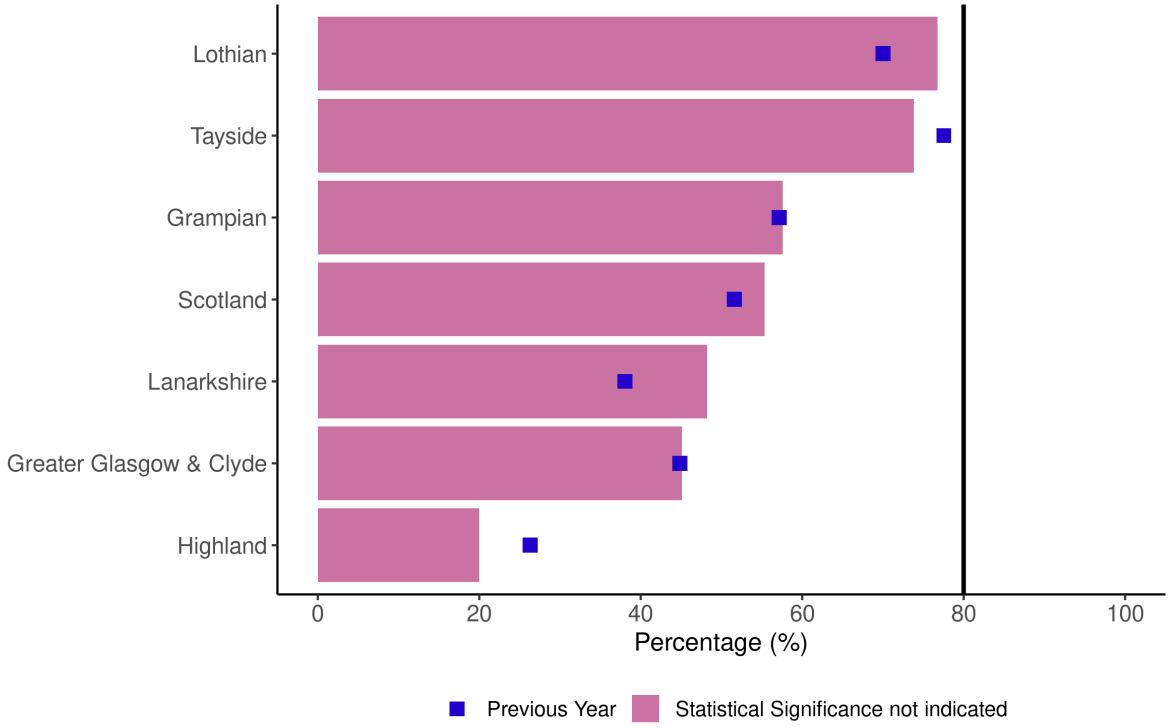
271 patients in Scotland had a CEA in 2024. The funnel plot (Fig 2.10) demonstrates how each health board is performing. Although no health boards achieve the 80% standard, NHS Lothian is the best performing. Overall, the national percentages achieving the carotid intervention standard is largely unchanged, showing only single percentage changes over several years. Note that not every health board has an onsite vascular service, and this is reflected in the data.

Figure 2.12 Percentage of patients undergoing carotid endarterectomy for symptomatic carotid stenosis who have an operation within 14 days of referral by NHS board carrying out the procedure: 2024 (bar) compared to 2023 (square).



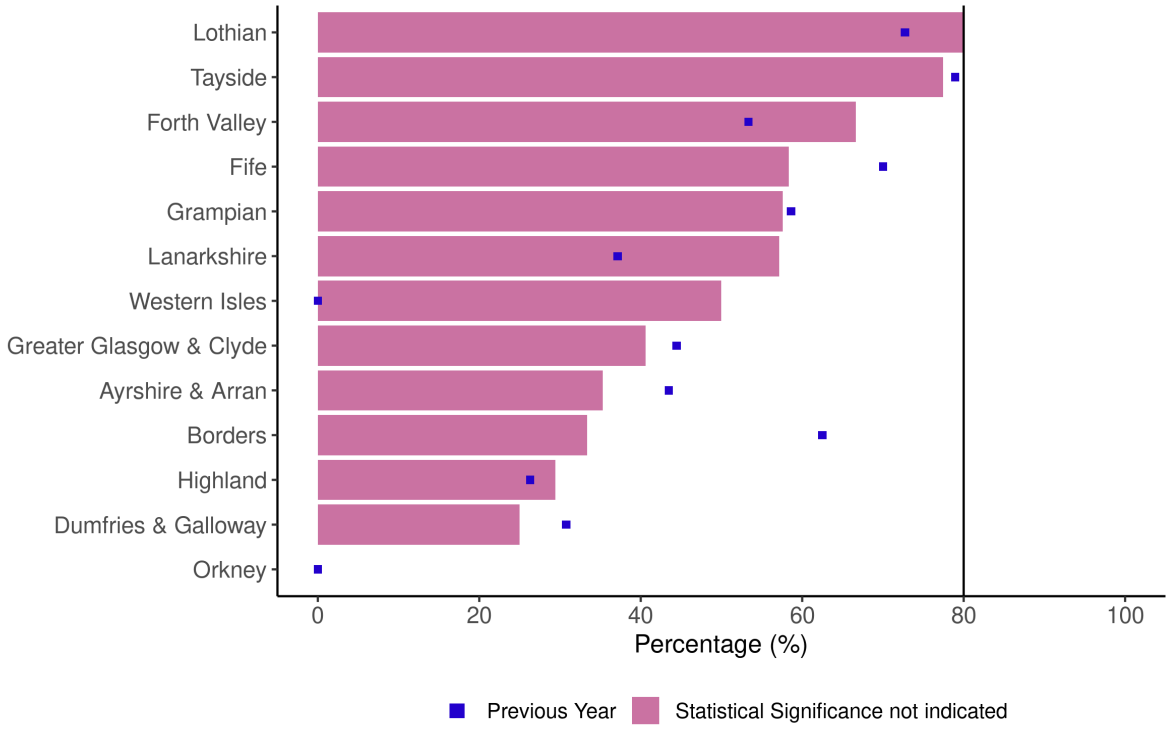
NHS Grampian and NHS Highland fail to treat >80% with CEA within 14 days of referral. NHS Grampian has seen a fall in performance potentially related to delays in surgery for patients on dual antiplatelets. NHS Lothian continues to improve so that 100% are treated within two weeks with NHS Lanarkshire also improving to 87.5%.

Figure 2.13 Percentage of patients undergoing carotid endarterectomy for symptomatic carotid stenosis who have an operation within 14 days of event by NHS board: 2024 (bar) compared to 2023 (square).



Assessed against the standard of 80% undergoing CEA within 14 days of event, all hospitals fail to meet the evidence-based target for timely CEA. This is also true of all health boards except NHS Lothian.

Figure 2.14 Percentage of patients undergoing carotid endarterectomy for symptomatic carotid stenosis who have an operation within 14 days of event by NHS board of referral: 2024 (bar) compared to 2023 (square).

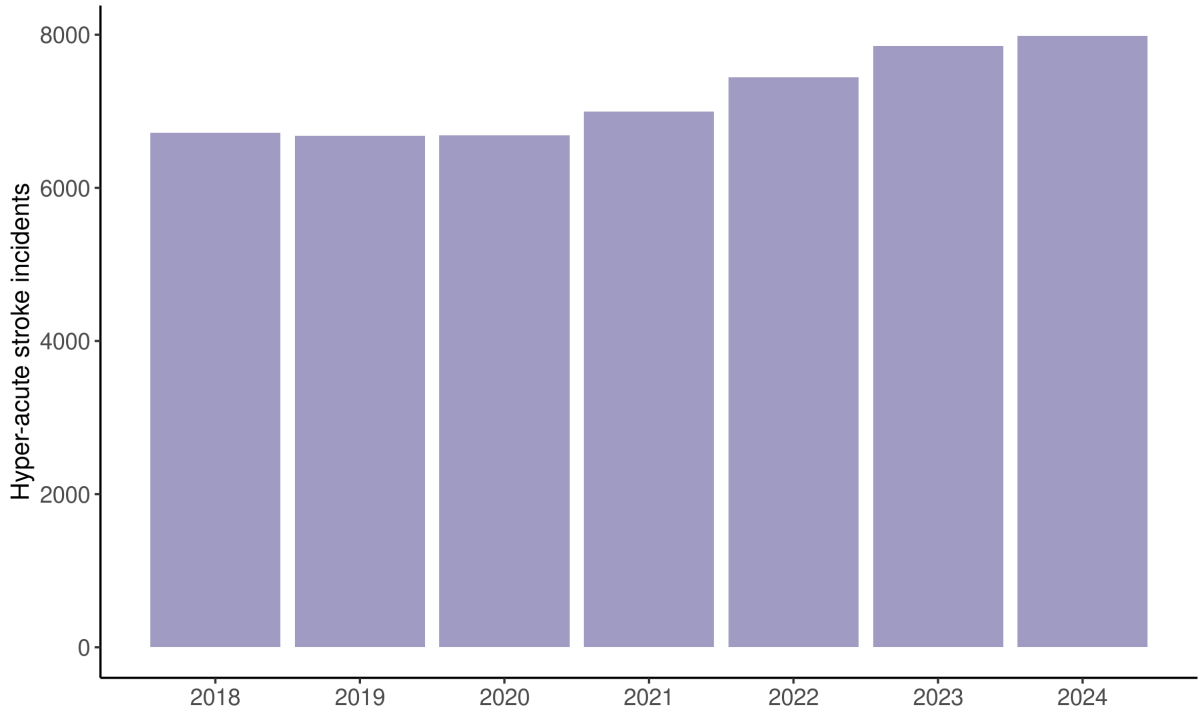


Closer review of the data from point of referral demonstrates a more accurate national picture. Those Heath Boards with onsite vascular services perhaps demonstrate ease of access to timely CEA, whereas those having to refer off site show a fall in timely CEA performance e.g. NHS Ayrshire and Arran, NHS Borders, NHS Dumfries and Galloway, NHS Fife, NHS Grampian, NHS Greater Glasgow and Clyde and NHS Tayside demonstrate a fall in performance.

3. Scottish Ambulance Service

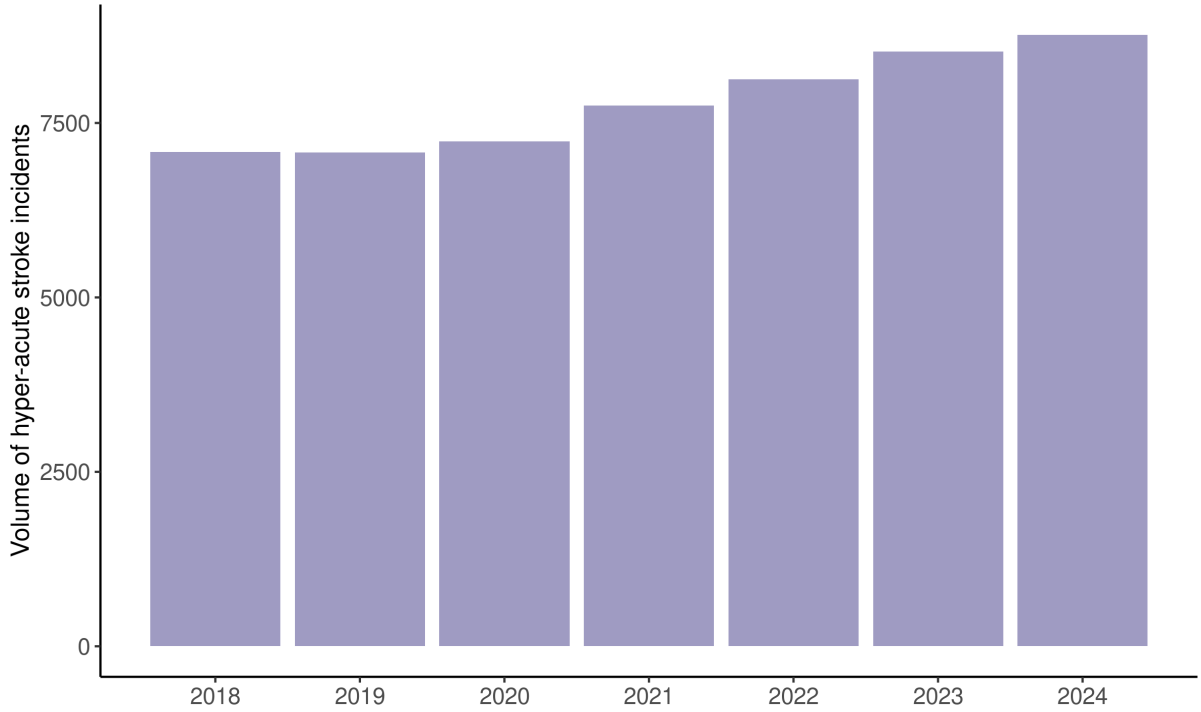
The number of incidents identified as potential ‘hyper-acute’ strokes on initial call to SAS has increased from 6,719 in 2018, to 7,982 in 2024.

Figure 3.1: Volume of hyper-acute stroke incidents from call receipt to allocation of a conveying resource from 2018 to 2024



This represents a 19% increase over that time period. When ambulance clinicians attend, the number of potential hyper-acute strokes increased to 8,760 in 2024.

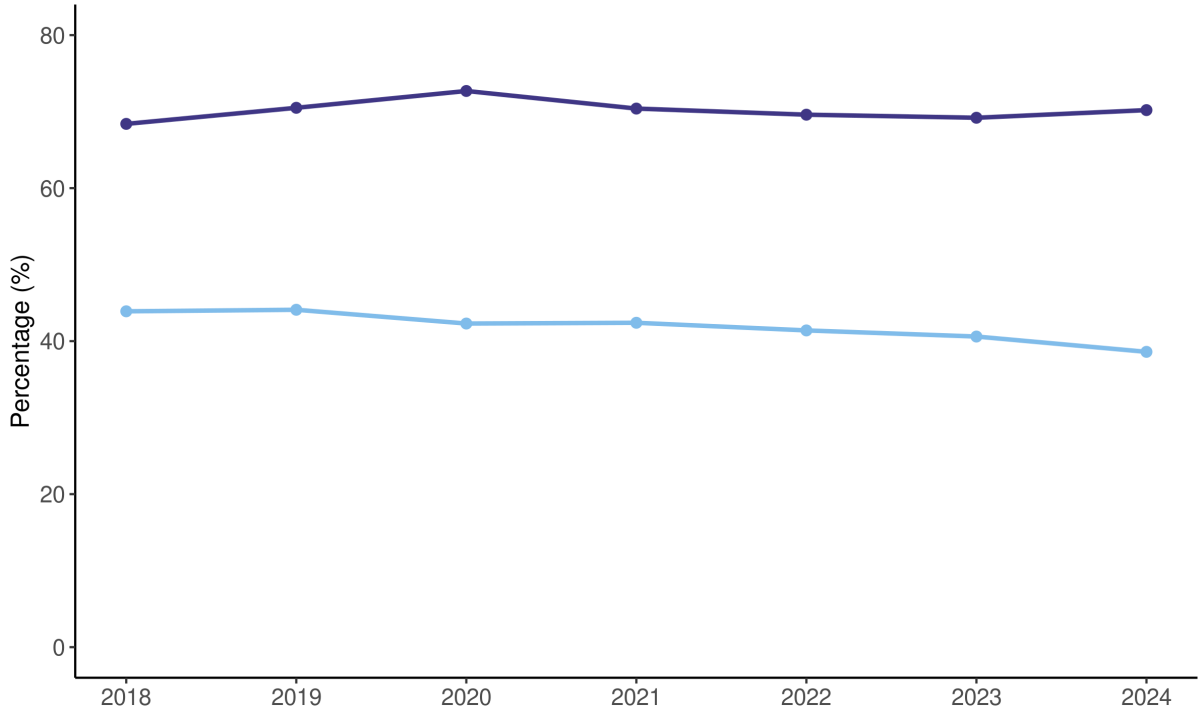
Figure 3.2: Volume of attended emergency incidents identified as hyper-acute stroke by ambulance clinicians from 2018 to 2024



Overall, this represents 1.6% of all attended emergency incidents, representing a significant workload for SAS.

Data from SAS has now been linked to SSCA which allows us to compare initial ambulance clinician diagnosis to final stroke diagnosis in SSCA.

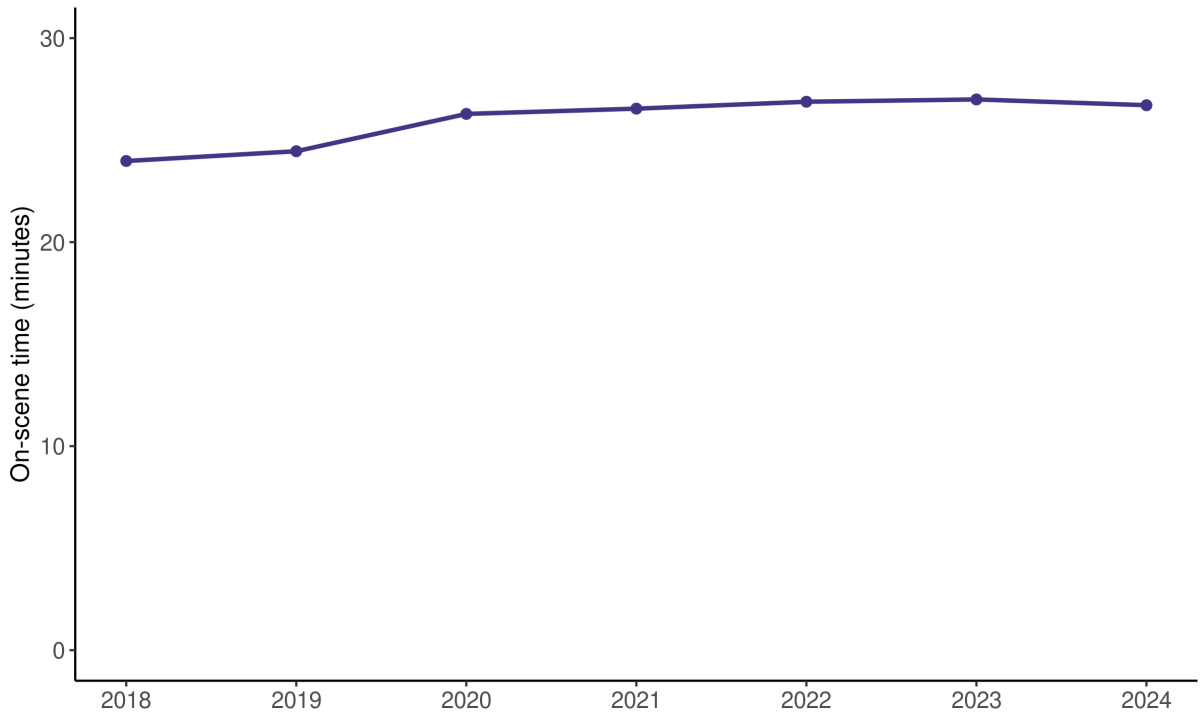
Figure 3.3: Positive predictor value and sensitivity of emergency incidents identified as stroke by ambulance clinicians and classified as having a final diagnosis of stroke in hospital by SSCA, from 2018 to 2024



38.6% of those identified as a potential diagnosis of stroke by ambulance clinicians have a final diagnosis of stroke at hospital discharge. However, of those who have had a stroke and who are reviewed by ambulance clinicians in the pre-hospital setting, 70.2% are identified as stroke with diagnosis likely more difficult in patients who have less typical presentations.

As time to treatment is an important component predicting a good recovery after thrombolysis, reducing time 'on scene' to speed up the pre-hospital journey is a focus of improvement. The time between arrival at the patient and departure to hospital was 26.7 minutes on average in 2024. This figure is broadly consistent with timings observed since 2021 and represents a longer mean time on scene compared to 2018.

Figure 3.4 Average time (in minutes) from the arrival of conveying resource on scene to departure from the scene from 2018 to 2024



For those who are given thrombolysis, the average interval between call and treatment time (which encompasses both pre-hospital and in hospital delays) was 126 minutes in 2024, an increase of 9 minutes from 2018. In future, we plan to dissect out the various stages in the patient journey to identify where delays can be minimised. A standard 'per-alert' to hospitals for FAST positive patients may help with this.

A more detailed report from SAS is available **here.**

3. Rehabilitation

Rehabilitation elements of the Scottish Stroke Improvement Plan (SSIP) are evaluated through twenty-three key criteria which underpin a holistic person-centred rehabilitation approach delivered by interdisciplinary teams across rehabilitation pathways. Each region reports their performance for each of the set rehabilitation criteria and is asked to identify areas of good practice and any areas for improvement along with local action plans. This is assessed through annual review meetings with the National Stroke Improvement (SIP) team. This approach allows the SIP team to recognise and share best practice across NHS boards and to be able to monitor for improvements and identify areas of significant challenge in the delivery of stroke rehabilitation services across Scotland.

The SSIP highlights our aim to implement measures of rehabilitation, which reflect the experiences and outcomes for those who have had a stroke. A rehabilitation dataset has been identified and includes timely access to specialist stroke rehabilitation, personalised rehabilitation plans, a single point of contact on discharge from hospital services and six-month reviews of their progress. This rehabilitation data set is currently being tested in two regions with differing recording systems to ensure that data can be captured effectively and reliably, before rolling out to all regions in Scotland and to form a permanent addition to the SSCA.

Work is ongoing to develop Patient Reported Experience Measures (PREMS) to capture experiences of stroke care from a patient perspective.

4. Research

Routinely collected anonymised data helps us answer questions around the efficacy of patient care and service organisation. It also helps us to look at outcomes after stroke and identify the factors that influence survival or time spent in hospital.

In Scotland, we benefit from the ability to securely link datasets held by Public Health Scotland (PHS) so that we can better understand the causes and outcomes of stroke and how stroke interacts with other diseases. All linkage studies are approved by the

Public Benefit and Privacy Panel (PBPP) and data is stored within a data safe haven with appropriate safeguards for access.

We have a number of recent publications emphasising different aspects of stroke care across Scotland.

Data discussed in last year's report on how rurality interacts with ease of access to hospital is now published in Stroke (1). We report that compared to patients in other areas of Scotland, patients in large urban areas are more likely to receive thrombolysis but also have longer length of stay and a higher risk of death in hospital and also up to one year after stroke.

We have also demonstrated that living in a deprived region of Scotland is associated with increased mortality, despite similar access to stroke care (2). This population have their strokes at a younger age and have more comorbidities. Interestingly there is more Atrial Fibrillation (AF) diagnosed either before or at the time of stroke in patients from more affluent areas (only partly reflecting age). If AF is diagnosed, those from more affluent areas are more likely to be anticoagulated. These findings will be further explored in an updated dataset, as there are important implications for equity of secondary prevention across Scotland.

A recent publication in the International Journal of Stroke looked at emergency readmissions to hospital in patients who have a first stroke (3). Among 48,080 stroke survivors discharged from hospital, 14,794 (30.8%) had an unscheduled readmission within the following year, spending a median of 9 days in hospital. Patients were more likely to be readmitted if they were older, lived alone, had more co-existing conditions or higher frailty. Patients who came from more affluent areas or who had achieved the stroke care bundle were less likely to be readmitted. As spending time at home after stroke is important to patients, we conclude that discharge planning and community services should focus on supporting higher risk patients to reduce the rates of readmission where possible.

Ongoing projects include a Chief Scientists Office (CSO) funded study looking at the interactions between stroke and cancer in Scotland: stroke patients with a cancer diagnosis perhaps unsurprisingly have poorer outcomes.

We are still awaiting an updated dataset to cover the period of Covid. However, there are updated permissions in place which would allow researchers who have research questions regarding aspects of stroke care to approach the SSCA team to discuss access.

A CSO funded project led by Dr Jim Lewsey, University of Glasgow is looking at factors influencing thrombectomy and thrombectomy provision. This work is ongoing.

The SSCA dataset is also included in data contained within the Health Data Science Centre UK, part of Health Data Research UK and funded by the British Heart

Foundation. Information is available on https://bhfdatasciencecentre.org.

Further updates and links to these publications are provided on the **PHS Scottish Stroke Care Audit webpage.**

1. Turner M, Murchie P, McLernon D, Langhorne P, MacLeod MJ. Factors influencing time spent in hospital for unscheduled readmissions after stroke discharge. International Journal of Stroke 2025 (Accepted)

2. Sterling K, Turner M, Langhorne P, Macleod MJ. Association of neighbourhood deprivation with secondary prevention prescribing and all-cause mortality among stroke patients in Scotland: a population-based study. Cerebrovascular Diseases. Published on line 2025 **https://doi.org/10.1159/000546261**

3. Impact of Rurality and Geographical Accessibility on Stroke Care and Outcomes.Turner, M. Dennis, M., Barber, M. & Macleod, M.J., Stroke. 2025:56;1210-1217 doi: 10.1161/STROKEAHA.124.048251

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For all media enquiries please email **phs.comms@phs.scot** or call 0131 275 6105.

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Appendices

Appendix 1 – Background information

The SSCA monitors the quality of care provided by the hospitals in all NHS boards by collating data collected by the LACs and associated stroke MCNs.

Appropriate care is measured using the stroke care bundle, which comprises four key components: admission to a stroke unit, swallow screen, brain imaging and aspirin administration. Not all patients are eligible for all four components. These data are used by the Scottish Government to monitor progress against the Scottish stroke care standards (2016) and the SSIP (2014).

The stroke care bundle is important because achieving it is associated with a reduced risk of dying and an increased likelihood of getting back home. NHS boards are expected to identify aspects of their stroke services which do not meet the Scottish standards and work with their stroke MCNs to improve their standards of care locally.

Appendix 2 – Publication metadata

Publication title

Scottish Stroke Improvement Plan with data from the Scottish Stroke Care Audit Annual Report 2025.

Description

The SSCA monitors the quality of care provided by the hospitals in all NHS boards by collating data collected by the stroke MCNs.

Theme

Healthcare audits.

Topic

Stroke.

Format

PDF and RShiny are available on the day of publication.

Data source(s)

The electronic Scottish Stroke Care Audit (eSSCA) database.

Date that data are acquired

31 March 2025 to 1 April 2025.

Release date

12 August 2025

Frequency

Annual

Timeframe of data and timeliness

1 January 2010–31 December 2024.

Continuity of data

No known issues.

Concepts and definitions

These are available on the SSCA website.

Relevance and key uses of the statistics

This publication is intended to support the SSIP, and to facilitate improvement in the care of stroke patients in Scotland.

Accuracy

Audit data are subject to validation at data entry and quality assurance procedures throughout the process. This release is intended to provide the public with timely information on the care of stroke patients in NHS Scotland.

Completeness

Data on patients who have a final diagnosis of stroke have been collected in every NHS board in Scotland. These are then compared to SMR01 data to ensure that no patients have been missed.

Comparability

The Sentinel Stroke National Audit Programme (SSNAP) publish data relating to the care of stroke patients in the rest of the UK.

Accessibility

It is the policy of PHS to make its websites and products accessible according to published guidelines. More information on accessibility can be found on the **PHS website**.

Coherence and clarity

This report is released in a PDF format, but also a RShiny report if additional information is required.

Value type and unit of measurement

Counts of admissions, rates of admissions, mean time, percentage of compliance.

Disclosure

The PHS Protocol on Statistical Disclosure is followed.

Official statistics accreditation

Management information.

UK Statistics Authority assessment

None Required.

Last published

30 July 2024.

Next published

11 August 2026.

Date of first publication

September 2008.

Help email

phs.strokeaudit@phs.scot

Date form completed

3 July 2025.

Appendix 3 – Early access details

Pre-release access

Under terms of the 'Pre-release Access to Official Statistics (Scotland) Order 2008', PHS is obliged to publish information on those receiving pre-release access ('pre-release access' refers to statistics in their final form prior to publication). The standard maximum pre-release access is five working days. Shown below are details of those receiving standard pre-release access.

Standard pre-release access:

Scottish Government Department of Health and Social Care (DHSC)

NHS board chief executives

NHS board communication leads

SSCA Report Writing Group

Early access for management information

These statistics will also have been made available to those who needed access to ‘management information’, i.e. as part of the delivery of health and care:

Early access for quality assurance

These statistics will also have been made available to those who needed access to help quality assure the publication:

Appendix 4 - SSCA report writing group

Name	Organisation	Role
Vera Cvoro	NHS Fife	Consultant stroke physician
Therese Lebedis OBE	NHS Grampian	Consultant occupational therapist in stroke and chair of the rehabilitation subgroup
Professor Mary-Joan Macleod	NHS Grampian and the University of Aberdeen	Consultant physician, professor in clinical pharmacology and chair/ clinical lead, SSCA steering group
Gethin Williams	NHS Highland	Consultant in stroke medicine, stroke MCN clinical lead
Mark Barber	NHS Lanarkshire	Consultant geriatrician, Stroke MCN clinical lead
Katrina Brennan MBE	NHS Lanarkshire/ Scottish Government	MCN manager and Scottish stroke improvement lead
Matt Lambert	NHS Tayside	Consultant in medicine for the elderly and stroke, and Speciality advisor to the Chief Medical Officer
Stuart Baird	PHS	Service manager, Scottish National Audit Programme (SNAP)
Stephen Marjoribanks	PHS	Senior Nurse, Scottish National Audit Programme (SNAP)

Neil Muir	PHS	National clinical coordinator, SNAP
Emma Munro	PHS	Regional coordinator, SNAP
George Addo Opoku-Pare	PHS	Information analyst
Stephannie Whigham	PHS	Senior information analyst
Gareth Clegg	SAS	Deputy medical director, SAS
Craig Henderson	SAS	Clinical improvement lead
Andrew Kent	SAS	Principal clinical outcomes analyst
Peter Langhorne	University of Glasgow and NHS Greater Glasgow and Clyde	Emeritus professor of stroke medicine and retired stroke physician

Appendix 5 – PHS and official statistics

About Public Health Scotland (PHS)

PHS is a knowledge-based and intelligence driven organisation with a critical reliance on data and information to enable it to be an independent voice for the public's health, leading collaboratively and effectively across the Scottish public health system, accountable at local and national levels, and providing leadership and focus for achieving better health and wellbeing outcomes for the population. Our statistics comply with the **Code of Practice for Statistics** in terms of trustworthiness, high quality and public value. This also means that we keep data secure at all stages, through collection, processing, analysis and output production, and adhere to the Office for National Statistics '**Five Safes**' of data privacy.

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