The Road to Recovery

The Ninth SSNAP Annual Report

Stroke care received between April 2021 to March 2022

KING'S College LONDON

Sentinel Stroke National Audit Programme

HQIP
Healthcare Quality Improvement Partnership

Description of front cover

Hello. My name is Andy and, like a number of people, I am recovering from a stroke.

In the middle of the COVID lockdowns I woke around 2am one morning and my bedroom was bathed in light but my bedroom light was off (I had been suffering from a sinus infection). I hurriedly packed a rucksack and was taken to hospital by ambulance. Driving down the A1, the staff informed me we were approaching 105mph (and, jokingly, it wasn't just for me. They like to trigger the speed cameras).

In the stroke ward, I asked the chap in the bed next to mine what he thought about this stroke business. He said, and I quote, "I am just glad both my eyes look in the same direction". One day I was taken for a head scan (one of several) and apologised to the lady technician for my clean but un-ironed shirt and, smiling, she informed me she would put it in her report.

After a week I arrived home and had to look after myself. As a single chap, this was pretty tricky (COVID restrictions!). I was left alone with my cooking! Poor left eyesight and weakness down my left side resulted in shaving looking like I'd been attacked by a very angry cat. Over the next few months I had to learn quickly.

Art has been one of the primary scaffoldings through my recovery and COVID lockdowns. I had no idea that attending art college for four years in the 1970s would be so important now. Most humbly, I believe my stroke has made me a better person.

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Foreword from Dr Shakeel Ahmad

Stroke services continue to face significant challenges as we emerge from the COVID-19 pandemic. Our teams have shown incredible dedication, strength, and determination in the most trying of times.

Over the last year we have worked nationally, across organisational boundaries to improve the thrombectomy pathway. A new Welsh Ambulance Services NHS Trust (WAST) red categorisation for stroke interhospital transfers is now in place, the first such development in the UK. Slow but measurable improvement is being made in this area which is encouraging but there is a long way to go and so much more we can collectively do. The 12-month rolling thrombolysis rate in Wales is 13.4% and continuing to improve recently hitting 14.9%.

Highlights include the procurement of an artificial intelligence programme to support stroke imaging. The 'Stop A Stroke' project which has facilitated an improvement in anticoagulation rates; up to 90% in atrial fibrillation patients across Wales. However, the pandemic emphasised that our systems are not as robust as they should be, that patients feel increasingly abandoned and that carers continue to shoulder more of a burden. The pandemic highlighted that whole scale improvements are needed to ensure we can provide the care our patients deserve no matter what the circumstances.

Early supported discharge figures at 30% with significant variation are also lower than the UK average, continued work around the rehabilitation services both within hospital and community settings is ongoing and paramount to the success of the whole stroke programme.

Sustainability of our stroke workforce is also another key area of focus, with work to improve access to leadership opportunities within nursing and allied health professionals also taking place with a jointly funded pilot of a new leadership programme with Cardiff Metropolitan University which completed in 2021. This year will see the first MRes in Stroke launched, continuing our commitment to developing the skills of our workforce and empowering them to work at the top of their licence.

The new Quality Statements for Stroke were published in September 2021 and forms part of a suite of documents sitting within the new National Clinical Framework. The Statements were developed in collaboration with colleagues across Wales and with our partners in the Stroke Association, and set out the vision for stroke services in Wales. To achieve the vision we need a strong focus on cross-working with other groups to address areas such as public health, deprivation, prevention, rehabilitation, carer burden, care for the critically ill and people who are at the end of their lives. It also requires close collaboration with other conditions, such as cardiovascular disease, neurological conditions, and diabetes. The drafting of a new Delivery Plan for Stroke using an outcome-based approach will enable us to develop a plan that is driven by what matters to our patients.

SSNAP is an excellent tool to evaluate the stroke pathway. It offers us a way to assess individual areas and seek solutions where performance does not meet the standard or the expectation

of service users and our dedicated teams. For example, we continue to experience a delay with admission to a stroke unit, with only 19.45% of patients meeting the target. The new National Stroke Programme for Wales will take forward whole scale changes to optimise our stroke pathways, with additional project work being undertaken around the pre-hospital part of the pathway with the aim of using technology to connect stroke physicians and emergency responders facilitating an earlier, digital pre-hospital assessment and direct transportation to the appropriate care centre, bypassing an already overstretched and overburdened Accident and Emergency unit.

The Stroke Programme will see NHS Wales work nationally to provide agreed services specifications and pathways, as well as regionally with our partners to find solutions that fit their population best. Through strengthening our optimal stroke pathway, lessening the pinch points at the front door, and using innovative processes such as artificial intelligence we have the opportunity to create a cutting-edge service that continues to put our stroke survivors at the heart of everything we do. By underpinning this with robust data, provided by SSNAP, GIRFT and our service users we can continue to evaluate and improve our stroke services and ultimately outcomes. By working collaboratively with compassion and truly listening to our service users we can produce optimal models of care which will drive forward sustainable service improvements ensuring that all people affected by stroke get the help and support they need to live the best life that they can.

Dr Shakeel Ahmad
National Clinical Lead for Stroke, Wales

Foreword from Dr Deb Lowe

As we look ahead to restoration and recovery post pandemic, not only for our services but also for ourselves, we must ensure that we remember what we have learnt over the last two extraordinary years. We should use our experiences to build resilience, both personally and within our teams, to be even stronger and with an increased resolve to continue to deliver high quality, evidence-based stroke care.

We know that prevention strategies are important and an area where the pandemic has had a detrimental effect, with primary care facing mounting pressures. We must support our primary care and community colleagues to ensure that we 'Make Every Contact Count' when it comes to delivering improved brain, heart, and vascular health. As we recover services, it is vital that we do so in an inclusive way to reduce the negative impact of health inequalities.

A continued focus on quality improvement is needed if we are to deliver the end-to-end pathway described in the NHS England National Stroke Service Model and Integrated Community Stroke Service Model. This is supported by the Getting It Right First Time (GIRFT) Programme National Speciality Report published this year that has given 29 key recommendations to support policy delivery and improve stroke care. Let us use our policy documents and national mandates to work with our new Integrated Care Systems, to ensure that stroke is given the parity of esteem with other long-term conditions as the largest cause of adult disability in the UK.

Most importantly we must use data to drive quality improvement ensuring that the performance and organisational data that we have from our excellent National Stroke Audit is used to greatest effect. How data is used to support the development and monitoring of services within the new commissioning landscape is vitally important.

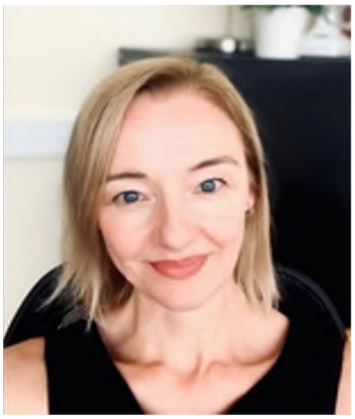
The specific challenges that we face in our recovery journey are described within this report. Unrelenting ambulance pressures leading to increased response times, compounded by reduced flow within A&E departments and resultant reduction in thrombolysis rates. Increased waits to be admitted to a Stroke Unit due to bed pressures as well as significant egress issues from Stroke Units has impacted 90% stay targets. These difficulties have been demonstrated within this report, culminating in a drop of the number of services that achieve an A or B within SSNAP. There have, however, been glimpses of hope in several areas with an increase in access to thrombectomy and encouragingly an increase in stroke survivors accessing Early Supported Discharge.

The last two years have seen some of the most rapid innovation in the history of the NHS, so we should harness the 'good stuff', including wider roll out of pre-hospital telemedicine, virtual interventions for those in which a virtual review is appropriate and the use of the National Optimal Stroke Imaging Pathway, incorporating Artificial Intelligence to expediate diagnosis and decision making in the hands of skilled clinicians.

Let us not forget that you can have the best policies and strategies in place, but they mean nothing without the people, the infrastructure, and compassionate, collective, and inclusive

leadership. Having seen our Integrated Stroke Delivery Networks in England develop and grow over the last year, I am confident that we have huge opportunities to bounce back and improve across our care delivery pathways.

Thank you for your interest, commitment, dedication to improving stroke care. Stroke care is exceptional because of its non-hierarchical multidisciplinary culture across acute and community care and close relationships with third sector, most notably the Stroke Association. It is great because of its people but can only flourish if we are kind to each other and kind to ourselves.



Dr Deb Lowe
National Clinical Director for Stroke, England

Executive summary

Since its inception in 2013, the results of SSNAP audit have been accessible to the general public at www.strokeaudit.org along with guidance regarding what people can expect from high quality stroke services.

Changes in SSNAP scores over time (2014-2022)
Proportion of teams

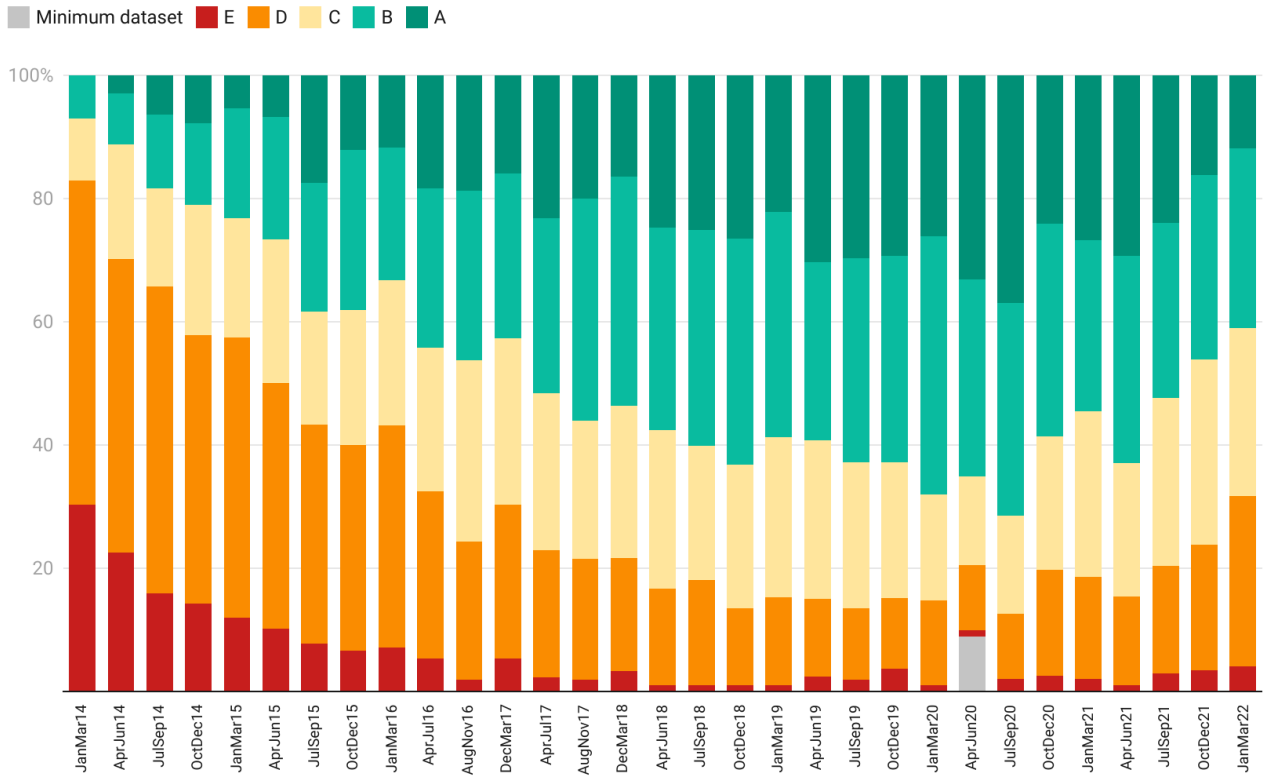


Figure 1: Quality of stroke services delivered between January 2014 and March 2022. Teams are rated A-E based on a summary of their performance. The grey bar for April-June 2020 shows the number of teams that entered data onto the minimum, emergency dataset and received a report but did not receive a score for that period.

At the inception of SSNAP in 2013, teams were expected to set out the ambition to achieve an overall A or B SSNAP rating. Such scores are indicative of 'first class quality of care' and a 'good or excellent service in many aspects' respectively. A SSNAP rating of a C or less would suggest that 'some or several areas of care require improvement', whilst a SSNAP rating of D or E would indicate that several areas are in need of significant improvement.

Although national audits remained suspended for five quarters (from April-June 2020 to April-June 2021), sites were largely able to continue participation. Figure 1 shows that during 2021-22, the proportion of 'first class' and 'good or excellent' services fell substantially, reversing much of the progress made in care quality in the years prior to the pandemic. This is the overall context in which we highlight areas ripe for recovery and improvement in the report that follows.

Mortality

In-hospital crude mortality (2013-2022)
Percentage of patients

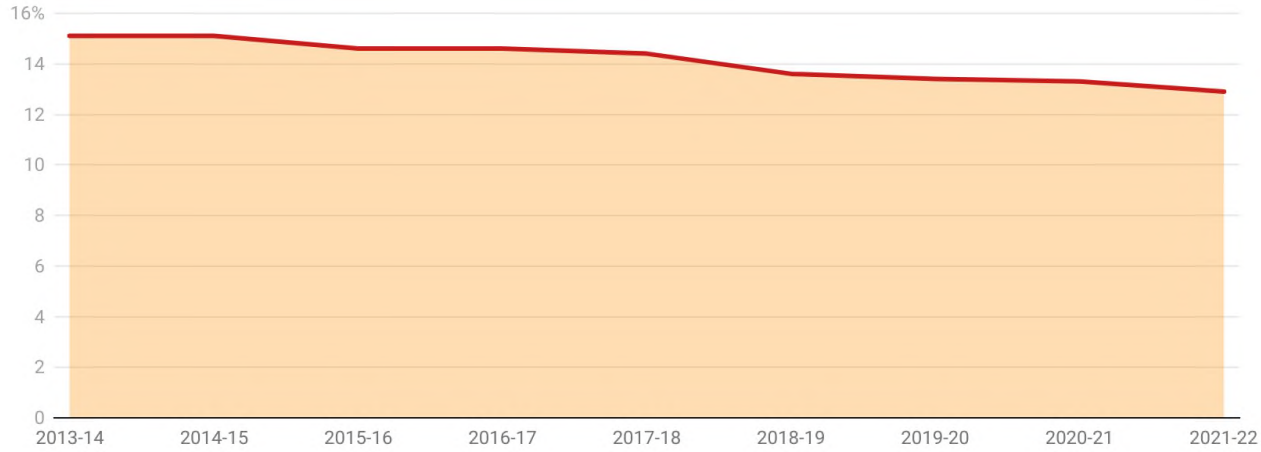


Figure 2: Proportion of patients that died in hospital between 2013 and 2022.

The crude in-hospital mortality rate (unadjusted for casemix) for 2021-22 is 12.9% (figure 2). SSNAP also separately reports on 30-day mortality which is adjusted for various factors which predict mortality. These include age, type of stroke, atrial fibrillation (irregular heart beat) and severity of stroke. This provides both the team's actual and expected number of deaths expressed as a standardised mortality ratio (SMR). The SMR for 2019-20 was 1.02. Mortality is reported to hospitals annually, and results are made publicly available at: www.strokeaudit.org. Mortality should not be interpreted in isolation as a measure of clinical quality, but in the context of other important SSNAP data.

Trends in stroke care from 2019-20 to 2021-22

It is important to measure specific evidence-based processes in order to understand how well stroke interventions are working and to what extent the quality of care has been preserved during the pandemic.

	2019-20	2020-21	2021-22
Improved quality standards			
◇ Patients undergoing thrombectomy (%)	1.8	2.0	2.4
◇ Time from arrival at hospital to specialist nursing assessment (mins)	56	50	48
◇ Access to specialist Early Supported Discharge team (%)	41	46	47
Mantained quality standards			
◇ Brain imaging within 1 hour of arrival at hospital (%)	55	55	55
◇ Thrombolysis within 1 hour of arrival at hospital (%)	61	60	61
◇ Door to needle time for thrombolysis (mins)	52	54	53
Deteriorated quality standards			
◇ Time from onset to hospital arrival (hours: mins)	3:15	3:25	3:47
◇ Patients receiving thrombolysis (%)	11.7	10.7	10.4
◇ Swallow screening within 4 hours of arrival at hospital	75	75	72
◇ Proportion of patients spending at least 90% of stay on a stroke unit (%)	84	82	78
◇ Compliance with physiotherapy target (%)	34	39	32
◇ Six-month assessment received if applicable (%)	43	42	39
	2019-20	2020-21	2021-22

Quality of stroke care (Apr 2021-Mar 2022)

High Quality Specialist Stroke Care

78%
of patients spent at least 90% of hospital stay on a specialist stroke unit.
Item reference: K32.11

90%
of patients received stroke specialist nursing assessment in less than 24 hours after admission.
Item reference: H8.3

72%
of applicable patients received swallow screening in less than 4 hours after admission.
Item reference: H14.20

Seven Day Priority Clinical Standards of Stroke Care

46%
of patients directly admitted to a stroke unit in less than 4 hours after admission.
Item reference: H7.18.1

57%
of patients assessed by a stroke specialist (in person or via telemedicine) within 14 hours after admission.
Item reference: H9.19

55%
of patients received brain imaging in less than 1 hour after admission.
Item reference: H6.9

Reperfusion Treatment

2.4%
of all stroke patients underwent a thrombectomy.
Item reference: H20.3

53 minutes
median time from arrival at hospital to thrombolysis treatment.
Item reference: H16.42

10.4%
of all stroke patients were given thrombolysis.
Item reference: H16.3

Models of Rehabilitation

% of applicable patients received the equivalent of 45 minutes of therapy per day 5 days a week.

32%
Physiotherapy.
Item reference: K35.18

34%
Occupational Therapy.
Item reference: K34.18

18%
Speech & Language Therapy.
Item reference: K36.18

Longer Term Outcome

39%
of applicable patients received a 6 month follow-up.
Item reference: M4.6

87%
of patients with atrial fibrillation at six months taking anti-coagulants.
Item reference: M9.12

3%
of patients had a recurrent stroke at six months recorded.
Item reference: M17.3

Item references refer to the annual results portfolio: https://www.strokeaudit.org/results/Clinical-audit/National-Results.aspx

Purpose of this report

This is the ninth annual SSNAP report. The purpose of this report is to summarise a huge amount of data regarding process and outcomes from stroke care into key messages for both those who provide and procure stroke care in hospitals and in the community across England, Wales and Northern Ireland. In particular, this year we are highlighting the changes in stroke care over the last two years of considerable stress on all aspects of emergency care in those nations, and the 'roads' that need to be followed in order to restore the quality of care. This should frame the 'Road to Recovery' that stroke services should prioritise and pursue over the coming year or so, while SSNAP continues to monitor and report on that recovery to all stakeholders within and outside the NHS.

The visualisations in this report are designed to improve the accessibility of the data. As much as possible we have adopted a colour scheme which is suitable for deuteranomaly (colour blindness). Some graphs transition from the annual results from the previous years to quarterly results from 2021-22. This has been done to highlight changes throughout the year.

The data summarised in this report are publicly available, and comprehensive and detailed reports can be accessed on the SSNAP website (https://www.strokeaudit.org/results.aspx) so that anyone can appreciate how stroke care is implemented regionally and nationally both in hospital and in the community. It is expected that this data is used constructively to help health care providers in stroke improve outcomes and the quality of care delivered to patients.

Overview of SSNAP

The Sentinel Stroke National Audit Programme (SSNAP) is a national healthcare quality improvement programme based in the School of Life Course and Population Sciences at King's College London. SSNAP is commissioned by the Healthcare Quality Improvement Partnership (HQIP) on behalf of the NHS in England and Wales, as part of the National Clinical Audit and Patient Outcomes Programme (NCAPOP).

Data from more than 89,000 patients admitted to hospitals between April 2021 and March 2022 were submitted to the audit, representing over 90% of all admitted strokes in England, Wales and Northern Ireland. In total over the last 9 years, over 750,000 cases have been recorded to date.

SSNAP measures the process of care (clinical audit) against evidence-based quality standards referring to the interventions that any patient may be expected to receive. These standards are laid out in the latest clinical guidelines, including the Royal College of Physicians National Clinical Guideline for Stroke (2016) and the NICE Clinical Guideline on Acute Stroke and TIA (NG128, 2019). These standards include whether patients receive clot busting drugs (thrombolysis), interventions for clot retrieval (thrombectomy), how quickly they receive a brain scan or how much therapy is delivered in hospital and at home.

Subsequent data is also collected, including 30-day mortality and disability and participation outcomes at hospital discharge and at six months using validated and standardised assessment scales. By recording these data, we can measure the impact of acute treatments and hospital care on longer term outcomes as well as recording the needs of patients as they continue their journey of recovery from stroke.

SSNAP also measures the infrastructure of stroke services (staffing levels, number of stroke unit beds and access to specialist services) against evidence-based standards using the Acute Organisational Audit (AOA) and the Post-Acute Organisational Audit (PAOA). The most recent round of both the AOA (Acute Organisational Report 2021) and the PAOA (Post-Acute Organisational Audit Report 2021) were held in October and April 2021, respectively. By combining comprehensive information about the composition and quality of stroke services both at a team/hospital level and at a patient level, SSNAP provides a powerful tool for clinicians, managers, health boards and commissioners and the public to evaluate performance in stroke care, identify further needs and drive the process of continuous quality improvement.

Impact of the COVID-19 pandemic

Number of patients admitted to hospital with COVID-19 in the United Kingdom (2020-2022)

Total number of patients

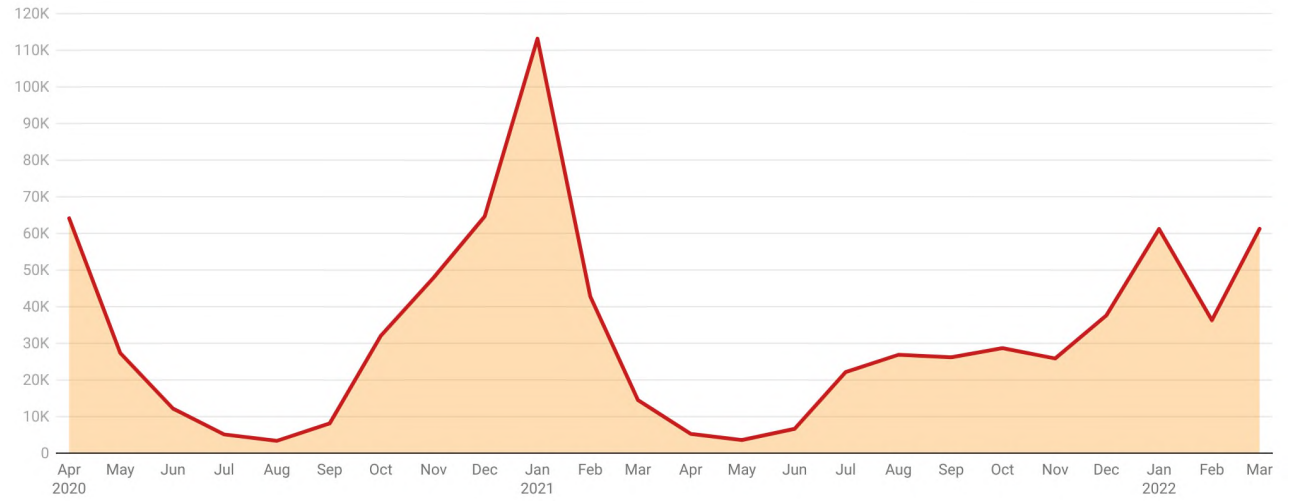


Figure 3: COVID-19 hospital admissions between April 2020 and March 2022. Data obtained from: https://coronavirus.data.gov.uk/

The unique and unprecedented challenges of the COVID-19 pandemic which impacted the delivery of high quality stroke services during 2020-21 have also been evident in 2021-22. The delivery and responsiveness of such services depends on the resilience, recovery and ability to adapt to increasing pressures of COVID-19 emergency admissions. Ensuring services are adequately staffed with a flexible workforce to mitigate the consequences of self-isolation as a result of COVID-19 will continue to be vital.

Despite these challenges, there have been a number of new models of practice for delivering multidisciplinary coordinated care across the whole stroke clinical pathway. Some of these involve temporary reconfiguration of existing services and resources in an attempt to balance delivering high quality care and the adoption of infection control measures. The impact of these interventions will need to be continuously measured to ensure that high quality evidence based care is implemented effectively as we follow the road to recovery.

82% of acute stroke services made a change to their service as part of the trust's COVID-19 response, including virtual triage of patients with suspected TIA or minor stroke (55%), separate pathways for positive and negative patients (71%), virtual ward rounds or multidisciplinary team meetings (28%) and decision support software use (23%).

66% post-acute inpatient teams and 64% post-acute multidisciplinary teams experienced a temporary reorganisation in response to COVID-19.

Ambulance activity

Onset to arrival time

The faster a patient is conveyed to hospital, the more likely they are to receive timely assessments, accurate identification of stroke and delivery of crucial reperfusion treatments. Rapid emergency response to stroke patients is vital to reduce mortality and disability - 'time is brain'.

Time from onset to arrival at hospital (2019-2022)
Median time

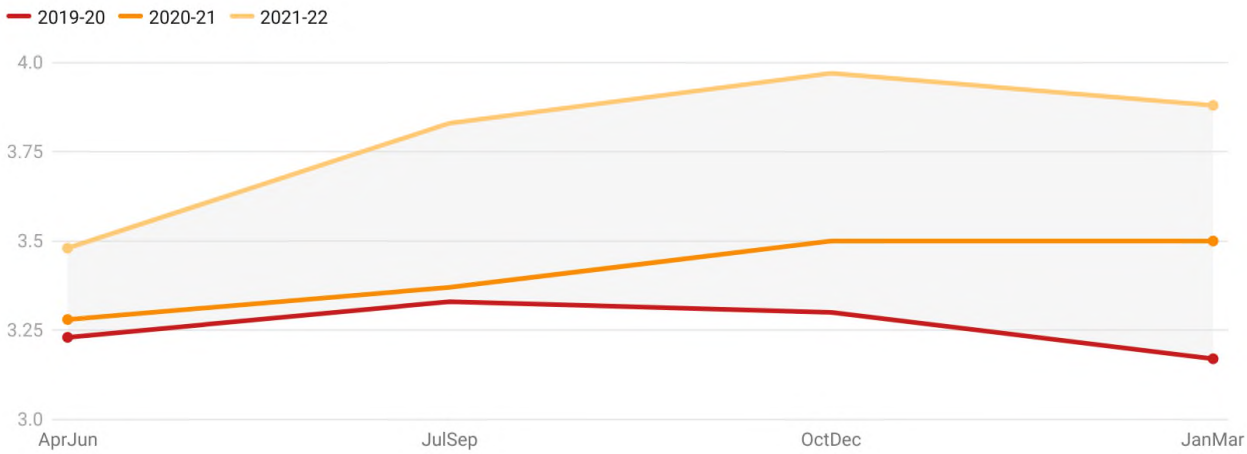


Figure 4: Time from onset of stroke to arrival at hospital between 2019 and 2022.

There has been a significant increase in stroke onset to hospital arrival time in 2021-22 compared to the previous two years (figure 4) with a median time from stroke onset to hospital arrival of 3 hours and 29 minutes during April-June 2021 increasing to 3 hours and 53 minutes during January-March 2022.

The causes are multifactorial and include delays in recognising stroke symptoms at the outset, reconfiguration of acute stroke services, conveyance of patients to their thrombectomy centre instead of their local acute service and infection control procedures applied between patients and ambulance staff.

The most pressing issue which requires addressing urgently concerns overstretched ambulance services and rising staff shortages coupled with increased COVID-19 hospitalisations, which have been replicated across other emergency conditions. These ongoing pressures at the pre-hospital stage threaten to adversely affect patients throughout the hospital stroke pathway and beyond.

What needs to happen next?

A systematic approach should be undertaken to address the current shortfall in ambulance delays and transfers. Such demonstrable delays have worsened and not solely due to the effects of COVID-19. The current response time for Category 2 emergencies such as stroke is 18 minutes, and Integrated Stroke Delivery Networks (ISDNs) need to collaborate with ambulance providers to ensure the most efficient practices are adopted to reduce delays. This includes using a validated stroke screening tool such as the Face Arm Speech Time (FAST) test, using pre-hospital video triage to aid appropriate conveyance to the right stroke centre, and agreed action plans to improve ambulance response times and reduce on-scene times. Raising public awareness through stroke symptom recognition will also be important, as the public 'memory' for the signs of a stroke is short.

Call to arrival time

Paramedics play a pivotal role in the first assessment of patients with stroke and are best placed to communicate important clinical assessments to the emergency department through a 'pre-alert'. Due to additional demands on pre-hospital emergency services, particularly peak times of COVID-19 activity, continued uptake of screening tools such as FAST becomes increasingly challenging.

Time from call to arrival at hospital (2020-2022)
Median time

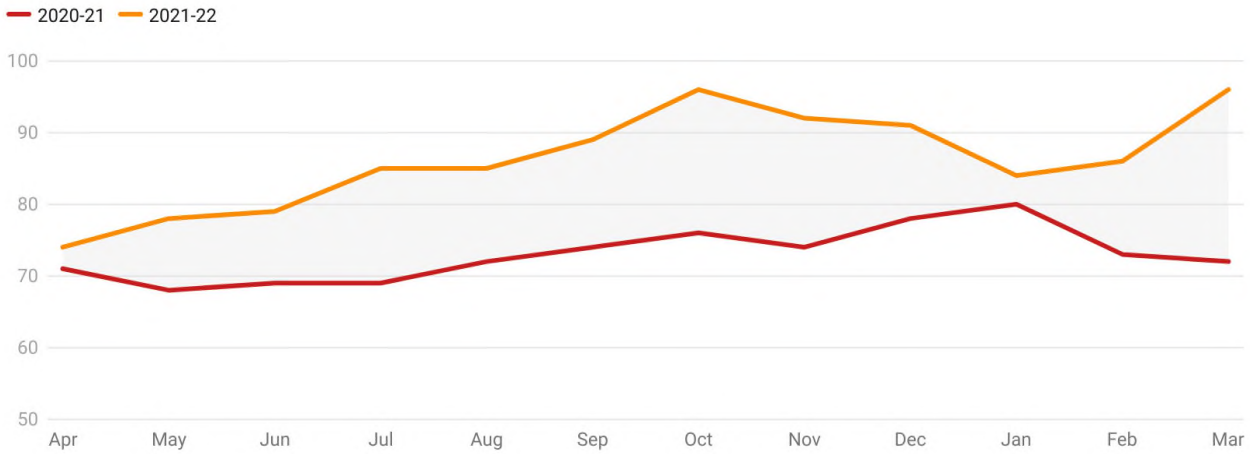
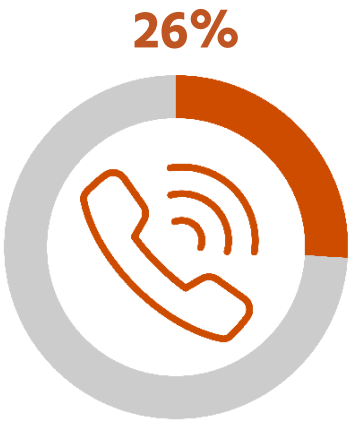
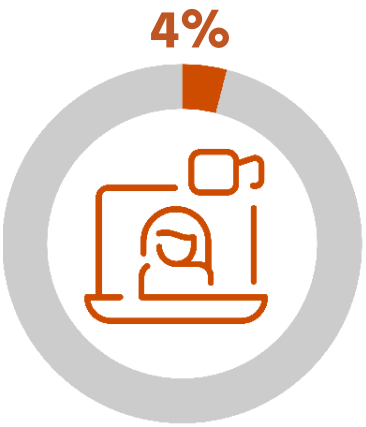


Figure 5: Time from ambulance call to arrival at hospital between April 2020 and March 2022.

There has been a progressive increase in time taken between the patient's call to the ambulance service and arrival to hospital in 2021-22 compared to the previous year (figure 5) with a median delay from patient's call to hospital arrival of 74 minutes in April 2021, peaking at 96 minutes at the onset of the 3rd wave in October 2021 and in March 2022. There has been a consistent finding throughout the pandemic that increased COVID-19 hospital admissions places additional pressure on pre-hospital services for a number of emergency conditions including stroke.



acute services have a pre-alert directly to the stroke team



acute services use video telehealth to review patients with local ambulance crews

Data taken from Acute Organisational Audit 2021

What needs to happen next?

In the context of the continued and well-publicised pressure on ambulance trusts, there needs to be a continued focus on reducing delays in pre-hospital emergency response and conveyance to hospital using pre-alerts to the stroke team. This will ensure that time critical acute treatments such as thrombolysis and thrombectomy, are delivered as rapidly as possible. Using pre-hospital video telemedicine between paramedics and stroke specialists in hospital will aid the diagnostic accuracy of stroke, enhance delivery of acute therapies and help to identify stroke 'mimics'. The use of such platforms is currently in the pilot phase in 8 ambulance trusts in England, but ongoing development with paramedic training will be crucial.

Case Study: System optimisation in times of crisis

East Kent Hospitals University NHS Foundation Trust

Clinical challenge

East Kent Stroke services admit 1,200 stroke patients per year, providing 24 hour acute stroke care to a population of 800,000 in South East England. Historically this was provided at two smaller Acute Stroke Centres (ASCs), with 600 patients each/yr that were co-located with Emergency Departments (ED) at William Harvey Hospital and Queen Elizabeth Queen Mother. The units struggled with poor performance for over 5 years, achieving overall SSNAP ratings of C-D.

During the COVID-19 pandemic, there was an urgent need to generate additional acute medical beds at the two ED hospital sites to care for COVID patients.

Solution

The two ASCs were merged into a larger ASC and temporarily relocated onto a non-ED acute hospital site at Kent and Canterbury Hospital. This site had an ITU and access to 24/7 CT imaging, 14hr/day access to MRI and 24/7 middle grade junior doctor cover. It was imperative to ensure the early and correct identification of stroke patients to be transferred to the new ASC, given it did not have an ED and was further away than the local ED for 2/3 of patients.

Innovations introduced:

- Prehospital. Tele-triage assessment between stroke specialist and ambulance crew; improving sensitivity and specificity of triage to support time critical access to Thrombolysis and Thrombectomy
- Adherence to a National Optimal Stroke Imaging Pathway (NOSIP). 24/7 access to CTA, CTP with AI support and 14hr access to MRI
- Standardised 9 step process to reduce Door In Door Out times.
- 7-day MDT working.

Impact

SSNAP process scores significantly increased from D to A
Thrombolysis rates of >20% (national average 11%)
Successful Mechanical Thrombectomy (off site) 5.4% (National average 1.92%)
38% reduction in length of stay to 11 days (national average 19)
Statistically significant relative mortality reduction of 60%, resulting in 65 more patients alive each year.
NHS people promise Staff satisfaction survey scores above trust and national average in all 7 domains.

Reflection

Processes of patient care, outcomes and staff satisfaction have significantly improved and been sustained in East Kent, through the system optimisation of stroke services inspired to support the wider COVID general medical response. The pandemic facilitated the realisation and introduction of novel innovative technologies at pace.
Consideration is being made to the benefit of continued non-ED sited ASC location.

The East Kent Hospitals University NHS Foundation Trust Stroke Team

Reperfusion treatment

Thrombolysis

The proportion of patients receiving thrombolysis has declined from 10.7% in 2020-21 to 10.4% in 2021-22, with the lowest thrombolysis rate recorded at 10.3% in January-March 2022 (figure 6). This is the lowest thrombolysis rate recorded since the inception of SSNAP and the first time that rates have been consistently below 11% across each quarter. The national data however, conceal significant differences in annual thrombolysis rates (2021-22) across England (10.2%), Wales (12.1%) and Northern Ireland (12.7%).

Proportion of all patients given thrombolysis (2019-2022)
Percentage of patients

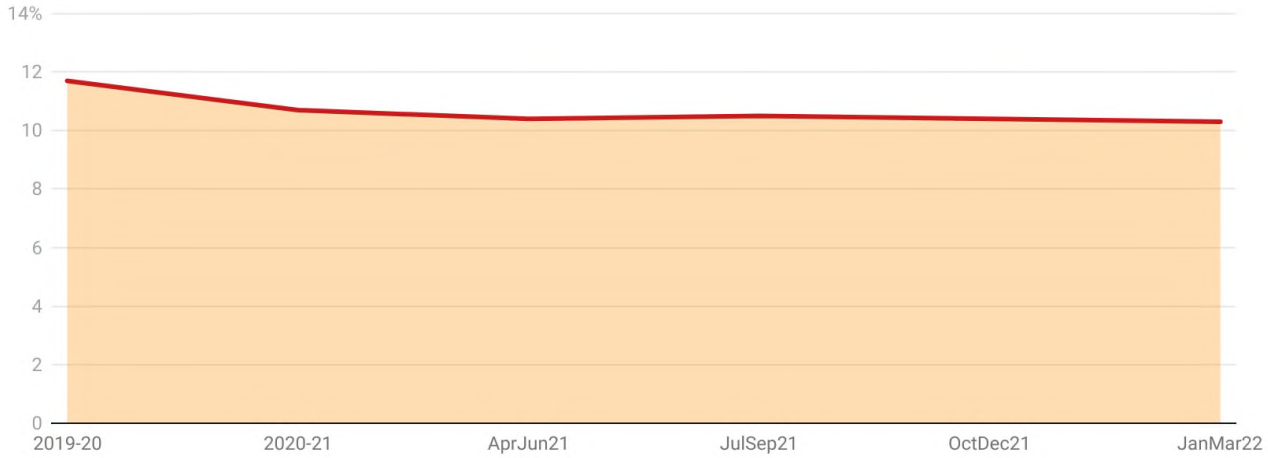


Figure 6: Proportion of patients (out of all strokes) receiving thrombolysis, comparing 2019-20 and 2020-21 annual data with 2021-22 quarterly data.

There are a number of reasons why thrombolysis rates have continued to decline nationally ranging from delayed admissions due to pre-hospital ambulance transfers; delays in imaging; challenges in identifying the exact time of stroke onset; disruption of in-hospital pathways due to COVID-19 infection control policies, and additional pressures created by increasing COVID-19 admissions during the third wave (October 2021- March 2022). The capacity for quality improvement (in hospital and pre-hospital) focussing on the speed and rate of thrombolysis may have also been compromised owing to increasing pressures on workforce and clinical demand.

The door to needle time has improved slightly from 54 minutes in 2020-21 to 53 minutes in 2021-22 but still remains challenging (figure 7). Improvements may have been tempered by the greater use of advanced imaging prior to thrombolysis as the identification of patients eligible for thrombectomy may take greater priority. The lessons learnt during the first and second pandemic waves with regards to increasing efficiency of infection prevention processes may have also led to improvements in the door to needle time.

Time from onset to thrombolysis (2019-2022)
Median time

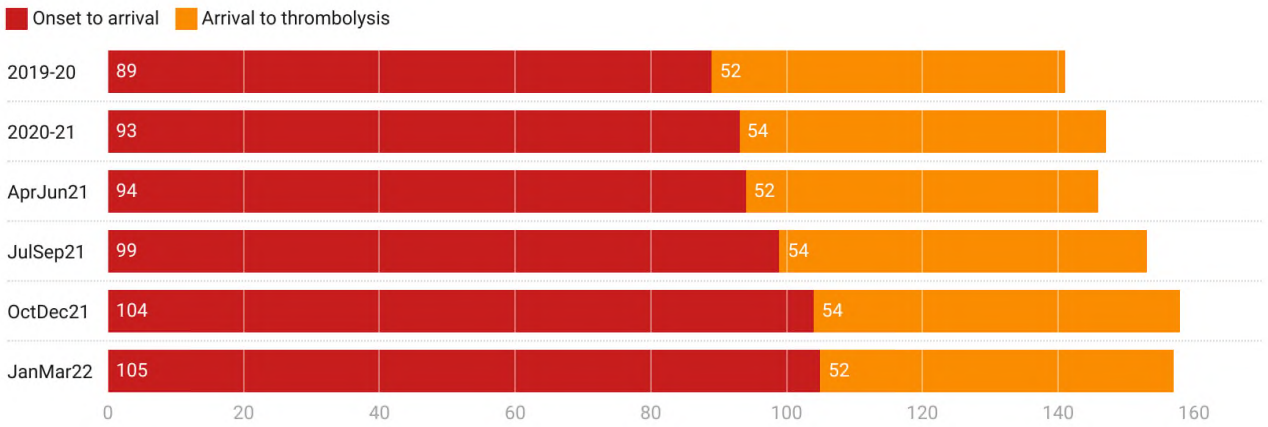


Figure 7: Time from onset of stroke to thrombolysis, comparing 2019-20 and 2020-21 annual data with 2021-22 quarterly data.

The onset to arrival time for patients undergoing thrombolysis has increased from one hour and 34 minutes in April-June 2021 to one hour and 45 minutes in January-March 2022 (figure 7). The marginal gains we have seen in the improvement in the door to needle times for thrombolysis have been counterbalanced by increasing delays from time of stroke to arrival to hospital.

What needs to happen next?

In order to maximise the population benefit from thrombolysis, a renewed focus needs to be directed in not only improving thrombolysis rates but also improving the door to needle times. Machine learning using data from SSNAP has suggested that reducing the door to needle time to 30 minutes in the UK will result in an increase of the overall population benefit by 26% (Use of Clinical Pathway Simulation and Machine Learning to Identify Key Levers for Maximizing the Benefit of Intravenous Thrombolysis in Acute Stroke). The wide variations in thrombolysis rates recorded nationally suggest it is possible to set up and deliver more efficient thrombolysis services even in the context of COVID-19, and constantly reviewing and evaluating protocols and pathways is crucial for quality improvement. Achieving higher thrombolysis rates depends on the public responding more quickly and contacting the emergency services, improving identification of stroke symptoms as well as time of stroke onset and rapidly improving the time from call to emergency services to treatment. Such efforts need to be collaborative across ISDNs/improvement networks to ensure that patients receive thrombolysis as rapidly as possible irrespective of where they live.

Case Study: Improving door-to-needle times for thrombolysis

University College London Hospital Comprehensive Stroke Service

Clinical challenge

In 2020 we moved from one hospital site within our Trust to a new site and needed to rebuild our acute pathways and to develop partnerships within a new hospital system. This move led us to place new focus on the thrombolysis pathway and on our Door to Needle times for thrombolysis in acute ischaemic stroke and to create a new model for continuous case review and iterative improvement in performance.

Solution

We rebuilt our thrombolysis pathway using our prior experience at the original hospital site

1. We centred our pathway around our thrombolysis nurse team so that the thrombolysis nurse for each call leads the patient flow through the pathway, ensuring that all safety guidelines are followed whilst facilitating fast progress to treatment decisions. The thrombolysis nurse also takes responsibility for time keeping, for leading the post-treatment debrief and for ensuring that process metrics and learning from each case are recorded.
2. We invited one of our senior stroke nurse practitioners to lead on the weekly case review meeting that focuses on relevant learning from all cases treated in more than 30 minutes or less than 20 minutes post arrival at the hospital. We ensure that this meeting is well attended by the wider stakeholder group (nurses, junior and senior doctors, radiographers and porter representatives) and that the learning is disseminated across all the teams.
3. The stroke nurse practitioner team lead the monthly simulation programme which is mandatory for all new doctor starters on our service. This simulation programme demonstrates our pathway to the new team but also makes visible our focus on the active partnership between doctor and nurse through the course of each clinical case.
4. We meet at the beginning of each shift to identify who has each role in the thrombolysis team and to check all are familiar with the pathway and the process.
5. We make visible each month the highest performing team, with the name of the relevant nurses, doctors, radiographers (and for thrombectomy radiologists and anaesthetists) flagged to the entire service together with the time achieved. This brings together the wider team and creates a healthy spirit of motivation towards fast times. We support this process with certificates of achievement and some small gifts of thanks as tangible reward for hard work.

In addition to these improvements on our original pathway our stroke nurses participate in all the video pre-assessment triages planned for conveyance to our hospital so that our team are aware and have planned provisional actions for all cases potentially for thrombolysis (and thrombectomy) even before arrival.

Impact

Our model keeps visible to the team our focus on safety and efficiency but also our drive to keep improving. The model also has helped us to bring the wider team together most visibly through the daily meetings at the start of the shift. Finally the model has engaged and empowered the stroke nurse team to actively manage the pathway in real time if delays begin to appear. The monthly review and publishing of excellent times boosts teams spirits and allows

for a healthy competition within the team and encourages knowledge and practice sharing and leads to skill development across the whole team.

The University College London Hospital Stroke Team

Reflection

We had been running thrombolysis pathways since 2010 but our service change in 2020 led to a re-structuring of our pathway, informed by our previous experience. In the new pathway we have placed our stroke nurses at the centre, have optimised our model for building team working through collaboration and have made constantly visible to all the involved teams, our successes and the team members who have achieved together these results. In addition, our team have found huge benefit from the opportunity provided by pre-hospital video re-view.

Thrombectomy

Proportion of all patients receiving thrombectomy (2015-2022)
Percentage of patients

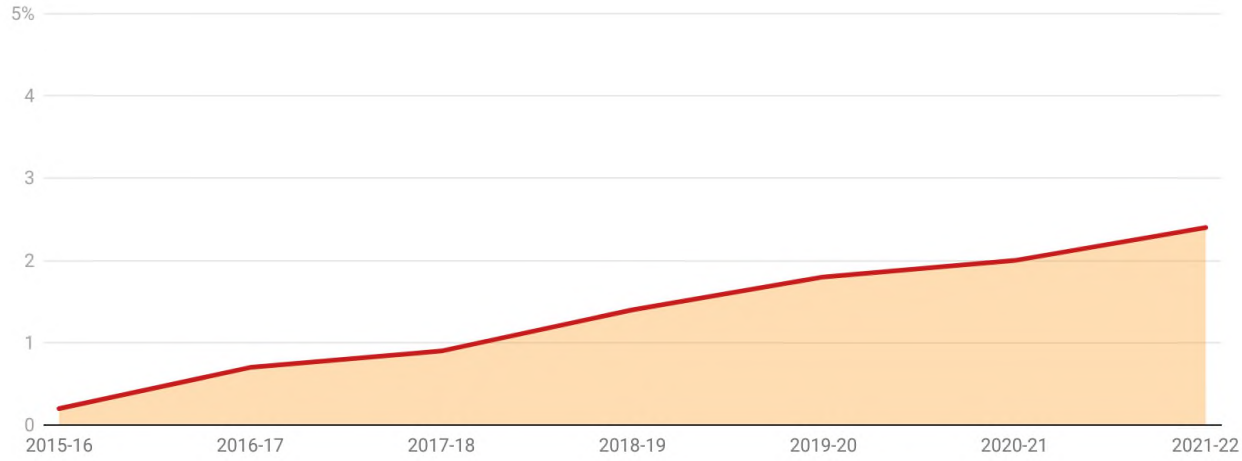


Figure 8: Proportion of patients (out of all strokes) receiving thrombectomy between 2015 and 2022.

The percentage of stroke patients receiving mechanical thrombectomy has increased significantly from 2.0% in 2020-21 to 2.4% in 2021-22 (figure 8). Although the growth and trajectory has remained slow, it is encouraging to see the highest rate of mechanical thrombectomy was recorded during January-March 2022 (2.7%). This occurred during the third wave of the pandemic suggesting thrombectomy pathways were still functional and developed some resilience, although there still remains plenty to do to attain the aspirational target of 10% set by the 2019 NHS Long Term Plan for England.

Map showing percentage of all thrombectomies performed by centres in the region

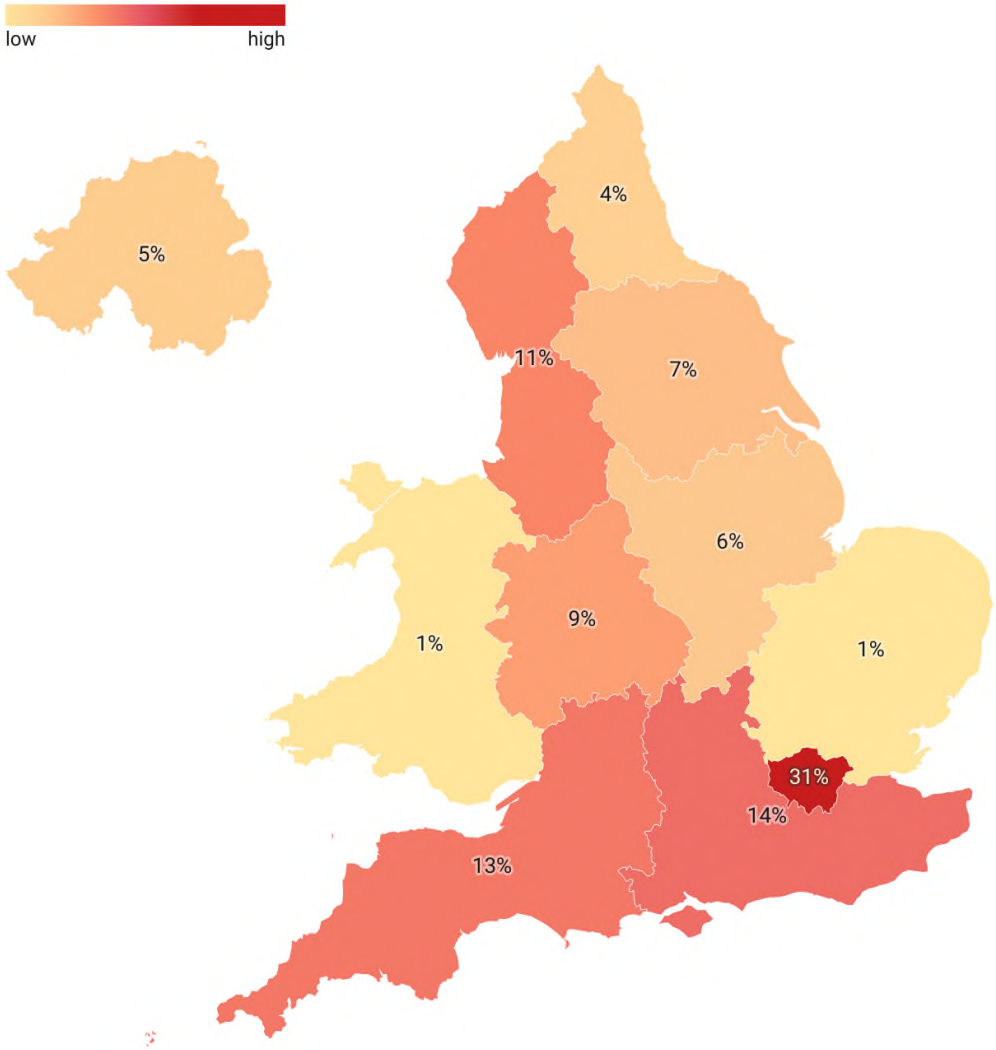
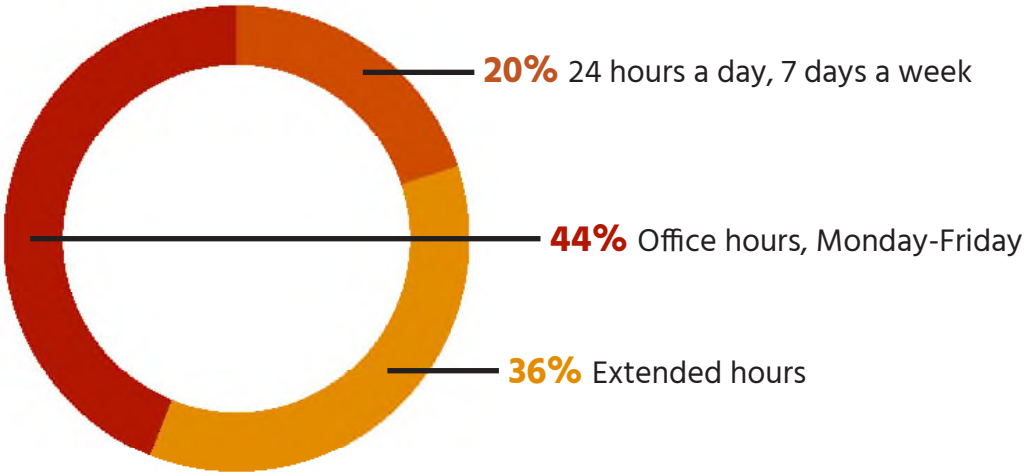


Figure 9: Percentage of thrombectomies performed by thrombectomy centres in each region, across England and in Wales and Northern Ireland, between April 2021 and March 2022.

There are currently 26 centres delivering thrombectomy (England: 24, Northern Ireland: 1 and Wales: 1). There is wide variation in the proportion of thrombectomies delivered across NHS regions in England, Wales and Northern Ireland (figure 9). 31% of thrombectomies are carried out in London as opposed to lower rates across other regions stipulating that there is potential for more growth through extending operating hours, enhancing the workforce of interventional neuro-radiology staff and developing robust inter-hospital pathways.



Thrombectomy centre hours of operation

Data taken from Acute Organisational Audit 2021

What needs to happen next?

There needs to be a comprehensive whole-pathway approach to enhance the provision of thrombectomy 24 hours, seven days per week nationally irrespective of where the patient resides (Saving Brains). There needs to be additional capital investment for thrombectomy centres, expansion of thrombectomy workforce with credential training for gaining thrombectomy expertise, improvement of pre-hospital ambulance timings and strengthening of local governance applications with quality improvement.

The uptake of advanced imaging acting as a decision support tool to allow clinicians to identify patients suitable for thrombectomy will also be crucial. Approximately 50% of patients receiving thrombectomy are presently referred from acute stroke centres (referring sites) to comprehensive stroke centres delivering thrombectomy. It is vital therefore that delays for inter-hospital transfers ('door in door out times' and ambulance transfer delays) are kept to a minimum to maximise the benefits of time dependent thrombectomy. Measures to improve 'door in door out times' thereby enhancing conveyance between hospitals are articulated in the Consensus Guidance of Mechanical Thrombectomy Services, 2021 (To support safe provision of mechanical thrombectomy services for patients with acute ischaemic stroke). In order for these measures to be implemented and sustained, collaboration within ISDNs focussing on shared effective pathway protocols, rapid sharing of images and rapid conveyance from ambulance services will need to be prioritised.

Access to specialist stroke care

Stroke Units

Stroke units remain the most effective intervention for stroke patients at a population level. Direct admission to a stroke unit ensures timely acute interventions and multidisciplinary assessments are undertaken rapidly in order to improve outcomes and reduce mortality. These assessments include coordinated nursing, medical and therapy assessments throughout the patient's hospital stay.

Proportion of patients admitted to a specialist stroke unit within 4 hours of arrival (2019-2022)

Percentage of patients

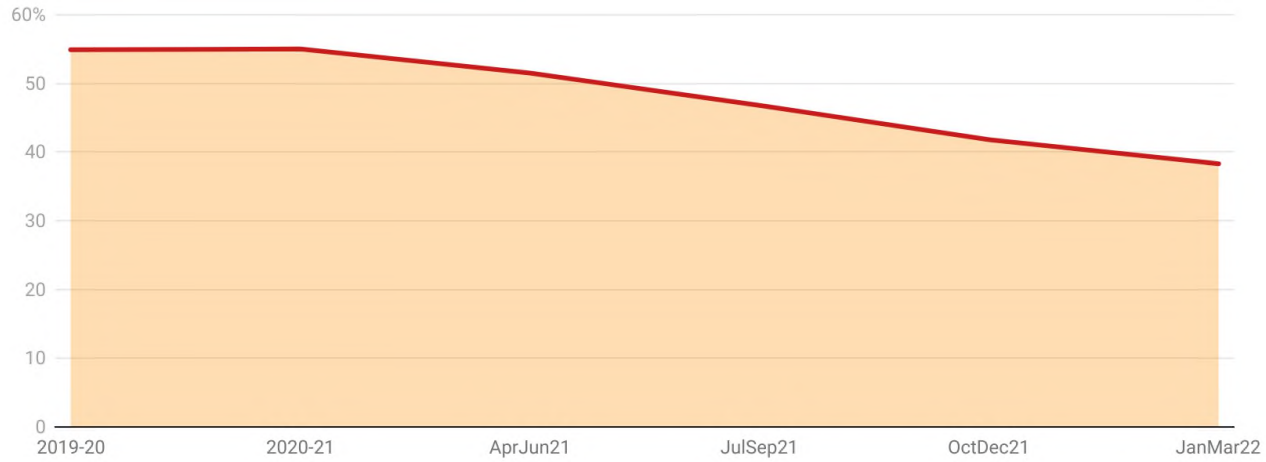


Figure 10: Proportion of patients admitted to a stroke unit within 4 hours of arrival, comparing 2019-20 and 2020-21 annual data with 2021-22 quarterly data.

The proportion of patients accessing specialist stroke units within 4 hours of admission has significantly fallen during 2021-22 from 51.5% in April-June 2021 to 38.3% in January-March 2022 (figure 10). This is the first time this metric has fallen below 40%.

Many factors have contributed to this, including increasing demands of emergency admissions for non-stroke patients, reduced bed capacity owing to closures due to COVID-19 and delayed discharge to social care. The downward trajectory of patients not accessing specialist units rapidly will adversely impact the ability to deliver specialist assessments and treatments and this trend needs to be urgently reversed.

Proportion of patients spending at least 90% of their stay on a specialist stroke unit (2019-2022)

Percentage of patients

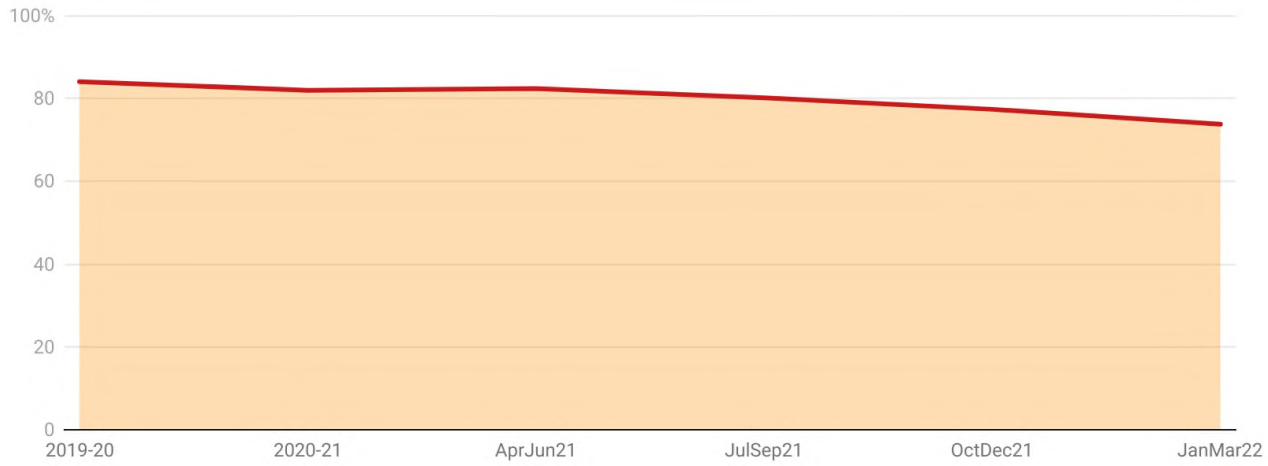


Figure 11: Proportion of patients spending at least 90% of their stay on a stroke unit, comparing 2019-20 and 2020-21 annual data with 2021-22 quarterly data.

The percentage of patients spending 90% of their stay on a stroke unit has also fallen significantly from 82.4% in April-June 2021 to 73.8% in January-March 2022 (figure 11). This is the lowest percentage recorded against this standard since the inception of SSNAP.

There are ongoing challenges to maintain bed capacity within stroke units consistently, with spikes of COVID-19 infection resulting in cohorting of stroke patients to non-stroke unit beds as well as increasing admissions of non-stroke patients. The lack of recovery of this metric this year, suggests services are struggling to optimise patient flow efficiently on stroke units which becomes more challenging with each wave of COVID-19 related hospital activity.

What needs to happen next?

4-hour stroke unit access and the 90% stay metric are the 'flagship' indicators of organisational priority for acute stroke, and both indicators have struggled more than ever this year. There needs to be a refreshed approach to improving patient flow along the stroke pathway, commencing at the front door, facilitating early discharge, particularly at weekends and continuing to emphasise the need to reduce cross infection within stroke units to preserve bed capacity. For those patients who are subsequently cohorted onto non-stroke units beds due to COVID-19 infection, they should still have access to the stroke multidisciplinary team for continued assessment and be transferred back to the stroke unit when appropriate. Widely-publicised issues with access to social care will be having a disproportionate effect on disabled stroke survivors, and need urgent collective action.

Swallowing screening

Proportion of patients given a swallow screen within 4 hours of arrival (2019-2022)
Percentage of patients

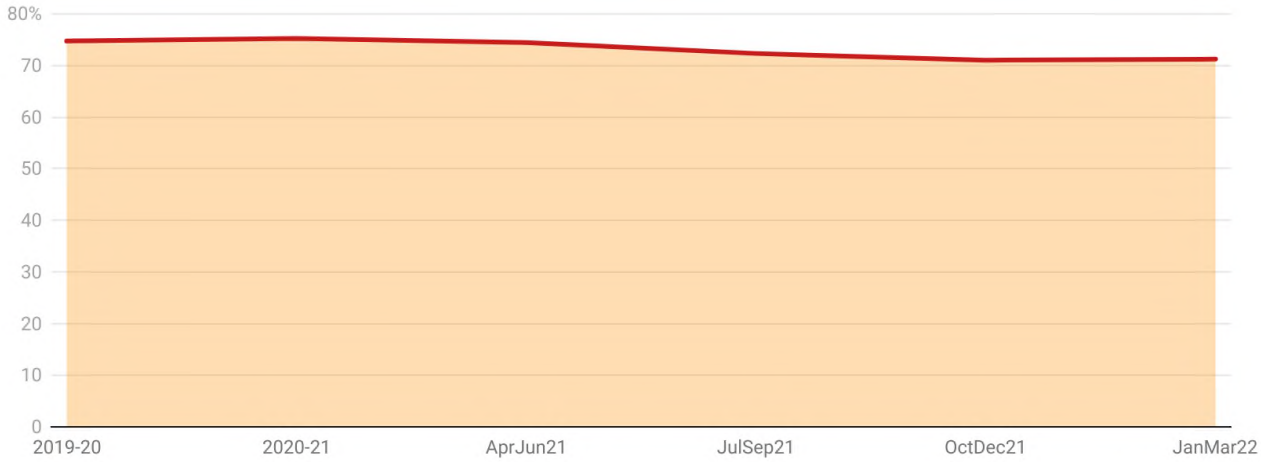


Figure 12: Proportion of patients receiving a swallow screen within 4 hours of arrival, comparing 2019-20 and 2020-21 annual data with 2021-22 quarterly data.

There has been a decline in the overall percentage of swallowing screening within 4 hours from 74.4% in April-June 2021 to 71.2% January-March 2022 (figure 12). This highlights ongoing challenges with the availability of registered nurses trained in swallowing screening on stroke units both during the weekday and weekends (AOA 2021 report table 1.7).

Median number of nurses (IQR)		
	2019	2021
Weekdays	1.5 (1.1-2.1)	1.4 (0.9-1.9)
Saturdays	1.4 (0.9-2.0)	1.3 (0.8-1.8)
Sundays	1.4 (0.9-2.0)	1.2 (0.8-1.8)

Swallow screen trained nurses per 10 stroke unit beds

Data taken from Acute Organisational Audit 2021

What needs to happen next?

Given the benefits of early swallow screening in reducing stroke associated aspiration pneumonia and ensuring adequate nutrition and hydration, it is important that appropriately skilled nursing workforce are maintained across the acute stroke pathway. In particular, avoiding redeployment of nurses trained in swallowing screening to other services during a period of increasing hospital demand and preserving their expertise in acute stroke is a priority.

Urgent brain imaging

Proportion of patients receiving brain imaging within 1 hour of arrival (2013-2022)

Percentage of patients

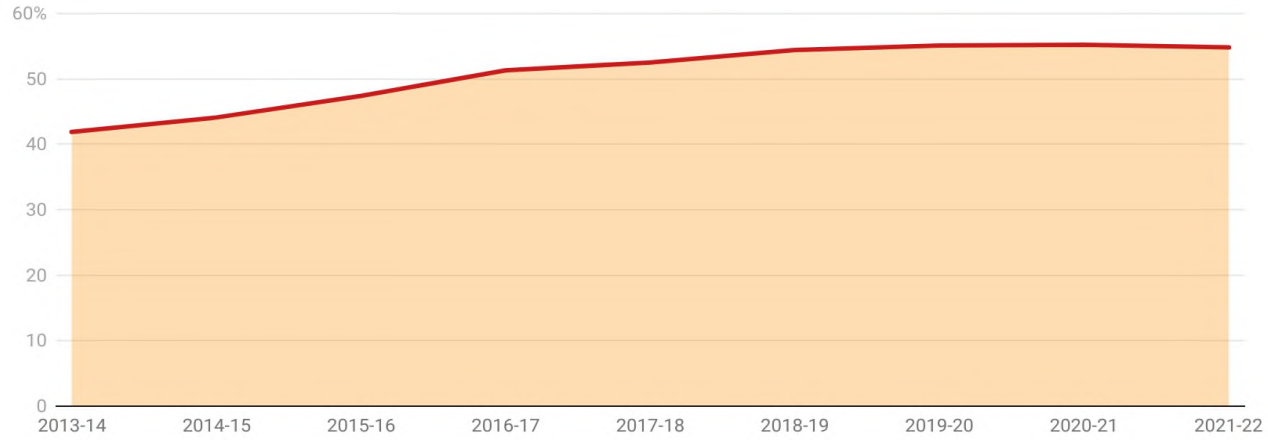


Figure 13: Proportion of patients receiving brain imaging within 1 hour of arrival, 2013 to 2022.

The proportion of patients undergoing brain imaging within one hour of hospital arrival has remained stable at 54.8% in 2021-22 (figure 13). Some delays in individual sites may have been exacerbated by infection prevention measures and screening as a result of COVID-19 but it is reassuring to see that services were still able to deliver this standard to pre-pandemic COVID-19 levels.

From July 2021, SSNAP have recorded the modality of brain imaging on the first visit to the imaging department after stroke, and whether artificial intelligence (AI) was used to support the interpretation of brain imaging. Between 1 July 2021 and 31 March 2022:

87% CT brain imaging
9% CT Angiography (CTA)
1.2% CT Perfusion (CTP)

23.5% AI used to support interpretation of brain imaging

The proportion of patients eligible for an initial CTA is estimated at 35% (Updating estimates of the number of UK stroke patients eligible for endovascular thrombectomy: incorporating recent evidence to facilitate service planning), and the National Optimal Stroke Imaging Pathway (NOSIP) stipulates these patients should be identified before the initial imaging visit so all relevant imaging can be performed at the first sitting. Initial data suggests there is still considerable scope to simplify and expedite initial stroke imaging in line with the NOSIP.

What needs to happen next?

In order to maximise the benefits of clot busting therapies and acute management of brain haemorrhage, protocols for immediate brain imaging should be prioritised within stroke services. Continued advancement in the acute management of stroke will demand increasing complex advanced imaging techniques such as CTA and CTP and these priorities are articulated in the NOSIP adopted by NHS England. Deployment of AI coupled with clinical interpretation of brain imaging is now becoming an increasingly important application in hyperacute stroke care.

Specialist assessment

There has been a continued increase in the delay to stroke specialist assessment from 9 hours and 35 minutes in April-June 2021 to 9 hours and 53 minutes in January-March 2022, with a peak of 10 hours and 9 minutes in October-December 2021 (figure 14). This occurred at a time of increasing COVID-19 emergency hospital admissions during the third wave resulting in significant emergency pressures with competing demands and making timely assessments challenging.

Time from arrival to assessment by stroke consultant (2019-2022)
Median time

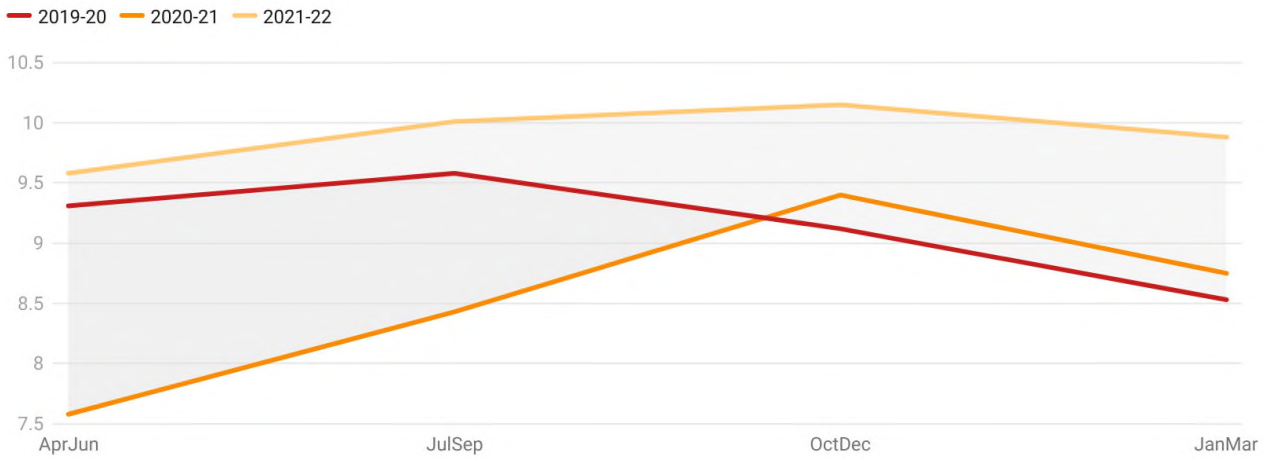


Figure 14: Time from arrival at hospital to assessment by a stroke consultant, 2019 to 2022.

Over the last three years, the timing of initial nursing assessments has improved significantly (figure 15), with improvement sustained this year. Despite the small reductions we have seen in registered nurse staffing on stroke units (AOA 2021 report table 1.22), nursing resource has been effectively mobilised and targeted to provide more timely direct patient assessment even in the setting of strict infection control measures.

Time from arrival to assessment by stroke specialist nurse (2019-2022)
Median time

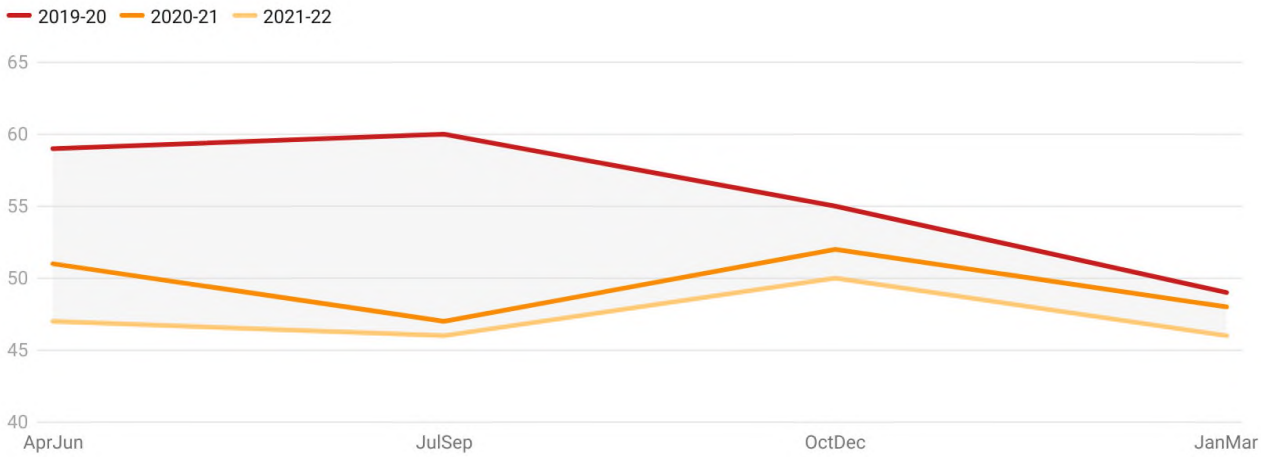


Figure 15: Time from arrival at hospital to assessment by a stroke specialist nurse, 2019 to 2022.

What needs to happen next?

In order to maximise recovery, incorporation of timely and planned assessments needs to be undertaken and prioritised through working creatively. This can be facilitated through a number of platforms through telemedicine applications and reorganising stroke specialist ward rounding to twice daily. These systems need to be in place and available over 7 days. The Critical Time Standards endorsed by NHS England will emphasise further the importance of specialist assessment within one hour of arrival in the emergency department. Workforce planning and in particular adopting the model stipulated by the British Association of Stroke Physicians (Meeting the Future Consultant Workforce Challenges: Stroke Medicine) will be crucial in supporting the needs of people with stroke.

52% acute services
have an unfilled stroke consultant post

18 months
median number of months stroke consultant post unfilled

Inpatient rehabilitation

Inpatient rehabilitation should be delivered 7 days a week by an adequately resourced and integrated MDT, providing tailored, intensive rehabilitation according to the patient's goals and preferences. The ongoing COVID-19 pandemic has highlighted a number of challenges which have hampered access to therapy both in hospital and in the community.

There has been a fall this year in the percentage of inpatient days on which therapy was received with lowest percentages seen during the January-March 2022 cohort for physiotherapy (68.3%), occupational therapy (60.6%) and speech and language therapy (48.2%) (figure 16).

Percentage of days on which therapy was received (2019-2022)
Percentage of days out of time required

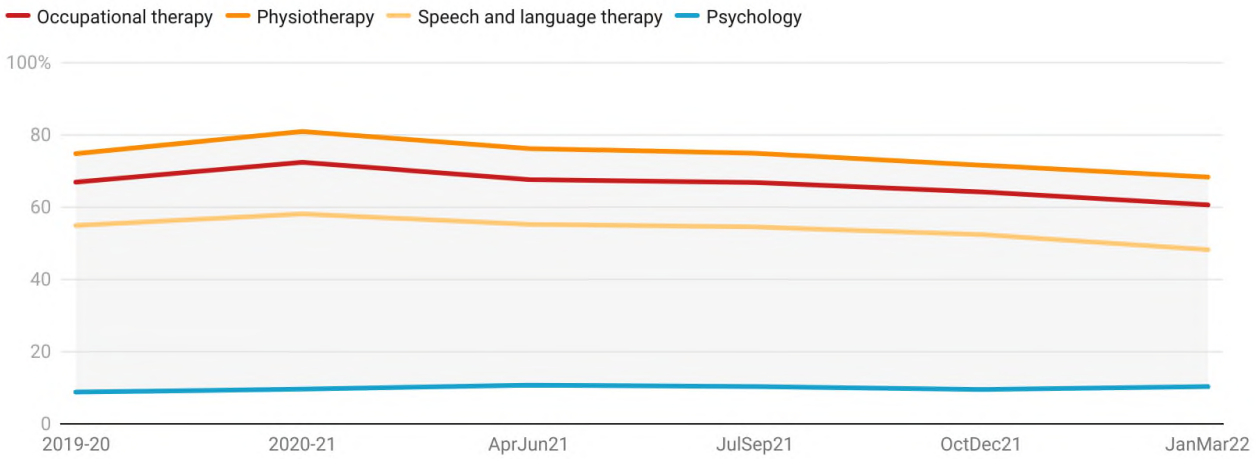
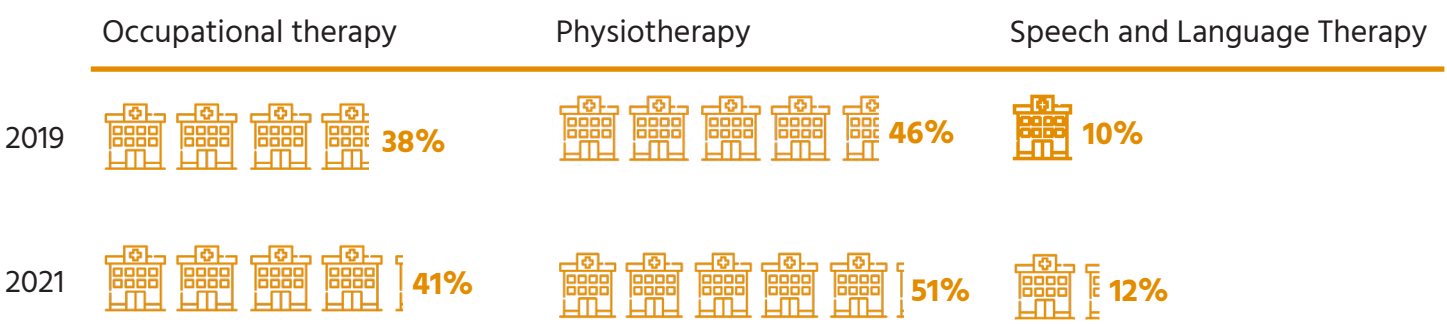


Figure 16: Percentage of days (out of time therapy was required) on which therapy was received, per discipline, comparing 2019-20 and 2020-21 annual data with 2021-22 quarterly data.

The continued fall in therapy received throughout inpatient stay is driven by a combination of workforce pressures (occupational therapy and speech and language therapy remain on the national occupational shortage list and are an area of attention and focus for Health Education England and Health Education and Improvement Wales) and shortages with redeployment of therapy staff as well as patients who are subsequently cohorted to non-stroke unit wards due to COVID-19 activity. Therapy space was lost in many hospitals to allow for bed spacing or additional bed capacity and has not returned in all services following stepping down of the emergency response.

Although levels of psychology received as a proportion of inpatient stay is still low at 10.2% (2021-22), this is a small incremental improvement compared to the previous year (2020-21) at 9.6% (figure 16). Given the breadth of mood, cognitive and adaptive issues following stroke, it remains as important as ever that emphasis is placed on improving support in this domain.

It is reassuring that the provision of qualified therapy, seven days per week involving at least two therapy domains (occupational therapy, physiotherapy and speech therapy) has improved, with 42% of acute sites delivering this standard in 2021 compared to 38% in 2019 (AOA 2021 report table 1.29), however it is crucial to ensure that this is not at the expense of diluting therapy delivered across the whole week.



Acute stroke services providing a 7-day therapy service

Data taken from [Acute Organisational Audit 2021]

Percentage target therapy compliance (2019-2022)
If applicable, patients receiving the equivalent of at least 45 minutes, 5 days a week

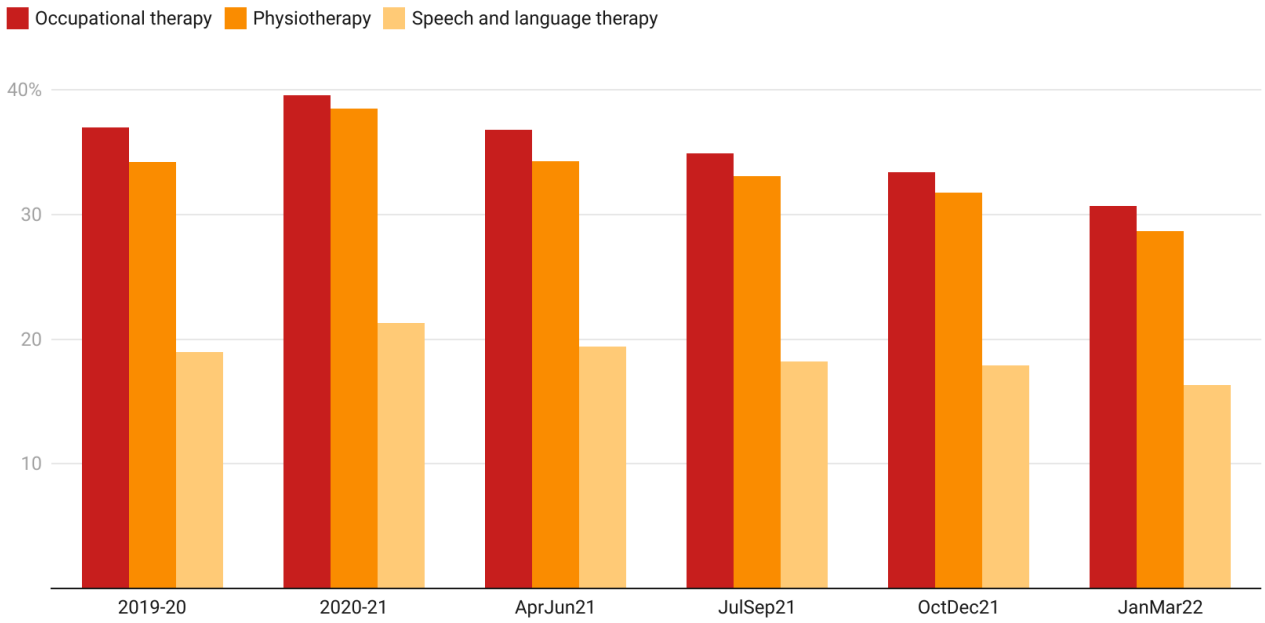


Figure 17: Percentage of patients receiving the equivalent of at least 45 minutes of therapy, 5 days a week, per discipline, comparing 2019-20 and 2020-21 annual data with 2021-22 quarterly data.

SSNAP reports on the percentage of patients who receive at least 45 minutes of each therapy that they require 5 days per week. Although SSNAP now reports this standard at 7 days a week (from October 2020), for comparative purposes with historical cohorts, 5 days a week standards are presented. The proportion of patients receiving these standards has shown a steady decline: physiotherapy (28.7%), occupational therapy (30.7%) and speech and language therapy (16.3%) in January-March 2022 (figure 17) meaning that a significant number of patients are not receiving the intensity of rehabilitation recommended by national guidelines to maximise their rehabilitation and recovery.

What needs to happen next?

Greater emphasis needs to be applied to deliver a multidisciplinary workforce capable of delivering the recommended amount of rehabilitation to patients according to their need and this needs to be adequately resourced. This applies to both qualified therapists and therapy support workers in order to maximise delivery over 7 days consistently. Seven day therapy services will offer a genuine opportunity to enhance the intensity of rehabilitation with greater number of therapy minutes provided and this should be delivered to patients in both in-hospital and community rehabilitation beds (Does 7-day therapy working deliver more therapy overall?). Methods such as timetabling, group work and maximising carer involvement in and out of therapy sessions are all methods of increasing therapy intensity along with encouraging self-directed practice outside of sessions.

Psychology workforce issues also need to be addressed which is a larger challenge. In the meantime, psychology resource should prioritise time to working with the MDT to maximise what the whole team can deliver in terms of psychological support, particularly supporting Occupational Therapists and others involved in cognitive and mood assessment and formulation, by offering formal supervision and training.

Rehabilitation at home

Early Supported Discharge and Community Stroke Rehabilitation

Stroke is a complex and debilitating condition which requires provision of specialist rehabilitation throughout the stroke care pathway. Community based stroke rehabilitation should be provided by specialist multidisciplinary teams, who coordinate transfer of care from hospital to home and who provide specialist rehabilitation in the patient's place of residence. Early Supported Discharge (ESD) reduces length of hospital stay and reduces the risk of death and dependency, by providing responsive and intensive stroke rehabilitation in the patient's place of residence.

Over the past year there has been increased recognition of the importance of community stroke rehabilitation for a wider population of patients, who may not be deemed eligible for ESD or who require stroke rehabilitation beyond ESD. This was highlighted in NHS England's publication of the National service model for an integrated community stroke service in February 2022 recommending integrated services which provide both ESD intervention and needs-led community stroke rehabilitation.

Proportion of patients discharged to a stroke/neurology specific service (2013-2022)
Percentage of patients

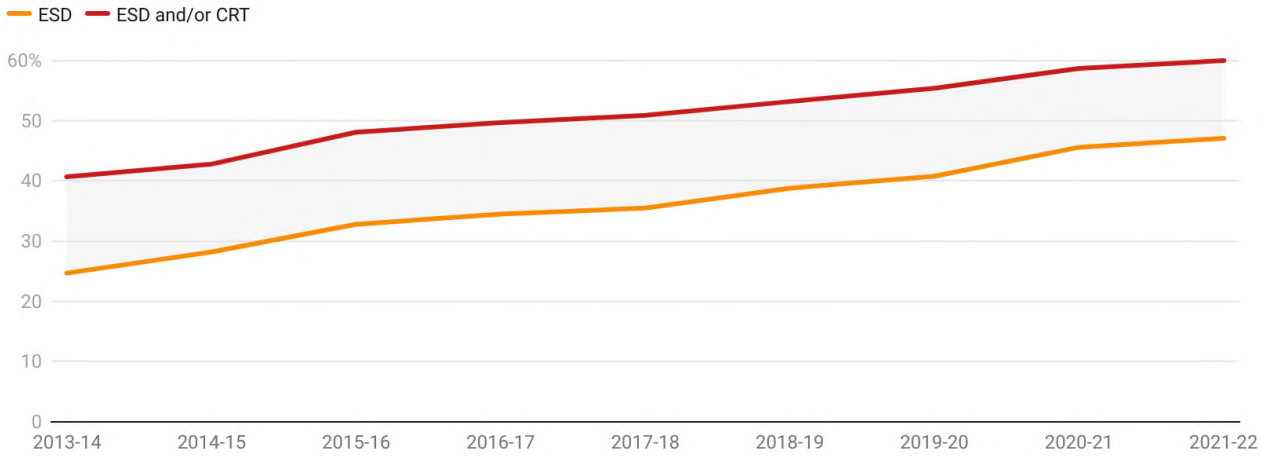


Figure 18: Proportion of patients discharged to a stroke-specific ESD service compared to the proportion of patients discharged to a stroke-specific ESD and/or stroke-specific community rehabilitation service between 2013 and 2022.

The percentage of patients discharged from hospital accessing ESD and ESD and/or community stroke rehabilitation services (CRT) has risen, with the most recent increase from 45.6% in 2020-21 to 47.1% in 2021-22 for ESD and 58.7% to 60.0% for ESD and/or CRT (figure 18).

This, in part, reflects an increase in the range of post-acute services now provided across England, Northern Ireland and Wales (figure 19) with provision of combined ESD and community stroke rehabilitation services (PAOA 2021 report table 2.3).

Map showing distribution of Early Supported Discharge, Community Rehabilitation teams and Combined ESD/CRT

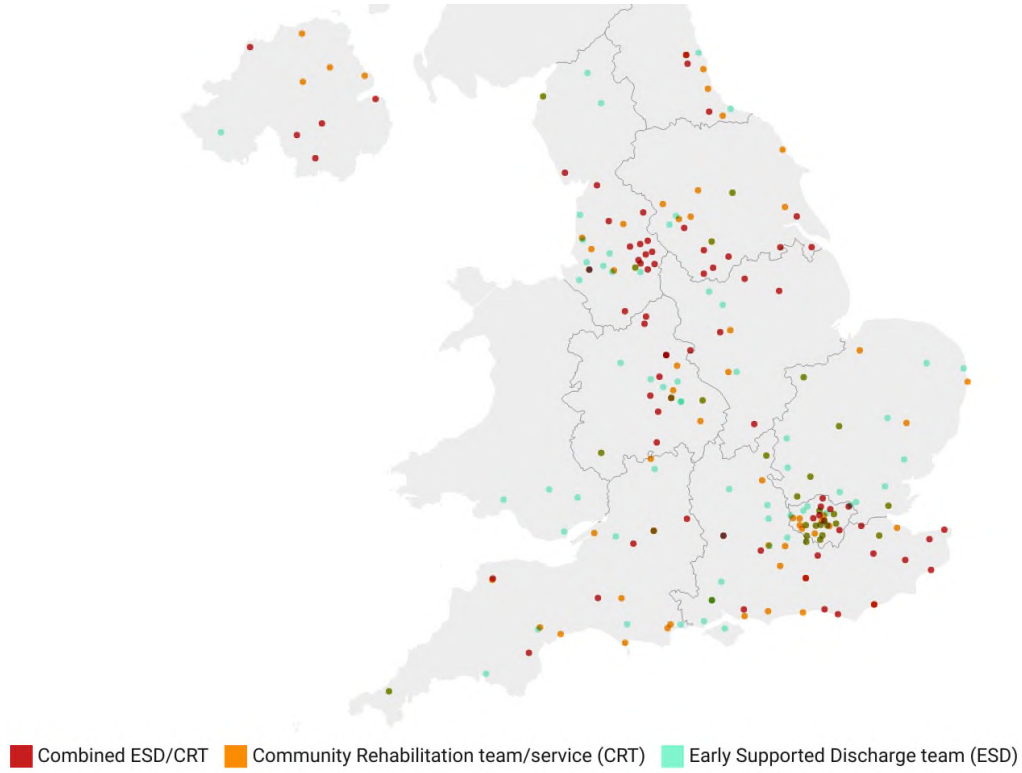


Figure 19: Distribution of multidisciplinary post-acute non-inpatient teams throughout England, Wales and Northern Ireland, as of 1 April 2021. Data from the 2021 post-acute organisational audit.

It also reflects an increase in the numbers of patients accessing community stroke services. The need for flexibility of access was accelerated during earlier waves of the COVID-19 pandemic, in order to reduce the risk of nosocomial infection and ensure patients were supported appropriately at home. Many community based stroke services reported an increase in their caseload, including patients with more complex needs. This is reflected, in part, by an increase in proportion of patients discharged from hospital with a modified Rankin Score (mRS) of 3 (moderate disability) from 17.6% in 2018-19 to 18.9 % in 2021-22 and 4 (moderately severe disability) from 15.3% in 2018-19 to 16.2% in 2021-22 (figure 20).

This increase in patient numbers and complexity emphasises the need for community based stroke services to be appropriately resourced, in order to maintain provision of responsive and intensive ESD for patients who need it whilst also providing stroke specialist rehabilitation to a wider stroke population. Whilst responsiveness, as defined by patients accessing ESD within 1 day of discharge from hospital appears to have declined from 60% to 41 % between 2015 and 2021, it is important to note that 48% of ESD/CRT teams meet required standards with a median waiting time within 3 days (PAOA 2021 figure 4.3). This again, reflects a move in the right direction.

However, given that the majority of community based stroke services still operate over a 5 or 6 days a week basis, with only 26% of teams operating 7 days a week (PAOA 2021 table 4.1), further investment and improvement is required for community teams to meet the objective of delivering the same intensity of rehabilitation as could be delivered in hospital.

mRS score at discharge from inpatient care (2013-2022)

Percentage of patients by neurological disability

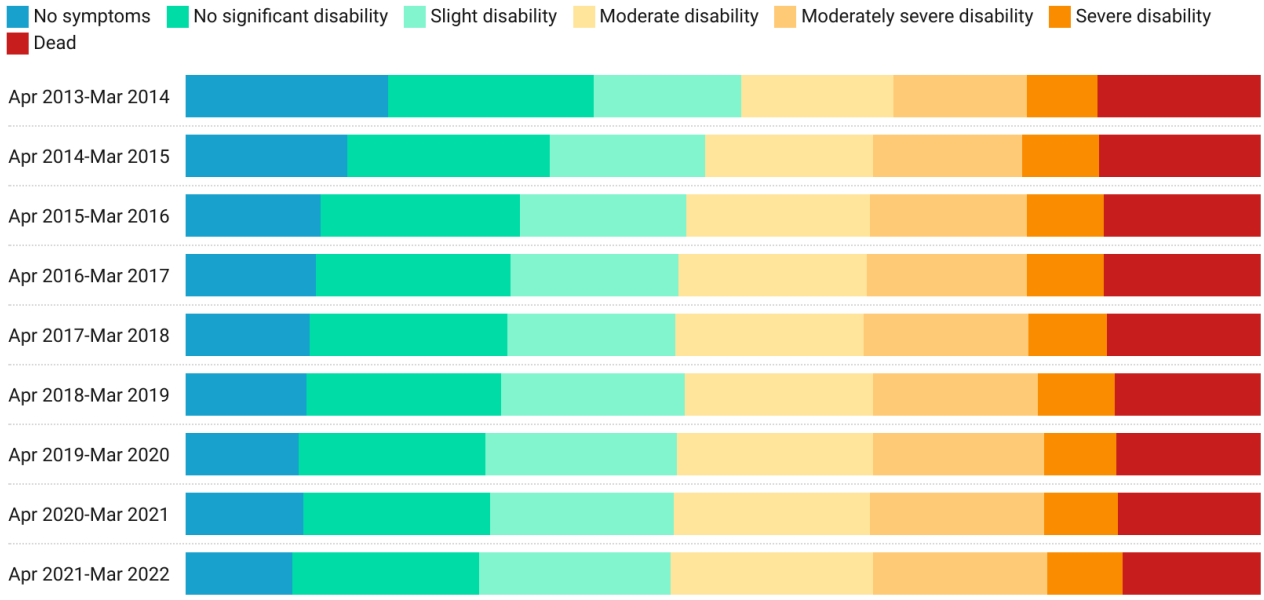


Figure 20: mRS at discharge from inpatient care between 2013 and 2022.

What needs to happen next?

Community based services should adopt an integrated service delivering on key features of integration, responsiveness, intensity and provision of a needs based rather than time based model. Adoption of core components of an evidence based service are recommended as part of this model (Effectiveness of Stroke Early Supported Discharge). In order for such services to be clinically effective, it is important that community stroke teams are appropriately staffed to the required standards (Post-Acute Organisational Audit Report 2021), given the increase in patient numbers and complexity this should be a priority. This includes appropriate access to clinical psychology and delivery of multidisciplinary care seven days per week. The focus of maximising the intensity of rehabilitation for stroke patients should also be delivered in parallel to self management strategies and involvement of family and carers. The COVID-19 pandemic has resulted in community teams working creatively and collaboratively with provision of telerehabilitation and virtual remote support to appropriate patients. These new models of practice need further evaluation as a method to facilitate delivery of therapy in the community effectively and efficiently before they are adopted more widely in the future.

Case Study: Using SSNAP data for pathway optimisation/modelling
Dorset County Hospital NHS Foundation Trust

Clinical challenge
The opportunity arose for pathway redesign in our local service, with an opportunity to refine our bed base (hyperacute, acute, rehabilitation), ambulatory care service and to develop our ESD service into a future Integrated Community Stroke Service (ICSS).

Solution
Data:

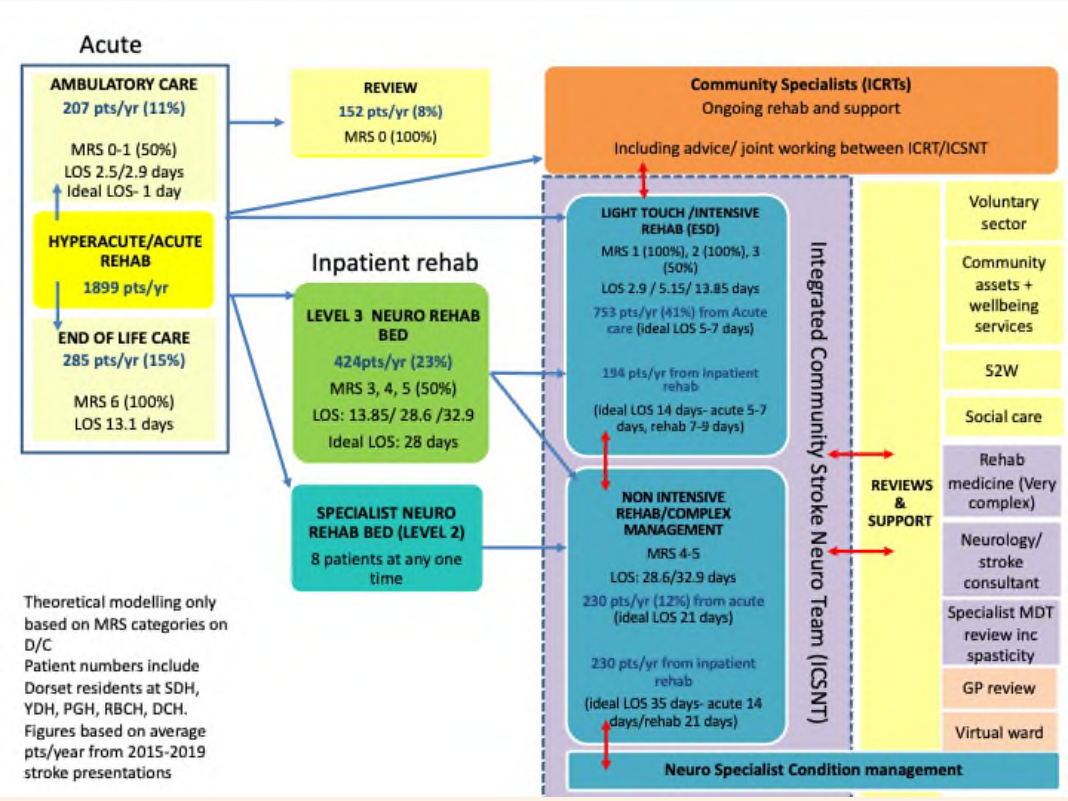
1. 4 years of SSNAP data were pulled and analysed for seasonal trends, and average stroke numbers/yr (Exporting SSNAP Data).
2. Patients were stratified using mRS (0-6), and length of stay (LOS) was analysed for each category.
3. Stakeholders agreed the ideal LOS per mRS category in comparison to average existing LOS.
4. Proportions of patients who fell within the ideal LOS per group was reviewed to ensure ideals were reasonable.
5. Statistical Process Control charts were created from SSNAP export including all patients. Notes were pulled for;
    a. patients whose LOS was the same or below the ideal LOS for that group, to review the care received for patients with an ideal LOS and determine features of good practice that could be replicated.
    b. a number of patients who sat above the upper control, to understand what happened to patients with a significantly longer LOS than expected, why this happened, and whether this was avoidable or needed to be factored into bed modelling.

Assumptive bed modelling:

6. Stakeholders agreed proportion of LOS for each mRS group which would likely be an acute and rehabilitation (medically stable) stay.
7. SSNAP data and hospital 'midnight bed occupancy' data was bought together by the business intelligence team to show current bed utilisation.
8. A factor was identified that when used in the model, reduced the average LOS for each mRS group's stay, in line with the ideal LOS identified. The model also accounted for the variation created by patients whose LOS was longer, with the assumption that this was due to social care delays. This modelling also explored future bed utilisation, allowing 85% bed occupancy if the ideal LOS were realised for example by optimising and tailoring services to each patient (mRS) group.

Pathway optimisation:

9. The pathway was considered for each patient group with assumptions made about the proportion of patients who could be seen in various settings (some of which would need to be developed) - for example ambulatory care, ESD, dedicated downstream rehab beds, community stroke team



Impact

This graphic shows the pathway, the patient numbers expected, mRS proportions assumed in the modelling, historic LOS and ideal LOS in an optimised pathway. This has been helpful in engaging with services to articulate a vision for the future- a vision for improvement.

Bed modelling outputs were used to inform movement of dedicated rehabilitation beds off the acute site to create a new stroke rehab unit in a community hospital during COVID. To support this, outputs were triangulated using the GIRFT bed modelling tool using population size and 3 x snapshot audit data from all patients on the ward. This investigated whether patients could be safely managed in a non-acute setting. All approaches supported the suggested bed numbers from the bed modelling process described above based on modelling SSNAP data.

Rehab beds moved off site in August 2020. LOS reductions were seen in line with ideals suggested whilst maintaining patient outcomes. SSNAP data is used to continually monitor ourselves against the assumptions in the above model as well as the usual process measures collected by SSNAP re quality. We continue to use this model in the development of our Integrated Community Stroke Services.

Reflection

The project brought together the clinical team and business intelligence team to create a data informed model that met clinical standards. We were reassured by the use of real-life data, including all the ups and downs that happen on stroke units, accounts for seasonal and natural variation that was also triangulated with other audit methods.

Six month assessments

In order to identify long term needs of stroke survivors, it is important to assess patients with a structured review at six months and then annually in conjunction with appropriately trained professionals. Identification of unmet need can prompt access to specialist services to address secondary prevention, psychological issues and access to work through vocational rehabilitation thus supporting patients living with long term disability.

Proportion of patients receiving a six month assessment (2013-2022)
Percentage of patients

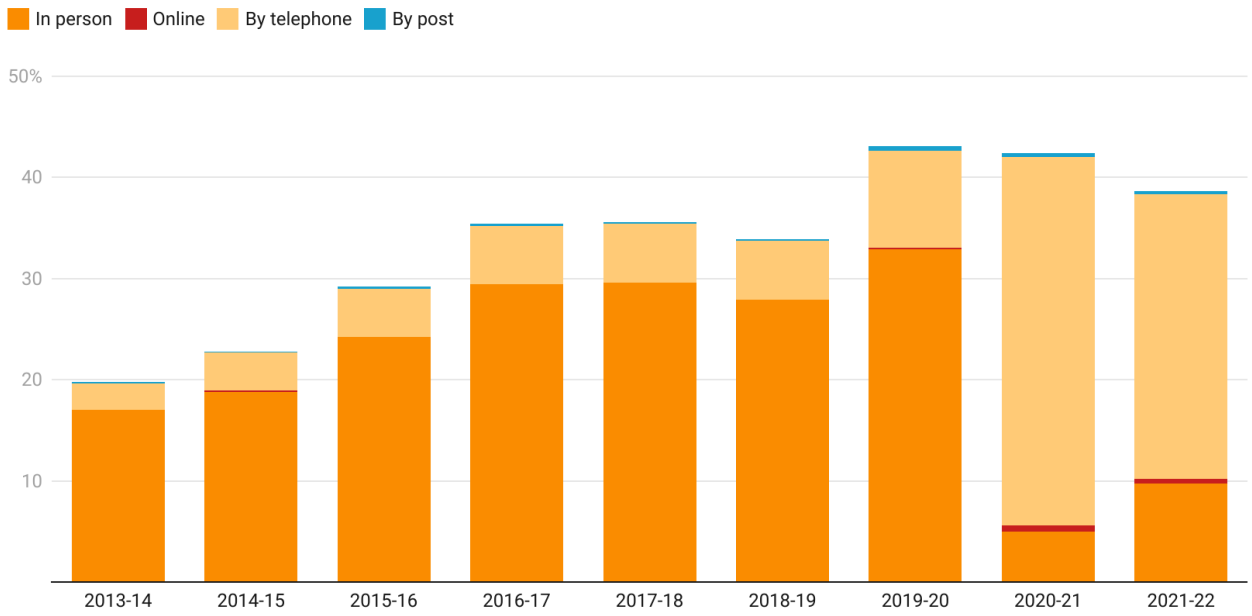


Figure 21: Proportion of patients receiving a follow-up six month after stroke, by follow-up method, 2013 to 2022.

The proportion of applicable patients undergoing an assessment at six months has decreased from 42.4% to 38.5% between 2020-21 and 2021-22 (figure 21). The majority of patients are still being assessed by telephone (72.9% for 2021-22), which may be appropriate for patients with transport difficulties and reflect greater versatility and flexibility in how reviews are being conducted. However, we have little data comparing patient satisfaction and comprehensive identification of needs in the various methods of conducting reviews.

Face to face assessments have increased from 11.7% in 2020-21 to 25.1% in 2021-22 (figure 21) which may reflect restoration and recovery of the review process following the peaks of the COVID-19 pandemic. There has been an increase in the number of acute services commissioned for six month reviews across England, Wales and Northern Ireland (AOA 2021 portfolio item ref. 5.12), but there is still a disparity of how such services are delivered nationally with relevance to rural areas and 'hard to reach groups' such as patients living in care homes.

EQ5D-5L at six months post-stroke
Percentage of patients choosing each option

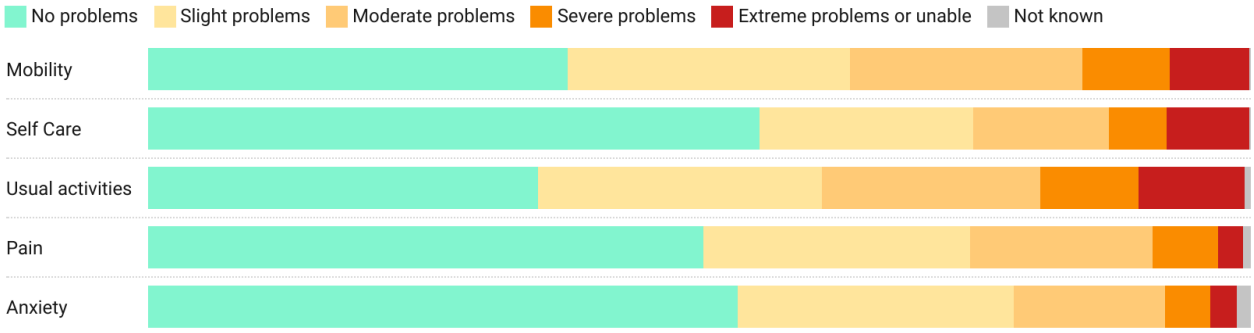


Figure 22: EQ5D-5L at six months post-stroke, between July 2021 and March 2022.

The inclusion of a quality of life measure (the EuroQoL EQ-5D-5L) at the six month post-stroke follow up this year has provided important information about the overall state of health of people living with stroke (figure 22). These early data show us that moderate problems with pain are at least as prominent as problems with self-care, and that nearly 40% of those able to attend a follow-up report at least moderate problems returning to their usual activities.

Collection of an additional quality of life measure is a big step forward and as this information accumulates we will be able to interpret the impact for patients of various interventions and models of care with greater confidence.

Employment status before stroke and at six months after stroke
Percentage of patients by employment type

Figure 23: Comparison of employment status of stroke patients before stroke and at six months after stroke, between July 2021 and March 2022.

Collection of employment status has also provided an understanding of the impact of stroke on returning to work or study, emphasising the importance of access to vocational rehabilitation services. 14% of patients were working full time prior to stroke compared with 6% of patients six months after their stroke in 2021-22 (figure 23).

What needs to happen next?

Addressing inequalities in healthcare for stroke patients and their families is a national priority which requires tackling at the coalface with a structured and systematic approach. The Stroke Association report 'Recoveries at Risk' 2020 (Stroke Recoveries at Risk Report) clearly highlighted the sense of abandonment for many patients, carers and families with unmet needs ranging from physical, mental health and social needs.

Commissioning six month reviews should be undertaken equitably so that all patients with stroke are assessed with a standardised tool measuring secondary prevention, disability management and patient outcomes. Patient outcomes are important to measure, in order to assess overall recovery from stroke, and to consider the effectiveness of rehabilitation strategies delivered as part of the stroke pathway. Continued collection of patient outcomes including physical and mental health related quality of life (EQ-5D-5L), employment status and days spent at home in the first four months after hospital admission (a further outcome measure coming in 2023) will provide opportunities for quality improvement.

Concluding thoughts

The purpose of reporting high quality data is to support clinicians, policy makers, and commissioners to identify where improvements are needed and where additional support and resources are required. For stroke care, this remains a priority in all three participating UK nations as reaffirmed by the NHS Long Term Plan (England) and corresponding policy statements from Wales and Northern Ireland. Our ninth SSNAP Annual Report highlights the current performance across the entire stroke pathway in 2021-22.

The COVID-19 pandemic has brought about its own unique challenges to the delivery of high quality stroke care as reported last year ('A Year Like No Other'; 2020-21) ranging from pre-hospital care, delivery of reperfusion therapies, provision of rehabilitation and longer term support. Although over the last nine years, there have been improvements in many of the key domains of stroke care, these most recent two years have brought significant challenges to the quality of care delivered as demonstrated by the national audit data, which have reversed some of the medium-term progress that has been made. The continued use of SSNAP as a unique tool to support data driven quality improvement will be crucial in delivering tangible changes to patient care and to supporting the process of recovery.

Our report this year showcases the 'Road to Recovery' and describes the delivery of stroke care in hospital and in the community as we emerge from the COVID-19 pandemic, as well as identifying what approaches need to be undertaken to accelerate recovery. Approaches have been innovative in nature and highlight the commitment, energy and collaboration of many multidisciplinary teams working towards patient centred care despite working under considerable and sustained pressure. No service can be expected to deliver high quality care without an adequately staffed multidisciplinary workforce and the COVID-19 pandemic has tested the capacity and resilience of such a workforce which has been eloquently described in both acute and post acute organisational reports.

The continued increase in time from onset to arrival to hospital and ambulance call to arrival highlight the well publicised pressures on the pre-hospital pathway which need to be improved irrespective of whether stroke patients are candidates for reperfusion therapy. The process of getting the right patient to the right place to receive the right treatment in good time has been complicated, and there still remains much to be done to understand the effective components of pre-hospital care, and learning from pilot work with teletriage and mobile stroke units will be key to that, but speed at every step of the process will remain a high priority.

A challenging consequence of the pandemic has been timely access to organised stroke care on the stroke unit whereby the '90% stay' headline indicator fell to its lowest point since 2013. In order to maintain these quality indicators, a whole systems approach on addressing rapid admission, bed flow improvement and facilitating timely discharge needs to be afforded continuously to ensure stroke unit bed capacity is maintained. The Critical Time Standards (in England) focussing on delivering timely assessments and interventions within one hour of arrival to hospital will provide a stimulus to enhance hyper-acute stroke practice.

This year has witnessed a further decline in thrombolysis rates. The decline in thrombolysis rates are not solely driven by increasing delays in onset to arrival time and we need to identify what other factors are responsible for delaying recovery in this metric as well as differences observed amongst the devolved nations. A renewed focus is warranted to ensure that we maximise the benefits of thrombolysis on the population, by improving door to needle times in parallel with improving proportion of patients thrombolysed. We would again encourage centres with low thrombolysis rates to visit high performing centres to share areas of good practice within ISDNs in England and collaborative networks in Wales.

Although we have witnessed a very welcome increase in the rate of thrombectomy, the aspirational target of 10% has yet to be delivered. However there are pockets of good practice demonstrating that it is still possible to deliver significant rates of thrombectomy across wide geographical areas, and these have been highlighted during the 2022 series of Thrombectomy Quality Reviews, based around natural communities of practice. Extending the operational service time to 24/7 for comprehensive stroke centres as well as adopting artificial intelligence approaches for advanced images and improving drip and ship transfer arrangements will improve the delivery of thrombectomy.

There are ongoing challenges with the multidisciplinary workforce affecting the ability to provide the necessary rehabilitation both in hospital and in the community. We welcome the sustained access to ESD alongside provision of community stroke rehabilitation, and examples of seven day provision of therapy given the increase in complexity of patients discharged from hospital. However it is imperative that such services are appropriately staffed and have the responsiveness and flexibility to deliver rehabilitation based upon patients needs. The Integrated Community Stroke Service (ICSS) Model for England has provided a timely description of the key components of community stroke rehabilitation and care that need to be commissioned, a process we hope to see expedited this year through the support of the Stroke Quality Improvement in Rehabilitation Leads (SQuIRe). Ensuring people with stroke get stroke rehabilitation at the necessary intensity, not just in hospital but also in the community, is a key objective in the NHS Long Term Plan, and enhancements to SSNAP's community data collection will help to facilitate and drive these improvements.

Measuring the impact of stroke longer term is vital to highlight the needs of both patients and families as well as examining the effects of stroke care interventions. It is important that we renew our engagement in this process to ensure that as many eligible patients as possible receive a comprehensive assessment at six months. For the first time this year, SSNAP has reported on additional patient-reported outcome measures (PROMs) describing the physical and mental health related quality of life for patients as well as employment status, and these have given us some significant findings from the early cohorts that will need to be considered as the sample increases in size. These additional measures will help providers and planners to focus on the longer term and societal implications of stroke with tangible relevance to patients and families.

This has been another challenging year for all as the NHS and wider society emerges from the COVID-19 pandemic and we must salute the commitment of the NHS workforce involved in stroke care who have worked tirelessly to maintain the quality of care despite working under severe and sustained clinical pressure. Maintaining resilience and supporting recovery of services through innovation is a pressing priority. SSNAP, as a comprehensive national comparative audit, remains committed to providing a vehicle to monitor performance across the entire stroke pathway and foster quality improvement at every level so that evidence- based high quality care is seen as the norm rather than the exception.

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Glossary

Ambulance Linkage Project: SSNAP has extended data collection of patients in England to include the time spent from the call to 999 services and times in between, up until arrival at hospital. Data is reported as part of the Ambulance Quality Indicators (AQI) https://www.england.nhs.uk/statistics/statistical-work-areas/ambulance-quality-indicators/

Artificial Intelligence (AI): Artificial Intelligence (AI) is the use of a non-human software package to interpret brain imaging, even if the imaging is also subsequently interpreted by a radiologist.

Atrial Fibrillation (AF): An abnormal heartbeat which can result in the formation of blood clots.

Bed capacity: The number of beds available for patients.

Clinical Audit: A way to find out if healthcare is being provided in line with standards and lets care providers and patients know where their service is doing well, and where there could be improvements.

Clinician: A professional delivering clinical care who has direct contact with patients rather than being involved solely in research and teaching.

COVID-19: An infectious disease caused by a newly discovered coronavirus.

CT scan: Computed Tomography scan. Detailed images of internal organs are obtained by this type of sophisticated X-ray device.

Door-to-needle time (DTN): Term that refers to the time from arrival at hospital or onset of stroke (for inpatient strokes) to the time a patient is thrombolysed. See Thrombolysis.

Drip-and-ship: The process of quickly administering thrombolysis to a patient at the first hospital they are admitted to, before they are immediately transported to a comprehensive stroke centre for further treatment.

Early Supported Discharge (ESD): A system in which rehabilitation is provided to stroke patients at home instead of at hospital at the same intensity as inpatient care.

Face Arm Speech Test (FAST): A test used to screen for the diagnosis of stroke or TIA. https://www.stroke.org.uk/what-is-stroke/what-are-the-symptoms-of-stroke

In hospital mortality rate: The proportion of patients who die during or shortly after admission to hospital. It is the proportion of people who are not discharged alive from inpatient care.

Integrated Stroke Delivery Network (ISDN): In NHS England's National Stroke Service Model ISDNs "bring services together to design optimal stroke pathways, from pre-hospital to early supported discharge (ESD), community specialist stroke-skilled rehabilitation and life after stroke support." https://www.england.nhs.uk/ourwork/clinical-policy/stroke/national-stroke-service-model/

Median: The median is the middle point of a data set; half of the values are below this point, and half are above this point.

Modified Rankin Scale (mRS): Measures the degree of disability or dependence in the daily activities of people who have suffered a stroke or other causes of neurological disability.

Multidisciplinary team: A team or service which is composed of staff from different healthcare professions with specialist skills and expertise. The members work together to ensure patients receive comprehensive, coordinated treatment.

Onset Time: This is the date and time recorded by the acute hospital in SSNAP as the date and time the patient first reported symptoms of stroke.

Post-acute organisational audit: Snapshot audit first run in 2015 and repeated in 2021, covering the quality of stroke service organisation in post-acute settings.

Pre-alert: The practice of placing a priority (pre-alert) call to hospitals to notify receiving staff that a stroke patient is in transit.

Stroke mimic: A patient assessed by the stroke team as a suspected stroke but whose final diagnosis was not a stroke.

Telemedicine: The remote diagnosis and treatment of patients by means of telecommunications technology.

Telerehabilitation: The delivery of rehabilitation services by means of telecommunications technology.

Thrombectomy: Also referred to as intra-arterial therapy. The surgical removal of a blood clot. Thrombectomy is a very new treatment that is not available in many parts of the country.

Thrombolysis: Treatment with a drug that breaks down blood clots.

Transient ischaemic attack (TIA): Causes sudden symptoms similar to a stroke but does not last as long as a stroke, often fully resolving within 24 hours. Often called a "mini stroke". https://www.nhs.uk/conditions/transient-ischaemic-attack-tia/

Further reading

Does 7 day therapy working deliver more therapy overall? Data from the national stroke audit for England, Wales and Northern Ireland (SSNAP) https://www.strokeaudit.org/ SupportFiles/Documents/Research/UKSF-poster-SSNAP-5v7-day-therapy.aspx

Effectiveness of Stroke Early Supported Discharge: https://www.ahajournals.org/ doi/10.1161/CIRCOUTCOMES.119.006395

Meeting the Future Consultant Workforce Challenges: Stroke Medicine: https://www.biasp.org/wp-content/uploads/2022/03/BASP-Stroke-Medicine-Workforce-Requirements-Report-FINAL.pdf

National service model for an integrated community stroke service: https://www.england.nhs.uk/publication/national-service-model-for-an-integrated-community-stroke-service/

Saving Brains: https://www.stroke.org.uk/sites/default/files/integrated_campaigns/thrombectomy_campaign/saving_brains_thrombectomy_report_july_2022_final.pdf

Seven Day Services Clinical Standards: https://www.england.nhs.uk/publication/ seven-day-services-clinical-standards/

SSNAP Acute Organisational Audit Report 2021: https://www.strokeaudit.org/Documents/National/AcuteOrg/2021/2021-AOANationalReport.aspx

SSNAP Post-Acute Organisational Audit Report 2021: https://www.strokeaudit.org /Documents/National/PostAcuteOrg/2021/2021-PAOrgPublicReport.aspx

Stroke Recoveries at Risk Report: https://www.stroke.org.uk/stroke-recoveries-at-risk-report

The Quality Statement for Stroke: https://gov.wales/quality-statement-stroke-html

To support safe provision of mechanical thrombectomy services for patients with acute ischaemic stroke: https://www.clinicalradiologyonline.net/article/S0009-9260 (21)00391-3/fulltext

Updating estimates of the number of UK stroke patients eligible for endovascular thrombectomy: incorporating recent evidence to facilitate service planning: https://journals.sagepub.com/doi/full/10.1177/23969873211059471

Use of Clinical Pathway Simulation and Machine Learning to Identify Key Levers for Maximizing the Benefit of Intravenous Thrombolysis in Acute Stroke: https://www.ahajournals.org/doi/abs/10.1161/STROKEAHA.121.038454

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HQIP is led by a consortium of the Academy of Medical Royal Colleges, the Royal College of Nursing, and National Voices. Its aim is to promote quality improvement in patient outcomes, and in particular, to increase the impact that clinical audit, outcome review programmes and registries have on healthcare quality in England and Wales. HQIP holds the contract to commission, manage, and develop the National Clinical Audit and Patient Outcomes Programme (NCAPOP), comprising around 40 projects covering care provided to people with a wide range of medical, surgical and mental health conditions.

The HQIP programme is funded by NHS England, the Welsh Government and, with some individual projects, other devolved administrations and crown dependencies.
http://www.hqip.org.uk/national-programmes

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