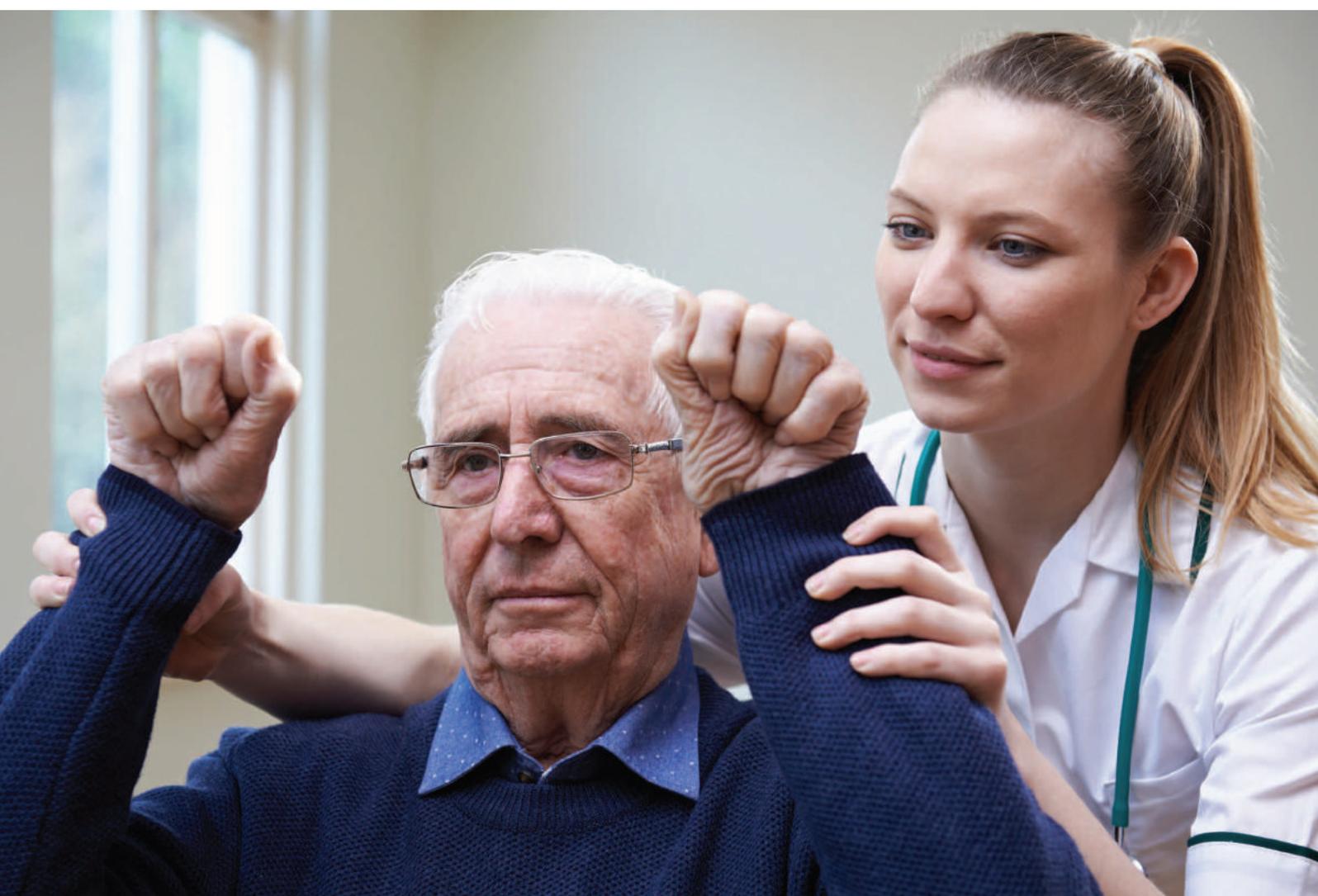


Stroke

GIRFT Programme National Specialty Report

By Dr David Hargroves and Dr Deb Lowe
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Foreword from Professor Tim Briggs

I am delighted to recommend this Getting it Right First Time review of stroke services by Dr David Hargroves and Dr Deb Lowe.

This report comes at a time when the NHS has undergone profound changes in response to the COVID-19 pandemic. The unprecedented events of 2020/21 – and the extraordinary response from everyone working in the NHS – add greater significance to GIRFT's recommendations, giving many of them a new sense of urgency.

Actions in the report, such as supporting the stroke workforce and staff wellbeing, and maintaining and evaluating the increased use of virtual working seen during the pandemic, can help the NHS as it faces the substantial challenge of recovering services, while remaining ready for any future surges, by operating more effectively and safely than ever before.

This report brings the GIRFT approach to stroke services, which encompass the full end-to-end pathway: from stroke prevention, pre-hospital and emergency management, to inpatient care and rehabilitation, both in hospital and, importantly, at home. Stroke is the greatest cause of disability and fourth largest cause of death in England. In the UK, 100,000 people have strokes each year and there are 1.2 million stroke survivors. Speed of access to treatment is a crucial factor in stroke to reduce the extent of brain injury and increase the potential for good outcomes. Some people may have full and quick recoveries, while many others will need long-term support to regain as much of their independence as possible.

The findings and recommendations in this report are based on their insights from meetings with 122 acute stroke services across the country, alongside data from Hospital Episode Statistics, the Sentinel Stroke National Audit Programme (SSNAP) and the Diagnostic Imaging Dataset. The report identifies areas of unwarranted variation and significant opportunities to improve outcomes for patients.

The report calls for system-wide working, and in particular strong leadership delivered by Integrated Stroke Delivery Networks (ISDNs). This was mirrored in the GIRFT deep dive process, which involved holding 22 STP/ICS-based network events and bringing together teams from different organisations and levels of leadership in each region.

It has been heartening to hear how many examples of excellence Deb and David have seen across stroke centres, many of which are highlighted in this report. The commitment and resilience of stroke teams has meant that despite these most challenging of times, stroke services have responded and innovated at pace. This commitment and dedication is crucial, as GIRFT cannot succeed without the backing of clinicians, managers, and commissioners involved in delivery of great stroke care.

With the recommendations made in this report, I hope that GIRFT will provide further impetus for all those involved in the delivery of stroke services to work together, shoulder to shoulder, to continue delivering improvements for the benefit of patients.



Professor Tim Briggs CBE

GIRFT programme Chair and National Director of Clinical Improvement for the NHS

Professor Tim Briggs is Consultant Orthopaedic Surgeon at the Royal National Orthopaedic Hospital NHS Trust, where he is also Director of Strategy and External Affairs. He led the first review of orthopaedic surgery that became the pilot for the GIRFT programme, which he now chairs. Professor Briggs is also National Director of Clinical Improvement for the NHS.

Introduction from Dr David Hargroves and Dr Deb Lowe

We have been privileged to meet 122 acute stroke services across the country over the last two years through this GIRFT stroke review. During those discussions, we have seen many examples of best-in-class clinical practice, delivered by talented, hard-working and committed stroke teams. We were particularly excited to see that this good practice was evident across many stroke centres – not just the major centres in conurbations, but also in the smaller centres that perhaps do not get as much limelight as their larger cousins. In this report, we highlight as much of that good practice as space allows.

Caring for individuals who are at risk of a stroke or have had a stroke and are recovering is a multidisciplinary effort. It relies on teams working effectively in their own organisations, partnering across organisations and working together across traditional health and social care boundaries. This calls for system-wide working and strong leadership. We tried to mirror these needs during our visits. To that end, we also ran 22 STP/ICS-based network events focused on regional practice and performance, bringing together teams at all levels of leadership and across all organisations.

During our visits, we also saw the pressures that many stroke services face. These pressures come in many forms: timely and consistent access to specialist workforce; limits on physical space and capacity; access to critical supporting and diagnostic services; and links with community rehabilitation, re-enablement and voluntary sector expertise to help stroke survivors regain independence.

In preparation for our visits, we developed detailed data packs that provide evidence of the variation of practice recorded across all acutely admitting stroke units. These packs draw on a range of data sources including SSNAP (Sentinel Stroke National Audit Programme), new questions that were added by GIRFT to SSNAP's Acute Organisational Audit (AOA), Hospital Episode Statistics (HES) and the Diagnostic Imaging Dataset (DID). This data triggered the conversations on our deep-dive visits that allowed innovative solutions to develop, best practice to be shared and recommendations to follow. Although the GIRFT programme has focused on the care delivered as an in-patient, we have tried, within the limitations of the project, to take as much of a whole pathway view as possible and hope to provide further insight into the complex world of prevention, community stroke rehabilitation and life after stroke services in future reviews.

We are grateful to colleagues at both NHS England and Improvement, the Sentinel Stroke National Audit Programme (SSNAP), the British Association of Stroke Physicians (BASP), the Stroke Association and wider professional and specialty groups. They have welcomed the GIRFT stroke programme, challenged our assumptions and consistently pushed us to provide a clear narrative and evidence for our programme of work and the recommendations that follow. Influencing both local and national policy, to enable immediate improvements to services for patients, was an early ambition of the stroke GIRFT programme. It has been an iterative process, running simultaneously with our visits and at a time of great opportunity with the development of the ambitions and then publication of NHS England's Long Term Plan.¹ We have communicated our findings from the programme to policy makers throughout the three years it has been running and have been encouraged by the inclusion of some of our recommendations into national policy and society guidance already.

Leadership is critical to driving and sustaining change in a coordinated manner across local and regional services. One of our very earliest reflections from the first visits in the autumn of 2018 was the absolute need to reinstate and empower clinically-led stroke networks. We have great hope that the newly-formed Integrated Stroke Delivery Networks (ISDNs) will support and drive the transformation of stroke care in this country. We used our regional visits and data packs to encourage local leaders to use a similar methodology to GIRFT, to reduce unwarranted variation and improve outcomes for patients in their geographies. This report includes a section focused solely on the topic of leadership as we fundamentally believe it is critical that local leaders, from across the disciplines, come together to ensure ISDNs are a success, supporting the development and delivery of sustainable evidence-based stroke services. We recognise that many of the recommendations and actions in this report will ultimately rely on ISDNs and service providers for implementation. So much has been achieved already in stroke care across the country, but where gaps remain, we expect localities will prioritise recommendations for implementation, based on the opportunities for biggest impact in their own geographies, organisations and patient demographics.

This report includes many case studies to highlight good practice that stroke services can learn from. We have also made a range of recommendations, based on the findings from our visits, to support improvements in local services. These recommendations include clear steps to implementation and who should take responsibility. Together they offer a substantial opportunity for change, benefiting patients and providers.

¹ NHS England The NHS Long Term Plan, January 2019.

We recognise that a skilled workforce is critical to maintaining and improving the quality of stroke care. On our visits, we saw that teams are under pressure and we know that more needs to be done to enable and empower the workforce – both through training and through the operational models that influence day-to-day stroke work. This report includes recommendations to support the workforce, which we hope will influence change at all levels in how we train, deploy and recognise individuals and teams.

During the COVID-19 pandemic we witnessed many stroke services adopting many local and regional recommendations at great pace. We have seen remarkable resilience and innovation from the stroke profession during this most challenging of times. To capture and share these innovations we collaborated with the Oxford Academic Health Science Network to publish a series of guidance documents.² We conclude our report with a synopsis of this work, a testament to the outstanding flexibility, vision and leadership shown by colleagues up and down the country in their response to the pandemic.

This report is based on the information available at the time of the visits, but has been updated in final editing to include improvements delivered up to June 2021.



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² Professor Gary A Ford, Dr David Hargroves, Dr Deb Lowe, Dr George Harston, Dr Guy Rooney, Hannah Oatley, Jemma Lough *Adapting stroke services during the COVID-19 pandemic: an implementation guide*, May 2020 (available at <https://www.basp.org/supporting-stroke-services-during-the-covid-19-pandemic/adapting-stroke-services/>)
Professor Gary A Ford, Dr David Hargroves, Dr Deb Lowe, Dr Guy Rooney, Dr Rebecca Fisher, Hannah Oatley, Jemma Lough, *Restoration and recovery of stroke services during the COVID-19 pandemic*, July 2020 (available at <https://www.basp.org/supporting-stroke-services-during-the-covid-19-pandemic/restoration-and-recovery/>)
GIRFT, Primary Care Cardiovascular Society, Oxford AHSN, *CVD prevention during the COVID-19 pandemic: Guidance for primary care teams* (available at: https://evessio.s3.amazonaws.com/customer/8603be9c-b8c3-49ef-86d2-e4ccb958c5d1/event/f7f018f1-82a1-4349-ab30-346a2eff9bac/media/General_Content/69f8e6d9-node_CVD_during_the_COVID-19_pandemic_-_guidance_for_primary_care_-_interactive.pdf-October_2020.pdf)

Statements of support

British Association of Stroke Physicians

Thank you for caring. You must be involved in delivering or improving medical care for patients with stroke if you have opened this report and you're reading this statement of support.

In this report, David Hargroves, Deb Lowe and the GIRFT report team have distilled their meetings with 122 acute stroke services in England down to 29 recommendations. They focus on areas of greatest variation in practice, which withstood scrutiny in an extensive consultation. I now encourage healthcare professionals and service providers to use these recommendations as a manageable wish list to review, address and monitor.

Stroke networks in NHS England and other health services in the UK are resourced to organise care and reduce variation. Sources of data to identify and monitor both improvement and variation are increasingly abundant and available. The recent pandemic has demonstrated the power of rapid data collection, linkage and analysis; we can only hope that these innovations will be used as our public health priorities refocus on stroke when the pandemic subsides.

GIRFT's recommendations are wide-ranging and some will require additional investment, particularly in the stroke workforce. Both the British Association of Stroke Physicians (BASP) and the Sentinel Stroke National Audit Programme (SSNAP) have identified that we lack almost half of the person-power we need to deliver stroke care. Relying on an insufficient workforce to deliver increasingly complex stroke care even better without additional investment is unsustainable. Therefore, I welcome this report's prioritisation of growing and nurturing the workforce and its leaders. Stroke medicine requires additional investment if the UK's performance is to catch up with the performance of other comparable economies that spend more per capita on healthcare.

So, please carry on caring, improve the quality of care where you can and support the case for better investment in stroke care for patients with stroke.



Professor Rustam Al-Shahi Salman

President, BASP

BRITISH ASSOCIATION OF STROKE PHYSICIANS
ADVANCING STROKE MEDICINE
REGISTERED CHARITY NO. 1134589



Stroke Association

The GIRFT stroke programme plays a vital role in helping colleagues – from nurses and therapists to clinicians and NHS decision makers – to understand the challenges, opportunities and variation in the delivery of stroke care across England.

There is no doubt that the leadership and support GIRFT provides has helped to drive change. There are some wonderful examples of good practice, and we are blessed to have such a dedicated and committed stroke workforce. But we cannot be complacent in addressing the barriers that prevent all stroke survivors from rebuilding their lives after stroke and making the best possible recovery.

We welcome the focus on culture and leadership. We know from our experiences over the past year that improvements to stroke prevention, treatment and care can only be delivered if health, social care and third sector staff work more closely together. We need strong and collaborative leadership to deliver the joined-up pathways of care that the new Integrated Stroke Delivery Networks (ISDNs) are designed to achieve. We need a patient-focused culture that prioritises outcomes that matter to people affected by stroke and enables their genuine involvement in co-designing solutions and informing decisions. And we need high quality data across the pathway to enable services to be personalised and best practice to be shared.

The unwarranted variation that the report highlights provides a stark picture of unmet need and inequalities across the country. We need to do everything we can to ensure that all stroke survivors receive the right levels of care and support, no matter where they live or when they have their stroke. In particular, we urgently need to see improvements in post-acute care. We need community-based stroke rehabilitation to be provided to the required dose and intensity wherever there is measurable benefit. And we need to address the postcode lottery of life after stroke services and ensure that structured follow-up and emotional, practical and social support is consistently offered to everyone.

By working together to deliver evidence-based solutions, we can and will make stroke the priority it needs to be and ensure that everyone affected by stroke gets access to the rehabilitation and lifelong support that they need. At the Stroke Association, we stand ready to offer our leadership and unreserved support for this change.



Juliet Bouverie OBE

Chief executive, Stroke Association



Executive summary

This report brings together our findings and recommendations based on the evidence and data we have collated during the GIRFT stroke programme. As part of this programme, we have provided detailed data packs for every acute stroke service in England, met with 122 acute stroke services across England and held 22 STP/ICS-based network events that brought clinical, executive, commissioning and managerial teams together across multiple organisations. It has been our privilege to meet so many talented and committed stroke teams. They have shared numerous examples of good practice, many of which are shared in this report. They have engaged with the evidence-base developed for this programme—much of which was new data collected specifically to support the GIRFT process—and have committed to support quality improvement activities based on the insights from the data and individual trust reports.

During our visits, we saw first-hand the pressures that stroke services are facing. The reasons for these pressures are varied. They reveal themselves through inconsistent provision of a specialist workforce, inadequate resource and funding, sub-optimal access to diagnostic services and interventions, limits on understanding capacity and demand, and varied access to community and third sector resources to support stroke survivors on their recovery journey.

This report makes practical recommendations that will address many of these pressures. It also looks to support regional delivery of the NHS Long Term Plan for stroke by supporting many of the objectives of the national Stroke Delivery Programme and service models for the 20 new Integrated Stroke Delivery Networks (ISDNs)

Leadership and culture

Research shows that leadership and culture are important contributors to delivering high quality stroke care. It is important at all levels (e.g. individual professionals, teams, units, trusts and across networks). Culture and tone from ‘the top’ matters and are key enablers of joint working across professional and organisational boundaries. The newly-formed Integrated Stroke Delivery Networks (ISDNs) are an opportunity to strengthen system leadership.

We are recommending that ISDNs lead and engage in activities that will promote leadership and culture across their networks with a particular emphasis on promoting collaboration and addressing silo working, ensuring leadership reflects the diversity and skills required to deliver effective stroke care, assisted with a national Stroke Leadership Academy programme. We propose that each NHS England and NHS Improvement region nominates an individual with experience of stroke services and system leadership to provide direct mentorship to ISDN leaders within their region.

Integrated Stroke Delivery Networks (ISDNs)

From April 2021, ISDNs bring together providers, patient voice representatives and commissioners of stroke services from across the whole of the stroke pathway. They are responsible for overseeing delivery of optimal stroke care using pathways which are networked, from pre-hospital through to rehabilitation and life after stroke, and clearly described in the national stroke service model. The evidence on the benefits of networked configurations of stroke care is clear—independent research shows that networked stroke services deliver significant improvements in patient outcomes—they are a core enabler of the commitments outlined in the NHS Long Term Plan (LTP). One of the main functions of ISDNs is to identify, coordinate and sustain change for their local population. They have a broad remit, for example to support the development of a competency-based stroke workforce, agree and implement local models of best practice, and build data and evidence to support quality improvement.

In some areas operational delivery networks (ODNs) were already operating. In others, networked configurations of stroke services were less well developed or did not exist. There was wide variation in the effectiveness and the impact of previous strategic clinical networks.

We are recommending that ISDNs develop data dashboards to support quality improvement activities across their networks, develop practical materials to support leadership and cultural change, and publish and monitor their ambitions and regional priorities. The regional recommendations we made following the GIRFT visits provide a starting point.

Pre-hospital pathway

Time is brain. The chances of survival after stroke, and surviving with a limited impact on quality of life, increases significantly if patients get access to organised emergency stroke care quickly. However, data from the SSNAP national stroke audit suggests that it is taking longer for patients to arrive at hospital - over the last seven years, the time between symptom onset and arrival at hospital has increased by 41 minutes.

This deterioration is likely to be multifactorial—rapid access relies on early recognition of the symptoms of stroke by patients and the public, a fast response from the ambulance service, with rapid assessments by pre-hospital clinicians so that there are no delays on scene. Patients with a suspected stroke should be taken to their nearest Comprehensive Stroke Centre (CSC) or Acute Stroke Centre (ASC) and there should be minimal delay from arrival to final handover. Technology, such as tele-triage where pre-hospital clinicians on-scene can access rapid real time support from a stroke specialist, and pre-alerting so that stroke teams are prepared for arrivals, are likely to be pivotal.

We are recommending that there is a refreshed public health campaign to highlight awareness of the symptoms of stroke and the importance of acting on these signs. We also recommend that ISDNs draw up local plans to strengthen pre-hospital pathways, working with regional and national ambulance teams to model demand and capacity, including ensuring that stroke experience is included in paramedic training in line with agreed protocols.

Rapid access to appropriate imaging

Imaging is fundamental to the initial diagnosis and management of patients suspected of suffering a stroke. It helps to distinguish not only between haemorrhagic and ischaemic stroke but also assists in identifying salvageable brain tissue, providing important information that will influence treatment. Imaging needs to happen as soon as possible after the onset of symptoms.

National data shows that imaging standards are not being met (43% of patients with stroke are not being scanned within one hour of arrival at the hospital) and there is wide variation across stroke units (including examples of good practice where over 95% of patients receive a scan within one hour). Professor Sir Mike Richards, in his recent review of diagnostic services, has made a series of recommendations about the configuration of imaging resources, which we support—including separating acute and elective resources and making greater use of community-based diagnostic hubs. Technology can also help speed up the sharing and interpretation of imaging. We saw examples where artificial intelligence (AI) is being used to support image interpretation, and technology is enabling rapid image sharing.

To facilitate improvements in access to imaging, we have worked with the NHS National Imaging Board, Royal College of Radiologists and Intercollegiate Stroke Working Party to develop the National Optimal Stroke Imaging Pathway (NOSIP). The NOSIP gives a clear and consistent view of how non-elective imaging resources should be optimally deployed to provide timely access that will support clinical decision-making. While this ambitious pathway will require work to support its implementation over time, it is clear that this pathway puts the patient at the centre, will reduce duplication of imaging and ensure the right test is done first time to reduce unnecessary admissions, diagnostics and enhance rapid access to highly evidence-based recanalisation therapies i.e. thrombolysis and thrombectomy.

We are recommending that NHS England and NHS Improvement continue with post-NOSIP publication consultation and that ISDNs, in partnership with diagnostic networks, develop local plans for implementation. This includes working towards 24/7 imaging, aligning with existing NICE guidance and incorporating recommendations from Professor Sir Mike Richards' review. We are also recommending investment in infrastructure and training to support sharing of images, and a coordinated national rollout of AI-enabled tools to support image interpretation and clinical decision-making.

Hyper acute and acute inpatient stroke care

Treatment at specialised stroke units that offer rapid access to assessment, multidisciplinary expertise and intervention is associated with lower mortality and lower rates of post-hospital disability. Every patient that suffers a stroke should have access to hyper acute stroke care at either a Comprehensive Stroke Centre (CSC) or Acute Stroke Centre (ASC) within four hours of arrival at hospital.

Data shows that there is still variation in meeting this target—nationally, three out of ten units are not meeting the target and there is significant variation in the likelihood of meeting the target by day of the week and time of day. In addition, too many patients are not spending 90% of their hospital stay on a specialist stroke unit.

The inability of stroke units to consistently meet these standards is multifactorial but driven by a lack of access to ring-fenced stroke beds, and the availability of specialist staff, including consultants, stroke specialist nurses, and therapists and other skilled staff to support rehabilitation. There is large unwarranted variation in timely access to the availability of specialist staff seven days a week. This variation is evident in staff groups that support the immediate assessment and treatment of stroke, but applies equally to staff involved in activities that prevent complications of stroke and support rehabilitation. Protecting stroke resources, for example through job planning that allows stroke specialists to be available for emergency stroke assessments and care, is also variable.

Our recommendations include measures that will strengthen access to organised stroke care, including working with ISDNs to review thrombolysis and thrombectomy pathways and optimising the delivery of 24/7 sustainable evidence-based acute care. There are specific actions units can take to address delays in accessing services that reduce the complications of stroke, such as swallow screening and access to physiotherapy, occupational therapy, dietetics and speech and language assessments and interventions.

Thrombectomy

Thrombectomy is a procedure in which a catheter and retriever device is used to restore blood flow to affected brain tissue. There is strong evidence that thrombectomy significantly reduces the severity of disability caused by an ischaemic stroke. Modelling suggests that up to 10% of patients with stroke may be appropriate for treatment with thrombectomy and current levels across the NHS are low – around 2.2% of patients with stroke receive thrombectomy. The NHS Long Term Plan sets a goal of increasing access to thrombectomy, and rates have increased in recent years (from a very low base). Current provision in England sees over 50% of all thrombectomy referrals and admissions for intervention occurring in the eight hours from 10am to 6pm, in part mirroring patient presentation but it is also reflective of the reduced hours of operation in many CSCs.

Optimisation of thrombectomy pathways, including immediate access to CT angiography (CTA), along with workforce and hospital investment in capital are some of the biggest constraints to improving access to thrombectomy. Thrombectomies are usually undertaken by specialist neurosciences centres and there are 24 of these across England (23 of which currently deliver thrombectomy services), however they are not spread evenly across the country. Interventional neuro-radiologists undertake the majority of thrombectomies in the NHS and there are very few of them (75 in 2019 and 85 in 2020). It is envisaged that a minimum of 156 will be needed to staff 26 thrombectomy-capable CSCs 24/7. New centres will require significant capital investment in estates, equipment and training. Effective transfer between referring units (spokes - ASCs) and thrombectomy centres (hubs - CSCs) also relies on effective pathway protocols and rapid sharing of images to aid diagnosis and assessment, and rapid secondary conveyance from ambulances services.

We are recommending measures to improve access to and time to thrombectomy intervention. During the GIRFT programme, we recommended establishing a Thrombectomy Implementation Group (TIG). The TIG is now in place and will coordinate a national response to shortfalls in implementation and delivery. We are also supporting existing programmes to finalise GMC credentialing, which will allow non-interventional radiologists to train and be supported to deliver thrombectomy.

Stroke prevention and TIA management

Over 80% of strokes are preventable or their onset may be delayed. The risk factors for stroke are similar to other cardiovascular diseases (CVD) and many are modifiable through behaviour and lifestyle change, or through medical management of conditions in primary care. Health inequalities exist in both the adverse behaviours associated with cardiovascular disease and access to identification and intervention. Prevention is at the heart of the NHS LTP, but we know from published data that there is wide variation across the country in the prevalence of risk factors for stroke and in how those risks are managed (e.g. the management of hypertension and atrial fibrillation in primary care). Brain and heart vascular health is everyone's responsibility.

General practitioners have access to a range of datasets and tools to support primary prevention of stroke, but we saw wide variation in how data was being used to evidence, target and monitor primary prevention activities. Prevention of recurrence of stroke relies on management of the same risk factors but with even greater urgency; there are additional investigations that should be used to support secondary prevention, such as prolonged cardiac monitoring and access to specialist support to assist in patient medication adherence. Again, the data shows wide variation in the delivery of these secondary interventions.

Transient ischaemic attack (TIA) is an important part of stroke prevention - TIAs are frequently a precursor to a stroke. We found that TIAs are often not given the priority review they require and access to imaging to investigate TIAs is variable with established NICE guidance often not followed. In some areas, TIA clinics have become a victim of their own success, with a huge increase in referrals over the years, but a static number of TIAs diagnosed – the majority of referrals culminate with a non-cerebrovascular diagnosis. We have developed a TIA triaging pathway to standardise the care that patients with a suspected TIA should receive. This will correctly identify the urgency of review and reduce the burden on stroke teams to see and investigate the many patients referred with non-neurovascular acute neurological conditions. Closer working with other specialties delivering rapid access clinics e.g. acute neurology clinics, transient loss of consciousness clinics, ophthalmology and first fit clinics, will be paramount to ensure that patients currently referred into TIA services can be expertly triaged and seen by the most appropriate specialist in an outpatient setting without delay.

We are recommending that ISDNs, working with local ICSs, CVD-R boards, primary care networks and other relevant bodies, engage in a coordinated approach to brain and heart vascular health prevention. This must be consistent with local and national priorities, driven by evidence (e.g. a stroke prevention dashboard) that is monitored on a quarterly basis and supports CVDPREVENT, RightCare and the new DES (Directed Enhanced Services) scheme. ISDNs should also oversee and support the implementation of pathways for secondary prevention in their localities. We are asking NHSX and NICE to support ISDNs to develop local plans that ensure adherence to NICE TIA guidance, including examining how technology can enable rapid access to diagnostics (e.g. remote and wearable devices).

Workforce

The stroke workforce is required to provide a comprehensive and integrated service, encompassing prevention, stroke management, rehabilitation and life after stroke support. This workforce must also address the challenges of long-term re-enablement, helping stroke survivors manage the impacts of their stroke. In addition to a trained clinical and multidisciplinary workforce, stroke care relies heavily on the informal workforce of relatives, carers and third sector groups to provide support to survivors of stroke. It must also acknowledge the importance of a capability-based workforce by ensuring everyone involved in the stroke pathway has opportunities to self-assess their own knowledge and competencies and have access to structured pathways for upskilling and role diversification.

There is currently a 40% vacancy rate in consultant stroke physicians in England. If the immediate deficits are to be successfully mitigated, closer working with colleagues in neurology, geriatric and acute medicine will be needed, building upon their shared skill set and expertise. The new shape of training for neurology offers a prime opportunity for an expanded workforce across the acute neurology and stroke pathway.

The NHS LTP recognises the need to build staff numbers and skill mix necessary to support stroke pathways. Whilst initiatives such as the Stroke-Specific Education Framework (SSEF) have helped to benchmark competencies and skills of the stroke workforce, the NHS has not met previous ambitions to deliver quality-assured and transferable training programmes for stroke, linked to professional roles and career pathways. Technological innovations may help to address some shortcomings in staffing levels and training opportunities in the stroke workforce, but these will only go a short way to address some of the current challenges.

We are recommending that the SSEF and STAR Framework are continually developed and used. This will require support from Health Education England to ensure that it supports structured training, recruitment and career development. We also support ongoing reforms to workforce education and training, including extended and advanced roles, and updating the curriculum for entry into stroke medicine. Stroke medicine placements should feature in undergraduate nursing, medical and therapy training programmes to ensure exposure and experience of the specialty. Services must assess how new technologies can be adopted to support the delivery of a high-quality service and release more time for care. Capacity and demand modelling is needed so that stroke services can calculate bed, and consequent workforce, requirements.

Rehabilitation and life after stroke

There is strong evidence that a coordinated multidisciplinary approach to rehabilitation of stroke survivors results in a reduction in death, institutionalisation, and dependency. Guidance from both the Royal College of Physicians and NICE emphasises the importance of both inpatient and community stroke-specific, needs-based rehabilitation that is not time limited. Life after stroke support is also an essential component of ongoing care, enabling a return to usual activity and functioning after a stroke.

Across England, there is inequity in the provision of stroke rehabilitation and life after stroke services. Research from the Stroke Association refers to a sense of abandonment, reporting that 45% of stroke survivors feel abandoned when they leave hospital. Data and evidence from our visits suggest that patients with stroke are not receiving the recommended level of in-hospital rehabilitation and that many stroke survivors do not get access to needs-based community rehabilitation when they need it. Access to Early Supported Discharge programmes is improving, but is still variable and often limited to five days a week. Many patients do not have a review documented at the recommended intervals to assess whether their support is appropriate for their needs.

We are recommending that stroke services ensure there is daily MDT and that discharge planning is integrated with social care and involves the patient and relatives. ISDNs must ensure there is a seven-day accessible Integrated Community Stroke Service (ICSS) to support discharge and community-based rehabilitation for all that may benefit. ISDNs should work to optimise lifelong recovery following stroke and review current Life After Stroke (LAS) pathways, including access to neuropsychology, vocational rehabilitation, voluntary sector support and appropriate patient-directed follow-up.

Audit and review

We made significant use of data to develop our evidence base, support our visits and make recommendations about service improvement. During our visits, we observed wide variation in the data that was available to services and how it was used to inform decision-making and track improvement. Sometimes doubts were expressed about the validity, accuracy and depth of the data. These doubts risk becoming an excuse to delay change or search for counterevidence. We strongly recommend that trusts focus attention on improving data entry and quality assurance, with regular meetings between stroke and coding teams to facilitate timely review and improve data quality. There are gaps in existing datasets, and often data is not granular enough or linked in a way that makes it possible to identify the root-cause or drivers of poor performance. In addition, most data is organisation-based, but should move to a more a patient level and then network view, delivered across organisational boundaries.

We are also aware that there is no routinely collected patient reported outcomes or experience measures that stroke services can use to assess the impact of their care. Pilot work is beginning to address this.

We are recommending that the Sentinel Stroke National Audit Programme (SSNAP), working with partners, reviews the data it collects to ensure that the information it provides to services is high quality and actionable, and that assurance processes are strengthened. We are also proposing a review of how SSNAP data links with other relevant audits and registries, and we advocate the routine collection of patient outcome and experience measures so that units improve their understanding of their impact on outcomes.

Recovering and learning from the COVID-19 pandemic

Many stroke services have made changes to the way that their teams work in response to the COVID-19 pandemic, demonstrating the ability of teams to adapt and change rapidly. These changes include using digital solutions and exploring the use of new pathways and technologies. Whilst many of these new interventions will require further evaluation, it is important that services do not slip back after the pandemic and hold on to inefficient ways of working. Examples include greater use of telemedicine, such as tele-stroke networks bringing physicians across trusts together and remote decision-making within trusts, making greater use of virtual consultations to triage and then assess patients with TIAs and virtual rehabilitation as appropriate.

We also recognise that the COVID-19 pandemic has been a time of unprecedented stress and pressure for NHS staff. A priority for all stroke services must be supporting staff wellbeing and recognising the emotional and psychological effects of the pandemic on the workforce, whilst returning to sustainable ways of working.

The impact on brain and heart vascular (CVD) health cannot be under-estimated. There will need to be a concerted effort to ensure that the half a million fewer people issued with prescriptions over the pandemic for blood pressure treatment, are not lost to follow-up and put at risk of future stroke or cardiac disease.³ Risk stratification, prioritisation frameworks and 'working differently' to ensure self-management and delivery of alternative models of prevention will be essential.

³ <https://www.bhf.org.uk/what-we-do/news-from-the-bhf/news-archive/2021/march/government-action-to-avoid-12000-heart-stroke-deaths>, accessed March 2021

Summary of recommendations

Recommendations to grow and sustain leadership in stroke services

Recommendation	Actions	Owners	Timescale
<p>1. ISDNs to ensure that they lead and engage in activities to promote leadership and culture across their networks, with a particular focus on:</p> <ul style="list-style-type: none"> the importance of culture and leadership in successful stroke teams; addressing systemic biases in the current leadership of stroke teams, actively promoting both medical and non-medical leadership; emphasising the multidisciplinary nature of high quality stroke care and diversity of leadership; promoting collaboration across the stroke pathway, including diagnostics, rehabilitation, and working with the third sector; and development and implementation of a 'Stroke Leadership Academy'. 	<p>a Develop national programme and offer that can be adopted locally to support leadership development in ISDNs.</p>	NHSE&I/GIRFT programme	Within 12 months of publication
	<p>b Ensure each NHS region has a nominated individual who is experienced in stroke leadership and with mentoring skills, to support clinical leads within ISDNs.</p>	NHSE&I Regional Medical Directorates (RMDs)	Within six months of publication
	<p>c ISDNs to ensure protected time for leadership activities, specifically focused on strengthening leadership and culture at network, trust and team level.</p>	ISDNs (with support from NHSE RMDs)	Within six months of publication
	<p>d ISDNs to use funding provided for network activities to support these leadership activities.</p>	ISDNs (with support from NHSE RMDs)	Within six months of publication
	<p>e Review, twice yearly, progress on leadership and culture objectives, based on domains outlined by the CQC and in the NHS People promise. This should be done at network level, and ISDNs should encourage organisations and teams to engage.</p>	ISDNs (with support from NHSE RMDs)	Within 12 months of publication
	<p>f Deliver resilience training, action learning sets, NHS policy and change management skills leading to 'learning cohorts' fostering shared development across the ISDNs.</p>	NHSE&I/GIRFT programme	Within 12 months of publication

Recommendations to support the implementation of ISDNs and adoption of best practice across localities

Recommendation	Actions	Owners	Timescale
2. Review regional guidance produced from GIRFT visits, implementing recommendations to ensure local services meet NICE 2019 and RCP 2016 guidance.	a ISDNs and providers to continue to review recommendations from their visits and agree local implementation.	ISDNs, supported by NHSE&I regional implementation teams	Within 12 months of publication
3. All regions will have fully functioning stroke networks (ISDNs) by April 2021 and must focus on establishing operational and governance best practice.	a ISDNs to have fully operational leadership and management teams, with clear governance and reporting structures in place.	ISDNs, overseen by NHSE Regional Medical Directorates	Within 12 months of publication
	b Develop materials on leadership and cultural change that localities can use to enable change.	NHSE&I/GIRFT programme	Within 12 months of publication
	c Define a minimum set of data and support development of key performance indicator (KPI) data dashboards to support quality improvement across networks. Support integration of patient reported outcomes and experience (PROMS and PREMS).	NHSE&I National Stroke Programme to coordinate	Within 18 months (acute-focused dashboard available within six months)
	d ISDNs to develop and implement local data dashboards to inform and track local improvement activities. Dashboards to include the national KPIs (previous action), tailored with metrics to reflect local priorities.	ISDNs	Within 12 months of publication
	e Publish a concise statement of intent / ambitions for priorities of each ISDN (must include thrombectomy, access to needs-related not time-related community stroke rehabilitation, stroke prevention and address health inequalities) with trajectories for improvement using percentage change from baseline as a barometer of success.	ISDNs, overseen by NHSE Regional Medical Directorates (RMDs)	Within six months of publication
	f Review progress on the ambitions annually. These reviews should be used to identify support that can be targeted at local systems to support change.	ISDNs	Within 12 months of publication
	g Nominate and fund one individual per year to attend a stroke leadership academy.	ISDNs	Within 12 months of publication
	h Implement inpatient and home bed day calculators to inform systems of workforce requirements.	NHSE Regional Medical Directorates with ISDNs	Within 12 months of publication
	i Review service optimisation needs of regions and secure capital funding for delivery of infrastructure changes.	NHSE Regional Medical Directorates	Within 12 months of publication

Recommendations to support improvements to the pre-hospital stroke pathway

Recommendation	Actions	Owners	Timescale
<p>4. ISDNs to draw up local emergency plans, informed by the data, to reduce symptom onset-to-door times. Work with regional and national ambulance teams to produce a 5% annual reduction from baseline and improve sensitivity and specificity of pre-hospital assessments.</p>	<p>a Train all ambulance crews in stroke recognition and ensure they are educated in the use of validated tools (e.g. FAST).</p>	Regional Ambulance Services	Within two years of publication
	<p>b Document and describe the case for rapid deployment of validated pre-hospital decision support aids, both digital tele-triage and physiological, and agree a timeline for implementation. Support the implementation of pre-hospital video triage for people with a suspected stroke in a selection of pilot areas. Share lessons learned with other areas and other clinical specialties to support implementation across the whole NHS in the long-term.</p>	GIRFT/NHSE&I National Stroke Programme, UEC Programme and ambulance trusts	Within 12 months of publication
	<p>c Review categorisation of 999 calls for patients with stroke symptoms. Determine the impact of extension of the recategorisation of stroke calls within each region to inform future categorisation changes.</p>	NHSE&I UEC Programme	Within 24 months of publication
	<p>d Approach royal colleges and HEE to agree upon content of training modules to support pre-hospital practitioners.</p>	NHSE&I/GIRFT programme	Within 12 months of publication
	<p>e Embed stroke competencies in paramedic training so staff can prepare patients appropriately for admission to hyper-acute stroke services according to agreed protocols.</p>	College of Paramedics	Within 12 months of publication
	<p>f Provide communication training to pre-hospital clinicians to help ambulance services manage patients with aphasia.</p>	College of Paramedics	Within two years of publication
	<p>g Provide ongoing stroke-specific training to pre-hospital clinicians as part of continuous professional development.</p>	HEE and College of Paramedics	Within 12 months of publication
	<p>h Establish a method to ensure that new evidence and guidance related to stroke care gets into front-line ambulance trust practice.</p>	NASMeD with Regional Ambulance Services	Within 12 months of publication
	<p>i Participate in local Stroke Research Network trials and studies.</p>	Regional Ambulance Services	Within six months of publication

Recommendations to ensure rapid access to imaging

Recommendation	Actions	Owners	Timescale
5. Implement the National Optimal Stroke Imaging Pathway, including: <ul style="list-style-type: none"> working towards 24/7 access to imaging aligning with NICE guidance for TIA reducing unwarranted variation in poor access to MRI improving brain imaging within one hour of arrival for all patients with stroke reducing duplication of MRI and CT within 24 hours of arrival; ensuring 24/7 access to CT angiogram and CT perfusion; and incorporating guidance from Sir Mike Richards' diagnostic imaging review. 	a Develop detailed implementation plans for delivering the NOSIP, with support from relevant stakeholders (including Royal College of Radiologists and Society of Radiographers).	NHSE&I National Stroke Programme	Within 12 months of publication
	b ISDNs to work with Imaging Networks to perform a gap analysis of current imaging practice against NOSIP, agree a local plan and actively monitor progress towards implementation.	ISDNs	Within 12 months of publication
	c Consider community diagnostic centres for the delivery of TIA imaging.	ISDNs	Within 12 months of publication
	d Review the workforce requirements of all radiology services to ensure their establishment is correct. All services should maximise recruitment and retention and all staff should be supported to work to the top of their licence (Recommendation 4 of GIRFT's radiology report https://www.gettingitrightfirsttime.co.uk/wp-content/uploads/2020/11/GIRFT-radiology-report.pdf).	GIRFT, HEE, NHSE&I, RCR, SoR and individual trusts (as per recommendation 4 of GIRFT's radiology report)	For progress within six months of publication (18 months for trusts to include dedicated CPD time in job planning)
6. Provide infrastructure, training and technology to share images between hospitals and clinicians to support image interpretation (see also Recommendation 9 from GIRFT's Radiology National Specialty Report - All trusts must meet the RCR standards for the use of IT).	a Support ICSs, ISDNs and trusts to ensure rapid inter-hospital sharing of imaging is available.	Diagnostic Networks, NHSX and NHS Digital	Within 12 months of publication
	b Develop training to support stroke clinicians to interpret imaging, leveraging Imaging Network subspecialist expertise and opinion. Encourage and promote the delivery of stroke-specific training workshops, reporting into the Thrombectomy Implementation Group (TIG) for oversight purposes	ICSs, ISDNs, and provider organisations	Within 12 months of publication
	c Increase regional availability of AI decision-support tools and training.	NHSE&I National Stroke Programme	Within 12 months of publication
	d Provide national support for regional roll-out of AI working closely with ISDN footprints.	NHSE&I National Stroke Programme	Within 12 months of publication

Recommendations to support the delivery of hyper acute and acute inpatient stroke care

Recommendation	Actions	Owners	Timescale
7. Services to adopt the new nomenclature for acute stroke services.	a Adopt nomenclature, ensuring communication of changes and uniform use.	NHSE&I National Stroke Programme, ISDNs and providers	Within six months of publication
8. Consider an accreditation system for stroke services.	a Review the need for and benefit of an accreditation system for all stroke services. This would build on previous examples (e.g. Angels, Royal College of Radiology's Quality Standard for Imaging (QSI)) and include community and rehabilitation care.	ICSWP with all interested parties, e.g. BASP, RCP, UKNG and third sector providers	Within 18 months of publication
9. Reduce door to intervention times for all stroke subtypes.	a Support the development and implementation of a set of critical-time standards for acute stroke care.	NHSE&I National Stroke Programme and UEC Programme	Within six months of publication
	b Complete a review of the time-critical interventions of thrombolysis, thrombectomy, primary intracerebral haemorrhage. Produce a detailed service improvement plan and monitor progress.	ISDNs, with support from NHSE&I	Within 12 months of publication
	c Deliver carotid endarterectomy within the specified time frame.	Vascular Hubs	For immediate action
10. Ensure access to highly specialised stroke units for patients with stroke in <4 hours and for >90% of their stay.	a Improve awareness of the benefits of organised stroke care to executive and bed management teams to ensure rapid access to and maintenance of stroke units.	NHSE&I Regional Medical Directorates and provider organisations	Immediate
	b Reduce use of stroke unit beds by general medical patients – reclassify beds and reallocate staff where necessary.	Provider organisations	Within 12 months of publication
11. Ensure equitable and timely access to services that reduce the risk of complications following stroke, including: <ul style="list-style-type: none"> • reduce time to swallow screen, with or without speech and language team (SLT) assessment, and review relationship with the use of antibiotics in the first seven days; • deliver definitive feeding solutions for those patients with prolonged dysphagia; • avoid health inequity in access to multidisciplinary care across the days of the week; • reduce falls risk and subsequent harm from falls; and • implement stroke-specific VTE assessment and ensure treatment / intervention. 	a Investigate variation and improve timely access to initial swallow screen and speech and language therapy assessments and interventions.	Provider organisations with guidance from RCSLT and British Dietetic Association	Within 18 months of publication
	b Ensure all patients are cared for on units with a designated antimicrobial stewardship lead.	Provider organisations	Within six months of publication
	c Ensure percutaneous endoscopic gastrostomy (PEG) tube insertion happens within 72 hours of referral. Those units at the extremes of PEG tube insertion timing should ensure all activity is accurately coded and explore their variation in use.	Provider organisations with support from ASPEN, BAPEN and BDA	Within six months of publication
	d Improve time from referral to placement of definitive feeding solution.	Provider organisations with support from ASPEN, BAPEN and BDA	Within six months of publication
	e Offer 7/7 access for all patients to the stroke MDT using a capability-based workforce model to enable the delivery of physiotherapy, occupational therapy, dietetics and SLT assessments and interventions.	ICS/STP commissioners working with ISDNs and provider organisations	Within 18 months of publication

Recommendations to support the delivery of hyper acute and acute inpatient stroke care (continued)

Recommendation	Actions	Owners	Timescale
11. (Continued)	f Develop stroke-specific advice within current patient falls prevention programmes.	NHSE&I National Stroke Programme	Within 12 months of publication
	g Review rates of falls and fractured neck of femur.	Provider organisations (acute and community), with oversight from ISDNs	Within 12 months of publication
	h Embed a patient and stroke specific falls prevention programme consistent with NICE guidance and which transfers with the patient, following their recovery journey to home or a community setting.	Provider organisations (acute and community), with oversight from ISDNs	Within 12 months of publication
	i Embed an osteopenia prophylaxis pathway.	Provider organisations (acute and community), with oversight from ISDNs	Within 12 months of publication
	j Adhere to guidance on venous thromboembolism (VTE) assessment and treatment.	Provider organisations	For immediate action

Recommendations to improve access to thrombectomy

Recommendation	Actions	Owners	Timescale
12. Improve access to and time to thrombectomy intervention. Aiming for 8% of all patients with stroke accessing thrombectomy by 2025.	a Develop the Thrombectomy Implementation Group (TIG) further to coordinate the national response, working closely with stakeholders.	NHSE&I National Stroke Programme and NHS Specialised Commissioning	Ongoing
	b Develop clear plans with implementation milestones and use data to monitor process and outcomes, reporting into the Thrombectomy Implementation Group (TIG) for oversight purposes.	ISDNs and regional medical directorates	Within six months of publication
	c Implement hub and spoke pathways within ISDNs to deliver thrombectomy, to deliver sustainable 24/7 access for the residents of each ISDN. This should involve specialised commissioning, the regional medical directors and all current referrers and providers.	ISDNs and communities of practice	Within 12 months of publication
	d Revise, pilot and implement new SSNAP metrics of process of care for thrombectomy, linking with specialised commissioning dashboards.	ISDNs	Within six months of publication
	e Implement imaging software (AI/decision-support tools) to rapidly identify patients that would benefit from thrombectomy.	ISDNs	Within 12 months of publication

Recommendations to strengthen primary and secondary prevention of stroke

Recommendation	Actions	Owners	Timescale
13. Conduct clear assessment of the health inequalities specific to geographical regions and groups.	a Undertake comprehensive review of the reversible risk factors of stroke in specific ISDNs appreciating underserved groups and social economic factors. Including but not exclusive to smoking, diet, alcohol and drug consumption, exercise levels, educational attainment, housing, employment, language barriers, hypertension, hypercholesterolaemia and atrial fibrillation.	ISDNs, CVD-R Boards and Local Authorities	Within 12 months of publication
14. ISDNs, working with ICSs and PCNs, to engage in a coordinated approach to CVD prevention.	a NHSE&I to coordinate the design and content of a CVD prevention data dashboard to support ISDNs with local prevention strategies.	NHSE&I National CVD Prevention Programme in partnership with Office for Health of Improvement and Disparities	Within 12 months of publication
	b ISDNs to engage with all stakeholders (local authorities, public health, patient groups) to agree an overall strategy for CVD prevention. The strategy should be linked to Regional CVD-R board priorities and the Long Term Plan CVD prevention priorities, using agreed data extracts from Public Health England's National Cardiovascular Intelligence Network and the new CVDPREVENT audit to understand performance, identify opportunities and track progress.	ISDNs, CVD-R Boards, ICSs and Local Authorities	Within 12 months of publication
	c Ensure every ISDN has access to the CVDPrevent audit and to RightCare tools for improving stroke prevention.	NHSE&I National CVD Prevention Programme and regional medical directorates	Within 12 months of publication
	d Publicise the 'every contact counts' message for improved brain and heart vascular health.	All health care and third sector providers that come into contact with patients	Within six months of publication
15. ISDNs to oversee and support the implementation of pathways for secondary prevention including cryptogenic stroke and TIA management.	a Ensure each ISDN has clear protocols in place for blood pressure lowering, lipid management and anticoagulation therapy for at risk populations.	ISDNs, PCNs and provider organisations, and Regional CVD-R Boards	Within six months of publication
	b Develop a clinical consensus pathway for secondary stroke prevention and investigation of cryptogenic stroke (including review of European Society of Cardiology recommendations) and recommend how best to embed in provider organisations. This must include rapid access to carotid endarterectomy.	GIRFT, ICSWP, NHSE&I	Within six months of publication
	c ISDNs to adopt and adapt ESO recommendations, with support from the ICSWP.	ISDNs and provider organisations	Within six months of publication
	d Each ISDN to ensure that all acute stroke providers have formal cryptogenic stroke regional MDT meetings where individual patients are discussed and referred for complex interventions, including but not exclusive to carotid endarterectomy, PFO closure and left atrial appendage occlusion. These meetings should have all relevant experts in attendance, including those who undertake the procedures.	ISDNs and acute stroke providers	Within six months of publication
	e Commission and deliver 6-week, 6-month and 12-month post-discharge reviews. Providers to coordinate data collection to monitor delivery of post-discharge follow-up and include adherence to secondary prevention.	Commissioners and providers of 6-week, 6-month and 12-month reviews	Within 12 months of publication
	f Partnership working with the CVD prevention programme to assess and evaluate remote, wearable devices and access to implantable devices and understand feasibility of national procurement framework.	NHSE&I National CVD Prevention and Stroke Programme	Within 18 months of publication

Recommendations to strengthen primary and secondary prevention of stroke (continued)

Recommendation	Actions	Owners	Timescale
<p>16. ISDNs to work with their local systems and ensure adherence to NICE guidance for TIA. Patients with suspected TIA must be assessed seven days a week with remote triage to prioritise assessment within 24 hours. Assessment must include appropriate investigations including brain imaging, carotid vessel imaging (where appropriate) and rhythm check to exclude atrial fibrillation.</p>	<p>a Review stroke services and ensure access to 7-day TIA assessment. This should begin with a gap analysis covering pathway elements including senior clinical triage, same day imaging and initiation of appropriate secondary prevention within 24 hours.</p>	ISDNs and provider organisations	Within six months of publication
	<p>b Provide access to alternative specialist rapid-access clinics e.g. acute neurology, transient loss of consciousness clinics, falls and first fit clinics.</p>	Acute providers	Within 18 months of publication
	<p>c Each ISDN to have an agreed a pathway of care to support provider delivery.</p>	ISDNs working with Imaging Networks	Within six months of publication
	<p>d Work towards 7-day MRI access and discontinue inappropriate CT scanning for TIA.</p>	Provider organisations	Within 18 months of publication
	<p>e Establish capacity to review TIA patients at recommended intervals (current RCP guidance is at four weeks).</p>	Provider organisations	Within six months of publication

Recommendations to support the stroke workforce

Recommendation	Actions	Owners	Timescale
<p>17. Increase awareness of and delivery of the NHS People Plan – Our NHS People Promise. Use ISDN leadership and governance structures and the Stroke Specific Educational Framework (SSEF) to support the delivery a regional ‘Stroke People Plan’ to meet the needs of the stroke workforce and improve staff experience and retention.</p>	<p>a ISDNs to work with local services to identify the key actions required to deliver the NHS People Plan, specifically within stroke services.</p>	ISDNs and provider organisations	Within six months of publication
	<p>b Develop a plan in each ISDN to deliver a compassionate, inclusive, and collaborative leadership culture within and across ISDN networks.</p>	ISDNs, supported by NHSE&I regional medical directorate teams	Within 18 months of publication
	<p>c Further develop the Stroke Specific Educational Framework (SSEF) with support from HEE, and working with relevant specialist societies, to ensure it is fit for purpose as a tool to support capability assessment, role development and structured training and career development for both the registered and non-registered workforce.</p>	HEE	Within 12 months of publication
	<p>d Support and enable workforce redesign through better use of clinical and non-clinical roles, including extended and advanced roles e.g. Advanced Clinical Practice (ACP) roles, and encouraging usage of the SSEF.</p>	BASP, GIRFT/NHSE&I, HEE, GMC, RCN and relevant professional bodies (including societies and royal colleges)	Within 18 months of publication
	<p>e Ensure delivery of updated curriculum for medical specialty training in stroke medicine and its integration into the new shape of training for neurology.</p>	HEE	Within six months of publication
	<p>f Promote the <i>BASP Meeting the Future Consultant Workforce Challenges</i> paper and support the consultant job planning calculator.</p>	ISDNs	Within six months of publication

Recommendations to support the stroke workforce (continued)

Recommendation	Actions	Owners	Timescale
18. Transform delivery of care and efficiency of workforce by incorporation of digital technology.	a Review the impact of virtual working, rapid adoption of technology and digital exclusion on the workforce to establish good practice. Formally evaluate and support local adoption.	HEE supported by NHSE&I NHSX and AHSNs	Within 18 months of publication
	b Implement digital technology at local level, based on formal evaluation.	ISDNs	Within two years of publication
19. ISDNs and local providers to use NHS England and NHS Improvement's stroke bed calculator to plan bed capacity requirements in a consistent and evidence-based way.	a Calculate stroke service bed requirements, reflecting both patients in hospital and those requiring community rehabilitation support at home, to inform workforce planning and funding models.	ISDNs and providers	Within 12 months of publication
20. Deliver a sustainable workforce for thrombectomy.	a Thrombectomy Implementation Group (TIG) to develop options to inform an overall thrombectomy workforce strategy, in partnership with the relevant professional bodies.	NHSE&I National Stroke Programme and HEE	Within 9-12 months of publication
	b Support for GMC credentialing for non-interventional neuro-radiologists to deliver thrombectomy.	GMC with support from NHSE&I Thrombectomy Implementation Group	Within 12 months of publication
	c Develop national thrombectomy training academies and community of practice reporting into the Thrombectomy Implementation Group (TIG) for oversight purposes.	HEE	Within 12 months of publication
	d Ensure adequate availability of staff across the thrombectomy pathway.	ISDNs	Within 12 months of publication
21. Further develop the SSEF with a focus on the post-acute pathway, including life after stroke, psychological models of care, voluntary sector workforce and end of life care.	a Develop a consensus on the principles of a Life After Stroke care pathway.	NHSE&I National Stroke Programme and the Stroke Association, working with other voluntary sector groups	Within 12 months of publication
	b Review training requirements for current and anticipated future workforce including non-registered workers.	ISDNs and provider organisations	Within 12 months of publication
	c Review workforce requirements across post-acute stroke pathway.	ISDNs	Within 12 months of publication
	d Deliver a continuous learning framework to support extended and advanced roles.	HEE with relevant professional bodies	Ongoing

Recommendations to support rehabilitation and life after stroke services

Recommendation	Actions	Owners	Timescale
22. Ensure daily MDT patient goal setting (including social care support to facilitate discharge planning). Stroke survivors and those that support them must be involved in goal-setting and discharge planning discussions.	a Ensure all stroke services have structured daily MDT board rounds.	Provider organisations	Within six months of publication
	b Consider domiciliary care as part of early supported discharge (ESD) and integrated community stroke services.	Provider organisations	Within 12 months of publication
	c Consider virtual MDTs between acute, community and social care teams to support discharge planning and ongoing support.	Provider organisations	Within 12 months of publication
23. All ISDNs should ensure commissioning of a needs-based 7-day accessible Integrated Community Stroke Service, appropriately staffed with stroke specialist practitioners. This ICSS should incorporate traditional elements of early supported discharge (ESD) with more generic community-based rehabilitation for the latter stages of the stroke recovery journey. Stroke rehabilitation should be accessible to all that may benefit, this should include nursing home residents and those with severe disabling stroke cared for in their own homes.	a Discuss with commissioners, as a matter of urgency, the establishment of needs-based 7-day access to early supported discharge and community stroke rehabilitation teams, where services do not already have this in place. Use the NHSE&I National Stroke Service Model (NSSM) and ICS level commissioning to ensure equitable delivery of services for stroke survivors. Commissioners should be encouraged to agree equitable provision and ensure this activity is documented within the SSNAP national audit tool as a prerequisite for funding.	Commissioners with support from ISDNs	Within two years of publication
	b Review payment and funding mechanisms for community pathways (e.g. home bed day calculations, tariff redesign and cost based principle models).	NHSE&I National Stroke Programme	Within 12 months of publication
	c Review current neuro-rehabilitation commissioning within each ISDN footprint to attempt to understand where there may be opportunities to co-commission these pathways.	ISDNs working with local and specialised commissioners	Within 12 months of publication
	d Use the recommended ICSS national staffing structure, i.e. WTE/100 patients per year, when calculating staffing requirements.	ISDNs	Within two years of publication
24. ISDNs should work with stroke teams to review current provision of Life after Stroke pathways. This should include access to psychological care, voluntary sector support and appropriate patient directed follow-up.	a Review current models of service delivery across providers and consider ISDN footprint commissioning with single lead commissioner and service specification.	ISDNs and provider organisations	Within 12 months of publication
	b Support the delivery of the principles of the Life After Stroke care pathway.	NHSE&I National Stroke Programme and Stroke Association	Within 12 months of publication
	c Consider a 'blended' approach to service delivery with a mixture of face to face, telephone/video call, voluntary-led and peer-to-peer support groups.	ISDNs, provider organisations and voluntary sector organisations	Within 12 months of publication
	d Review delivery models of psychological care post-stroke and work with ISDNs to improve access.	Led by NHSE&I National Stroke Programme and ISDNs	Within 12 months of publication
	e Introduce <i>my stroke</i> record - a stroke patient passport (personal stroke information) system, initially in paper format, moving to electronic, to facilitate education, self-directed care, and follow-up.	Stroke Association, NHSE&I Personalised Care team	Within 12-18 months of publication

Recommendations to strengthen audit and review

Recommendation	Actions	Owners	Timescale
<p>25. Review stroke data collection, data fields and links to other registries, reflecting feedback from acute and community teams. This will ensure units continue to receive high-quality and actionable insights from the national audit. This must include more real-time reporting and an ability for local ISDNs to interrogate data and produce their own bespoke reports based on their own priorities and challenges.</p>	<p>a Review questions within the SSNAP dataset to reflect changes in care delivery pathways e.g. thrombectomy patient flows and metrics, delivery of virtual models of care and rehabilitation pathways.</p>	SSNAP, HQIP and NHSE&I National Stroke Programme	Within six months of publication
	<p>b Continue the commissioning of national audit including formal review of contract and prioritisation of work plan.</p>	HQIP	Ongoing
	<p>c Ensure the longevity and sustainability of a national stroke audit that links with other registries so that data is collected only once, is linked and accessible.</p>	HQIP and NHSE&I	Ongoing
	<p>d Define a minimum set of data and support development of key performance indicator (KPI) data dashboards to support quality improvement across networks.</p>	NHSE&I National Stroke Programme in partnership with the national stroke audit provider	Within 18 months (acute-focused dashboard available within six months)
	<p>e Enable real time linkage of SSNAP data to increase timeliness of mortality data reports.</p>	SSNAP, HQIP and NHSE&I National Stroke Programme	Within 12 months of publication
	<p>f ISDNs to work with local units to ensure completion of data entry from all providers across the stroke pathway.</p>	ISDNs and providers (community and secondary care)	Ongoing
<p>26. Formalise the ISDN assurance process for quality of SSNAP data entry and performance. There should be regular meetings between clinical and coding teams to ensure alignment with HES data and SSNAP.</p>	<p>a Establish quarterly independent verification of SSNAP attainment score via independent assessors.</p>	ISDNs and provider organisations	Within six months of publication
	<p>b Stroke teams and coding teams to engage in continuous review of the coding of patients with stroke in HES and SSNAP. This will ensure that data is accurate and comparable. Data must be available to teams in a timely to allow for case review and improvement actions.</p>	Provider organisations	For immediate action
<p>27. Use PROMs and PREMs collection to understand the impact and outcomes of enhanced rehabilitation and life after stroke services.</p>	<p>a Develop a national PREMs questionnaire with supported analysis and reporting at provider, ISDN, regional and national level.</p>	NHSE&I National Stroke Programme in partnership with the national stroke audit provider and the Stroke Association	Within 18 months of publication
	<p>b Integrate PROMs questions within national audit and introduce into national data set within SSNAP after initial testing in rehabilitation pilots.</p>	NHSE&I, SSNAP implemented via ISDNs and provider organisations	Within 18 months of publication

Recommendations to reduce incidents that lead to litigation

Recommendation	Actions	Owners	Timescale
<p>28.Reduce litigation costs by application of the GIRFT Programme's five-point plan.</p> <p>Although claims relating to stroke have not been directly identified in the GIRFT litigation data pack as a separate specialty, trusts can ensure they learn from claims relating to stroke by following the five-point plan for all claims listed for both medical and surgical specialties, as a proportion of these relate to patients with stroke.</p>	<p>a Clinicians and trust management to assess their benchmarked position compared to the national average when reviewing the estimated litigation cost per activity. Trusts would have received this information in the GIRFT Litigation data pack.</p>	Trusts	For immediate action
	<p>b Clinicians and trust management to discuss with the legal department or claims handler the claims submitted to NHS Resolution included in the data set to confirm correct coding to that department. Inform NHS Resolution of any claims which are not coded correctly to the appropriate specialty via CNST.Help@resolution.nhs.uk</p>	Trusts	Upon completion of a
	<p>c Once claims have been verified clinicians and trust management to further review claims in detail including expert witness statements, panel firm reports and counsel advice as well as medical records to determine where patient care or documentation could be improved. If the legal department or claims handler needs additional assistance with this, each trusts panel firm should be able to provide support.</p>	Trusts	Upon completion of b
	<p>d Claims should be triangulated with learning themes from complaints, inquests and serious incidents (SI) and where a claim has not already been reviewed as SI we would recommend that this is carried out to ensure no opportunity for learning is missed. The findings from this learning should be shared with all front-line clinical staff in a structured format at departmental/directorate meetings (including multidisciplinary team meetings, morbidity and mortality meetings where appropriate).</p>	Trusts	Upon completion of c
	<p>e Where trusts are outside the top quartile of trusts for litigation costs per activity GIRFT we will be asking national clinical leads and regional teams to follow up and support trusts in the steps taken to learn from claims. They will also be able to share with trusts examples of good practice where it would be of benefit.</p>	Trusts	For continual action throughout GIRFT programme
<p>29.NHS Resolution to develop its clinical coding to enable the identification of all claims that relate to stroke as either a primary or secondary factor in a claim.</p>	<p>a Code claims related to stroke separately to allow identification of the true prevalence of stroke in clinical negligence claims.</p>	NHS Resolution	For continual action through GIRFT and NHS Resolution's collaborative work

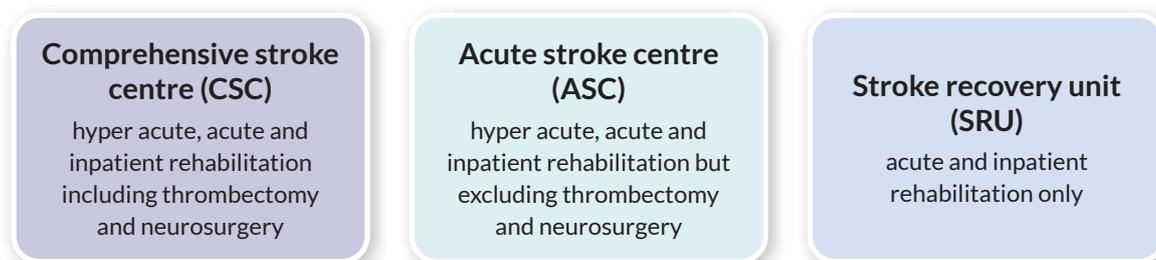
What is stroke care?

Stroke care encompasses the end-to-end pathway of the emergency management of stroke, subsequent acute care, rehabilitation, life after stroke and stroke prevention. Hyper acute stroke care is currently delivered in one of 107 current stroke units across England managing a caseload that averages around 650 acute stroke spells per unit, per year—the largest units treat more than 1,500 patients diagnosed with stroke a year and a small number see fewer than 300.

High quality stroke care relies on networks. These networks ensure patients can access specialist interventions such as brain and vessel image interpretation, thrombolysis, thrombectomy and carotid endarterectomy. There are often agreed relationships and pathways in place between acute providers to ensure patients with stroke access specialist care when they need it. The networked model also allows patient flows to be managed in a way that ensures units are receiving a safe minimum number of patients with stroke every year.

Behind successful networks, there should be a clear understanding of ‘who does what’ along the stroke pathway. Over the course of this GIRFT review, it became apparent that the established classification of organised stroke care in England (hyper acute stroke units, acute stroke units and rehabilitation units) was not consistent and felt confusing for patients. Following extensive consultation with stroke survivors, carers, third sector partners and clinicians, there was support for reviewing the classification. **Figure 1** summarises the consensus agreement for designation of acute and rehabilitation units and the differences between them using new nomenclature.

Figure 1: Designation of providers of stroke care



High quality rehabilitation and life after stroke care for those that have suffered a stroke also relies on networks. Effective rehabilitation draws on a range of therapies and requires collaboration between the stroke survivor and their carers, the transferring acute trust, community services, social care, third sector organisations and primary care. Whilst these structures are sometimes less formal than in the acute phase, high quality stroke care needs these informal networks to come together in a coordinated and consistent way.⁴

Good stroke teams function as multidisciplinary units that bring together skilled professions to manage stroke inpatient care and ensure the full range of therapy is available to support recovery at the point of discharge within community stroke teams. This model of working relies on strong leadership, a culture of collaboration and clear accountability structures, otherwise patient care and flow may be less effective. Almost always, the examples of good practice that we saw on our visits were where systems and networks were working together seamlessly. We have highlighted many examples throughout this report. Evidence presented in this report, supported by research from organisations such as the Stroke Association, demonstrates that there are still many opportunities to improve the quality of care. In too many areas, we have found that national performance against standards for stroke care has stalled and there is wide variation in the care that patients with stroke are receiving.

In this report, we are bringing together evidence about the variation in clinical care delivered by the services we visited, supported by case studies of good practice. We use these to make recommendations across several themes. These include:

- The importance of leadership and culture, and the development of effective network and cross-team working.
- Primary and secondary prevention of stroke.
- The acute stroke pathway (from initial symptom recognition through diagnostic and other interventions to manage the acute phase of a stroke).
- Rehabilitation and life after stroke.
- The importance of growing and sustaining a skilled workforce.

⁴ In February 2021, the Department of Health and Social care published its legislative proposals for removing barriers to integrated working (*Integration and Innovation: working together to improve health and social care for all*)

Our views in this report have been shaped by the data and evidence we analysed, and our deep-dive visits with every acute stroke team and over 60 community rehabilitation teams in England. Through this we have identified areas where data could be used in a more systematic way to support quality improvement activities. We have also identified where existing metrics may be revised so that they are granular enough to provide a single view that services may agree and act on.

As with all services across the NHS, our GIRFT work was impacted by COVID-19. Whilst the pandemic has put a tremendous strain on the workload of our colleagues involved in stroke care, their response gives us reason to be positive. Many examples of the positive changes we highlight in this report have come because of services having to work differently in response to COVID-19.

We are fortunate in stroke care that it is a high-profile specialty that has undertaken research and developed evidence-based clinical guidance over the years. As a consequence, the clinical consensus about what 'good looks like' is strong. The challenge is to make sure this evidence-based care is delivered and reduce the unwarranted variation in the adoption of this good practice across the country.

About the analysis

The GIRFT stroke workstream has created the largest and most comprehensive specialty data set that has ever been assembled for stroke services.

Data sources

The GIRFT programme was funded to provide an insight into the acute secondary care processes of care. We have extended the programme as far as the data allowed across the stroke pathway. The analysis we carried out in developing this report is based on the Getting It Right First Time (GIRFT) programme model (see page 210).

Initially we identified the relevant routinely collected healthcare data related to stroke services, and through data sharing agreements brought this into the GIRFT team for analysis. A main source was Hospital Episode Statistics (HES), which contains every episode of admitted NHS patient care, A&E attendances and outpatient appointments at all NHS hospitals in England.

For inpatient and day case admissions, the information contained within HES is very detailed and includes treating specialty, all prevalent diagnoses coded according to the International Classification of Diseases (ICD-10), procedures coded according to OPCS Classification of Interventions and Procedures, readmissions, stroke recurrence rates and complications (e.g. myocardial infarction, fractured neck of femur). For outpatients, currently fewer than 5% of HES records contain information about diagnoses as this is not a mandated field in the dataset and therefore was not extensively analysed or reported.

Other additional national sources of data included in the analysis were:

- Sentinel Stroke National Audit Programme (SSNAP), both clinical and organisational audit data.
- NHS Resolution litigation data, both within the specialty and for some conditions across every specialty.
- NHS England Diagnostic Imaging Dataset (DID).
- PROMS and PREMS pilot questionnaire in conjunction the Stroke Association and Neurological Alliance.

We gained further data and insight from over 50 additional questions that were added to SSNAP's 2019 Acute Organisational Audit, with a 100% return rate. For ease of reference, this data may be specifically identified in green boxes throughout the report (see example box below), and the full data and all graphs are available as an Appendix to this report. We are grateful to stroke services for participating in this audit.

[Example] Insight from GIRFT's data

Less than 12% of patients with a suspected stroke are taken directly to CT for on arrival in hospital.

Information gathered from detailed questioning during our deep-dive visits with all acute stroke care providers was also analysed following our completion of visits in November 2019. These were fed back to regions and individual providers as part of their trust reports. We report the findings from our deep dive one-to-one visits in this report in blue boxes (see example below). These findings remain relevant following the pandemic, alongside reflections we make about how the pandemic has affected stroke services and practice.

[Example] View from our visits:

Physiotherapy: 83% of services were 7 day, but 53% of these were funded for 5 and stretched over 7 days.

Analytical process

We defined the key performance markers we wanted to investigate and looked at how we could best do this using the extensive datasets we had assembled. We prioritised domains for analysis based on their ability to provide a wide-ranging overview of the stroke activity in NHS hospitals in England. We used these outputs to create a data-driven, clinically-led, integrated set of metrics across the stroke pathway. This was predominantly acute care focused, given the paucity of reliable outpatient and community stroke-specific national data.

This enabled us to benchmark all stroke providers on key performance measures which identified variation in practice and outcomes. An extensive data pack specific to each trust was produced, providing insights into the way the department functions.

We then met 122 stroke services to review the data in depth with clinicians, senior management and many others involved in commissioning of and delivering care. These deep dives explored inpatient management of patients suspected of suffering a stroke or TIA at each trust as well as their transfer of care to community teams, subsequent care, follow-up arrangements and recurrence and complication rates. During the meetings, we discussed any variation in the data and how the trust stands in relation to their peers. These discussions have informed our findings and recommendations.

During our meetings, we highlighted performance against a range of process markers, including SSNAP score, with trust-related outcomes such as Summary Hospital-Level Mortality Indicator (SHMI), and patient-related metrics such as length of stay, 30-day readmission and recurrence rates and average bed day costs. These were presented in a single view for each trust amongst its peers within one of 22 geographical regions (see **Figure 2** for an example).

A considerable amount of time was spent reviewing the best footprints for these visits based on patient flow, historic strategic clinical network boundaries and location of neuroscience centres. The most highly performing trusts would aspire to have a predominantly green spread across these measures, as this would demonstrate they are among the most highly-performing providers of stroke care nationally for process, patient outcomes and cost efficiency. We found this single view to be a very helpful overview of performance, which was effective at filtering high level issues by trust, which were then explored in more depth.

Figure 2: Example summary view of selected metrics – the stroke 'bed spread'

		High is...	Provider A	Provider B	Provider C	Provider D	Provider E	
SSNAP Score average of last 4 periods*		poor	2.0	2.0	4.0	2.0	2.0	
Site rank for HES metrics & SSNAP mortality	SSNAP Mortality observed v expected		poor	97	32	89	107	16
	Hyper acute phase	Clock start to stroke unit time	poor	53	40	67	79	107
		Clock start to thrombolysis time	poor	32	43	11	55	46
		Access to imaging MRI only	good	93	75	103	85	1
		Nursing Therapy bundle	good	89	111	82	73	68
	Other metrics	LOS all spells	poor	71	19	8	89	65
		% of patients discharged home	n/a	20	95	30	69	53
		30 day readmission	poor	72	108	25	99	115
		Subsequent Stroke	poor	7	67	106	101	89
		Subsequent MI	poor	27	18	111	57	10
		Subsequent Fracture NoF	poor	53	64	113	7	25
		Average bed day cost (Provider)	poor	16	83	42	102	32
	% patients 6 month assessment	good	46	116	97	103	13	

*SSNAP Score, average of last 4 periods: A=1; B=2; C=3; D=4; E=5

Shading of SSNAP is based on average score for 17/18

SSNAP	A (1)	B (2)	C (3)	D (4)	E (5)
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All rankings are low to high (eg low score = low rank), non-SSNAP colour coding as follows:

high is...	0-10%	10-25%	25-75%	75-90%	90-100%
poor	Green	Light Green	Yellow	Red	Dark Red
n/a	Blue	Light Blue	Grey	Light Blue	Blue
good	Red	Light Red	Yellow	Light Green	Green

Source: GIRFT

Specialised Commissioning data

Some of the charts in this report show activity carried out in comprehensive stroke centres (CSCs) only i.e. thrombectomy. Data for thrombectomy was retrieved from both SUS and SSNAP data sets.

Data limitations

High quality stroke care relies on pathways that cross specialty and organisational boundaries. It requires rapid access to imaging, onward referral for specialist interventions such as thrombectomy, and rehabilitation, a critical part of supporting recovery and preventing recurrence of stroke. In regions that have undergone reconfiguration of acute stroke care service delivery to have what has historically been described as a HASU/ASU model, it was difficult to analyse the performance of the non-routinely admitting sites. Data on rehabilitation and life after stroke care is generally not readily available, and an absence of linked data makes it difficult to track patients across all the phases of their recovery journey. This limits our ability to assess issues such as speed of assessment, appropriateness of care setting and long-term follow-up. We have made recommendations for how these issues could be addressed in the future and hope to focus upon these areas at future follow-up visits.

Scope of this report

Our review covers stroke services commissioned by Clinical Commissioning Groups and by NHS England and NHS Improvement (Specialised Commissioning) in relation to the care of adult patients in England.

Areas of focus

Through the GIRFT process, we have focused our attention where we anticipated there might be the greatest variation in clinical practice, where evidence provides the clearest case for clinical improvement, and where clear data was available. We look at:

- service organisation, supporting sustainable stroke units and ensuring equitable access to services;
- supporting Integrated Stroke Delivery Networks, which are new bodies (from April 2021) that will take on new responsibilities for coordinating stroke care and ensuring patients have access to a consistent and high quality stroke pathway in their local geographies;
- service design, meeting demand and ensuring patients get the right care in the right setting;
- optimising patient pathways; and
- optimising use of resources.

Conditions and pathways

This report focuses upon the care pathway for those patients that stroke teams in England are routinely commissioned to care for and includes those with a suspected stroke or TIA. We have intentionally excluded pathway descriptions for those patients with neurovascular conditions that have historically not been managed consistently by stroke services in England (i.e. subarachnoid haemorrhage (SAH) and subdural haemorrhage (SH)). Data retrieved for analysis is based on final diagnosis (HES emergency stroke spells = HRG AA35 (excluding rehab spells) or inclusion in the SSNAP record). Inpatients whose condition 'mimicked' a stroke, but in fact was caused by an alternative diagnosis were excluded from data analysis. The exception to this was the SHMI mortality figure, which relates to the acute cerebrovascular disease bundle of conditions, which also includes non-traumatic SAH and SH.

Reliable data regarding drug prescriptions to patients with a stroke diagnosis was limited and therefore was excluded from analysis.

The impact of COVID-19

We have considered our findings and recommendations in the light of COVID-19. In particular, we have looked at how changes resulting from the pandemic, such as greater use of remote consultations (see Recovering and learning from the COVID-19 pandemic, page 172).

Aligning with local and national programmes

When implementing the recommendations and actions in this report, we have considered them alongside all trust-level actions identified on deep-dive visits, as well as any ongoing work by NHS England and NHS Improvement, the National Institute for Health and Care Excellence (NICE), the Royal College of Physicians, the Intercollegiate Stroke Working Party, HQIP, patient groups and charities, and other bodies designed to improve care for patients with stroke. We recognise the importance of co-production and believe that to support trusts in transforming their care for patients, effective implementation of the recommendations in this report will require collaboration at every level. The GIRFT stroke programme clinical leadership team have been in a privileged position to have also been working in senior clinical leadership roles within NHS England and NHS Improvement during the visits and production of this report. This has facilitated strong collaboration and integration across current and planned workstreams, magnifying the collective impact of future developments to enhance stroke care.

Findings and recommendations

Leadership and culture – driving and sustaining change

The importance of leadership and creating an inclusive culture

Leadership and culture are identified as an important factor in both analyses of major healthcare system failures and in recommendations to improve organisation and delivery of care. Evidence suggests that leadership at all levels of the health care system—macro (national/system), meso (organisational), and micro (individual/team)—is an important contributory factor to delivering high-quality care.

At the macro level, leadership sets the tone for a whole system, setting policy priorities and shaping regulation (in turn influencing directly both organisations and individual professionals). In the context of stroke care, the newly-established Integrated Stroke Delivery Networks (ISDNs, discussed in detail later in this report) are an important opportunity to establish and strengthen system leadership across local delivery networks.

At the meso level, leadership sets organisational strategy and engages both local staff and external organisations to support delivery of high-quality care. Many aspects of stroke care rely on multidisciplinary teams coming together and delivering a shared, comprehensive and time-critical pathway of care. Culture and tone from the top are integral enablers of the joint working across professional boundaries that we understand to underpin high-quality stroke care.

At the micro level, frontline leaders engage staff to ensure shared purpose and collaboration in providing high-quality care. Based on experience from our visits, some of the best examples of culture and leadership that we saw gave staff an equal voice in supporting stroke care, highlighting good practice and addressing areas of concern. These were often enabled through quite simple mechanisms such as team huddles, active listening and team building opportunities. Peer to peer support is also key in high-functioning teams, whether formal in terms of mentoring and coaching, or informal supportive relationships. This has never been more vital than now, as we progress through the COVID-19 pandemic and need effective structures to ensure the welfare and wellbeing of our teams.

Leadership and culture are already recognised as a key enabler that supports the delivery of high-quality care. The GIRFT programme has published a summary of its learnings on leadership based on over 1,600 deep-dive visits.⁵ The Care Quality Commission (CQC) explicitly assesses leadership as part of its review process with health care providers to ensure that:

'[an organisation is] providing high-quality care that's based around individual needs, that it encourages learning and innovation, and that it promotes an open and fair culture.'⁶

The NHS People Plan reinforces the importance of culture through its 'People Promise', which sets out a commitment to create a culture that is positive, compassionate, and inclusive. The People Promise focuses on seven hallmarks of a positive culture:

- we are a team;
- we work flexibly;
- we are always learning;
- we are safe and healthy;
- we each have a voice that counts;
- we are recognised and rewarded; and
- we are compassionate and inclusive.

Evidence on improving quality suggests that there is no 'magic bullet' to behaviour change. Improvement efforts rely on a combination of factors operating at multiple levels. For example, evidence on **audit and feedback** – a key example of how performance data may be shared to support improvements in quality – notes that sharing data can have a positive impact on behaviour, but that these effects tend to be small and variable. Furthermore, it is not just what is shared that matters, it is how it is shared. While the quality of the data presented is important, its impact is influenced by several factors, including the credibility of the individual/s sharing the feedback, whether the feedback is linked to meaningful action plans, and the extent to which staff are engaged and facilitated to put change into action (e.g. whether they have the time and capacity to make changes). In short, behavioural change will not happen unless improvement efforts are underpinned by strong leadership and an inclusive culture.

⁵ GIRFT (2019) *Getting it Right in Leadership: learning from the GIRFT experience*.

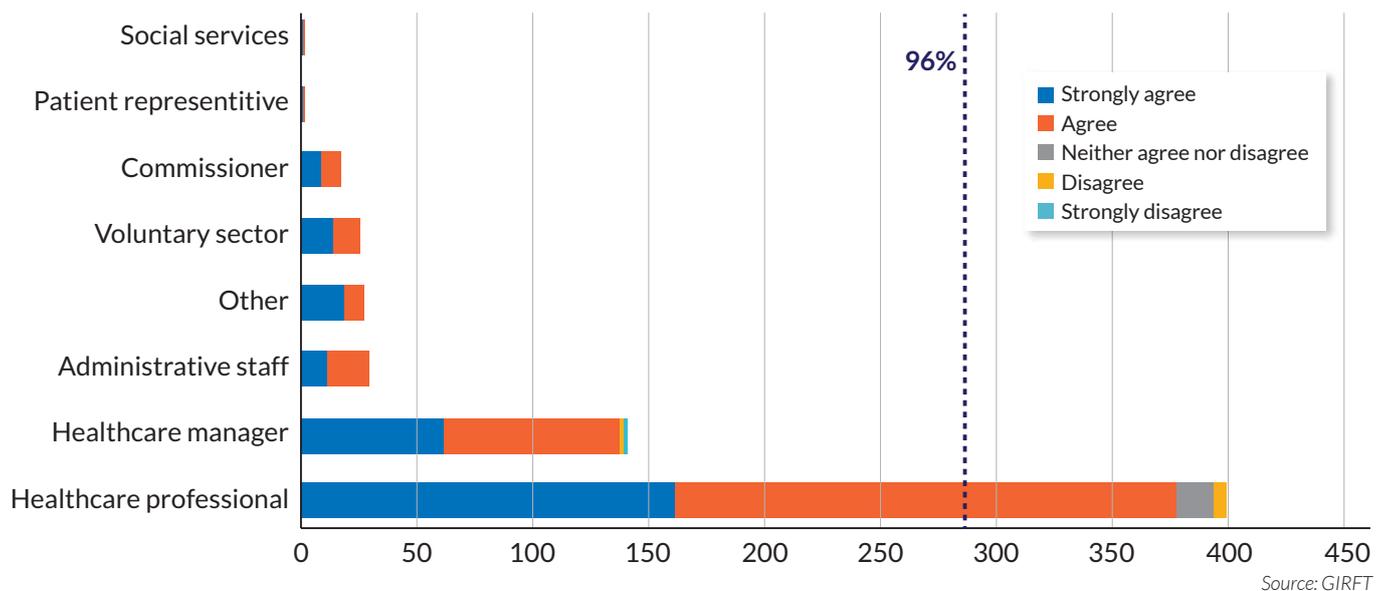
⁶ <https://www.cqc.org.uk/what-we-do/how-we-do-our-job/five-key-questions-we-ask>

Learnings from our visits

An important part of our programme of GIRFT visits was to mobilise evidence and facilitate local and regional improvement in stroke services. Our approach was informed by the multiple influences on quality in stroke services and an awareness that these influences do not operate solely within individual stroke teams, but are relevant at all levels – the micro, meso, and macro.

One of the mechanisms we used for information sharing was a series of region-wide face-to-face events (hereafter ‘regional events’). We conducted 22 of these GIRFT-led events over the period October 2018 to November 2019, covering all acutely admitting stroke services in the English NHS; there were over 2,000 attendees at these events. We deliberately designed the structure of our visits and learning sessions along principles that can be taken and adapted to support leadership and learning across stroke teams more generally. We have summarised these principles and our experiences from the regional visits below as they gave us valuable insights that we think are relevant to leadership and culture across all levels of stroke services. The feedback we collected during the regional events found that 96% of attendees found them useful (agreed or strongly agreed that the event was useful and informative).

Figure 3: Regional event participant feedback: was the event overall useful and informative?



Getting the right people in the room

At the **micro level**, stroke teams rely on a range of professional expertise and effective collaboration between these different disciplines. Prior to our GIRFT regional events, teams were encouraged to ensure representatives of the whole team were present, including data managers and managerial staff.

At the **meso/organisational level**, evidence suggests that stroke units need effective working relationships with other parts of their host organisation (e.g. diagnostics and ED), with support from senior management. Further, stroke services rely increasingly on effective collaboration with other providers, including the ambulance service, other hospitals (in order to access e.g. thrombectomy or rehabilitation services) and social care (in arranging timely, safe transfer of care of patients from the acute system). Underlying these relationships, is a need to work effectively with the wider local system, including local NHS oversight bodies and commissioners, the voluntary sector, patients and carers.

Reflecting this in our visits, the GIRFT regional events were designed to bring together these different stakeholder groups. The geographic/service footprints covered by regional events were guided by the realities of which stakeholders would likely be collaborating over the coming months and years, e.g. the stroke teams that would be making use of the same thrombectomy service, redesigning their acute pathways together, or forming an ISDN in the future.

It was important to ensure that it was not just the stroke teams who attended. Hospital senior management, local commissioners, ambulance services and community services were all prioritised invitees. Those who attended were encouraged to participate in all aspects of the regional events and their input into the deep-dive visits were particularly valuable. We encourage the focus of a shared vision as being paramount to a system's success and functionality.

At the **macro level**, there are several national-level influences on stroke units, including national policy priorities (e.g. the drive to provide thrombectomy, delivery of an Integrated Community Stroke Service), regulatory targets and participation in quality improvement programmes (e.g. SSNAP and RightCare).

Through the GIRFT programme we were able to bring a great deal of our own national-level expertise, including developing plans for implementation of the NHS Long Term Plan. In addition, representatives of the Long Term Plan, NHS RightCare, the Stroke Association, NHS Improvement Workforce Team and Health Education England (HEE) attended visits to present national priorities and respond to questions from local attendees.

Sharing evidence at team, regional and national level

A key part of the GIRFT process is developing a robust evidence base and using that evidence to support quality improvement activities with teams. The GIRFT dataset for stroke is comprehensive (including clinical processes, clinical outcomes, and costs). The data was disaggregated by team and performance was set alongside the wider national context. Placing data in context in this way is of course fundamental to effective feedback of performance data. However, we learnt that how you share data is also important. For example:

- While discussing national data, we included performance of our own two hospitals alongside – whether it was good or bad – to build a sense of shared need for improvement and trust.
- We highlighted local services that were performing well on a given activity, and then asked a representative to explain how they were achieving these results. This recognises services that are delivering impressive results and also contributes to lessons of national worth.
- There was also a prioritisation of data quality. The GIRFT team acknowledged that data might not be perfect. This was used as an opportunity to encourage staff to consider their relationship with data coders, and how their services might best manage resources in relation to data capture and quality improvement work.

Creating networks and relationships

There is growing recognition of the key interdependencies between stroke teams and other components of the system, including other hospital and community stroke teams, ambulance services, commissioners and the voluntary sector. During our visits, we prioritised dedicated time for shared coffee and lunch breaks, to increase opportunities for attendees to renew relationships with longstanding colleagues or build new links across the system. These connections and links are important, for example in helping prepare for the developing ISDNs. A good example of this was a 'breakthrough' moment between two senior clinical leaders from neighbouring large London HASUs that had been at an impasse for years about the delivery of an element of acute care. An external 'critical friend' moment and time to reflect in a neutral safe space allowed some free thinking and progress to be made.

Generating local ownership

During our visits, we worked one-to-one with each team. These meetings were an opportunity to explore in depth with individual teams where they should be focusing their improvement efforts in the immediate future, and what was needed to bring about these improvements. Sessions were well-attended, with up to 40 individuals from some organisations, and worked best with representation of the whole multidisciplinary team, senior hospital management (frequently at executive director level), community teams, the local clinical network and local commissioners.

We sought to create a positive, supportive environment, explicitly recognising that every voice was valid, and asking people to raise any points they felt were important. This ensured that when discussions focused on evidence from our datasets, each attendee was given the space to lead on his or her field of expertise, including those outside the immediate stroke team.

The flow of these discussions was exploratory, understanding why and how services were being delivered (e.g. in terms of local organisational/system context, staffing, and technology), and what might help services develop further. These discussions flowed quite naturally into how teams could develop further and address outstanding issues.

A process of review and continuous improvement

An important part of leading on quality is communicating the ongoing nature of the improvement process – ensuring people are supported to deliver change and making clear that there will be ongoing measurement of quality of care. In the context of our visits, we emphasised that stroke teams would receive support from GIRFT to implement improvement.

Creating a supportive environment

Reflecting the evidence on quality improvement, it was not just the data that mattered, but how it was communicated, to help ensure stroke teams were receptive to the data. In short, creating environments where people feel safe to share their experiences and concerns, and be open to new approaches to organising and delivering stroke care. In the context of the GIRFT visits, we aimed to do this by:

- sharing expert knowledge in factors influencing delivery of high-quality stroke care at national, regional and local team levels;
- drawing on common experiences of the day-to-day difficulties of running stroke services;
- showing openness and transparency by noting the deficits in our own services; and
- being open to debate and explanation - instilling a ‘democracy of ideas’ atmosphere.

The local recommendations for improvement were guided by the data, but we also drew on experiences and solutions from other services elsewhere in the country and research evidence to help guide teams on how they might develop. This bank of knowledge kept building over the course of the programme as we learned of new approaches to organising and delivering high-quality care.

Promoting leadership and culture across stroke services

The evidence, and our experiences from our visits, is clear – strong leadership and a culture that supports inclusion and continuous review leads to high-quality outcomes. During our visits, we saw examples of great leadership which specifically demonstrated:

- systematic attempts to reduce bias in leadership (high-performing teams had a mixed leadership, including nursing and therapy leadership, and demographic diversity);
- investment in training and development;
- tackling silo working;
- team building and the ‘huddle’ concept;
- promoting the concept of ‘psychological safety’⁷ at meetings;
- the pillars of functional teams were present:⁸ trust, conflict resolution, commitment to a shared vision, accountability and attention to outcome data.

The creation of ISDNs is an opportunity for systems to look again at leadership and culture across their area. One of the key roles of ISDNs is to agree and promote improved ways of joined up working and collaboration, with the evidence suggesting this will only be successful with strong leadership and an inclusive culture.

One of our recommendations is that ISDNs should actively support and promote activities that will improve leadership and culture within stroke services across their geography. ISDNs will receive funding from NHS England to support their development and the intention is that this funding should be secured within region for each ISDN's future workplans. Some of this should be used to fund protected time that is focused specifically on leadership, support to individual organisations and network development.

⁷ O'Donovan, R., McAuliffe, E. Exploring psychological safety in healthcare teams to inform the development of interventions: combining observational, survey and interview data. *BMC Health Serv Res* 20, 810 (2020). <https://doi.org/10.1186/s12913-020-05646-z>

⁸ *The Five Dysfunctions of a Team: A Leadership Fable (J-B Lencioni Series) 2002*

We recommend the development of a stroke-specific leadership academy. This would be centrally coordinated, co-designed and led by experts from across the professional bodies that represent all the disciplines that support stroke care. We envisage the programme would be continuous over a year, with new cohorts passing through the academy each year. Each ISDN should nominate individuals to attend the academy. The academy might deliver resilience training, active listening sets, NHS policy and change management skills, possibly leading to 'learning cohorts', fostering shared development in a 'train the leader' mentality, across the ISDNs. It must be supported by individuals with stroke leadership expertise who will commit time to mentoring, ensuring a sustainable cycle of local improvement and support.

We are also proposing that ISDNs support these activities by regularly assessing their progress on promoting leadership and culture. The CQC's questions⁹ and the commitments outlined in the NHS People Promise are a useful framework for doing this. These are summarised in **Box 1**, and we are recommending ISDNs are aware of these questions and use them as a basis to identify, assess and track progress to improving leadership and culture at all levels within their networks. We recommend that ISDNs should set specific time aside at least twice a year to review progress on leadership and culture, possibly using these questions, at all levels within their network.

Box 1: A framework for assessing leadership and culture across Integrated Stroke Delivery Networks (ISDNs)

1. Is there the leadership capacity and capability to deliver high-quality, sustainable care?
2. Is there a clear vision and credible strategy to deliver high-quality sustainable care to people, and robust plans to deliver?
3. Is there a culture of high-quality, sustainable care?
4. Are there clear responsibilities, roles and systems of accountability to support good governance and management?
5. Are there clear and effective processes for managing risks, issues and performance?
6. Is appropriate and accurate information being effectively processed, challenged and acted on?
7. Are the people who use services, the public, staff and external partners engaged and involved to support high-quality sustainable services?
8. Are there robust systems and processes for learning, continuous improvement and innovation?
9. Do we work as a team - give one another the space to innovate, support each other when times are tough, and we take time to celebrate successes, small and large?
10. Are teams supported to invest in their careers, through formal and informal training, to reach personal and professional goals. Is there time, space and funding to do this?
11. Do teams and individuals feel safe and confident when expressing views? Do we have a culture where we share best practice, help each other through challenges and take time to listen?
12. Are we open and inclusive, calling out inappropriate behaviour making our teams a place where we all feel we belong?

⁹ Care Quality Commission Key lines of enquiry, prompts and ratings characteristics for healthcare services, available www.cqc.org.uk

Recommendations to grow and sustain leadership in stroke services

Recommendation	Actions	Owners	Timescale
<p>1. ISDNs to ensure that they lead and engage in activities to promote leadership and culture across their networks, with a particular focus on:</p> <ul style="list-style-type: none"> the importance of culture and leadership in successful stroke teams; addressing systemic biases in the current leadership of stroke teams, actively promoting both medical and non-medical leadership; emphasising the multidisciplinary nature of high quality stroke care and diversity of leadership; promoting collaboration across the stroke pathway, including diagnostics, rehabilitation, and working with the third sector; and development and implementation of a 'Stroke Leadership Academy'. 	<p>a Develop national programme and offer that can be adopted locally to support leadership development in ISDNs.</p>	NHSE&I/GIRFT programme	Within 12 months of publication
	<p>b Ensure each NHS region has a nominated individual who is experienced in stroke leadership and with mentoring skills, to support clinical leads within ISDNs.</p>	NHSE&I Regional Medical Directorates (RMDs)	Within six months of publication
	<p>c ISDNs to ensure protected time for leadership activities, specifically focused on strengthening leadership and culture at network, trust and team level.</p>	ISDNs (with support from NHSE RMDs)	Within six months of publication
	<p>d ISDNs to use funding provided for network activities to support these leadership activities.</p>	ISDNs (with support from NHSE RMDs)	Within six months of publication
	<p>e Review, twice yearly, progress on leadership and culture objectives, based on domains outlined by the CQC and in the NHS People promise. This should be done at network level, and ISDNs should encourage organisations and teams to engage.</p>	ISDNs (with support from NHSE RMDs)	Within 12 months of publication
	<p>f Deliver resilience training, action learning sets, NHS policy and change management skills leading to 'learning cohorts' fostering shared development across the ISDNs.</p>	NHSE&I/GIRFT programme	Within 12 months of publication

Integrated Stroke Delivery Networks

Developing Integrated Stroke Delivery Networks across England

One of our reflections from our very first visits in 2018 was the obvious benefits of shared learning between providers, commissioners and the third sector; acknowledging that these groups functioned better when working together in a network. The NHS Long Term Plan now highlights this vision and Integrated Stroke Delivery Networks (ISDNs) are operational in all areas of England, bringing people and organisations together to deliver the best possible care for their population. This model is hoped to be an effective way to improve standards of health and social care outcomes for patients with stroke. We believe that ISDNs are essential to delivering the individual NHS Long Term Plan commitments for stroke.¹⁰

ISDNs became operational from April 2021. They will bring together providers and commissioners of services across the whole of the stroke pathway. ISDNs should be responsible for designing and delivering optimal stroke pathways for their local populations, making sure that more people who experience a stroke receive high-quality specialist care—from pre-hospital, through to rehabilitation and life after stroke.¹¹ **Figure 4** shows the 20 ISDN geographies, relating to the seven NHS England regions.

Figure 4: Integrated Stroke Delivery Network footprints (December 2020)



¹⁰ Page 64 of the NHS Long Term Plan sets out the plan and milestones for stroke care

¹¹ Latest draft is available on the Stroke Community Network on the FutureNHS collaboration platform (<https://future.nhs.uk/strokecommunity/grouphome>)

The National Stroke Strategy, published in 2007, first made the case for major system change in acute stroke services, creating ‘hub and spoke’ networks of ‘hub’ hyper acute stroke units (HASUs). ISDNs are an evolution of this, bringing commissioners, community and third sector partners into the network, with funding and governance structures to support and sustain improvement.

The clinical case for networks in stroke care is based on strong evidence that investigations and interventions such as brain scanning and thrombolysis can best be delivered as part of a 24/7 networked service, including initial assessment and intervention units (now to be known as CSC or ASC) that admit above a safe minimum number of acute patients with stroke a year. The exact number of safe minimum admissions per year is complex and we saw several examples of well-performing units who had below 500 admissions per year. Whether this is sustainable from a workforce perspective in the longer term is to be seen. Pathway optimisation should only be undertaken on the basis of observed and persistent poor processes of care or staffing issues that put patient care at risk.

Several pathway optimisations have been implemented in recent years, the highest profile being London and Greater Manchester. Independent research found that such systems saw significant improvements in patient outcomes and care delivery, and that systems of this kind were cost-effective. Research has also shown that improvements associated with such systems can be sustained over time. Importantly, the benefits of networks of this kind were most likely to be achieved if all patients accessed the hyper acute element of stroke care, rather than just a selection e.g. within a specific time frame from symptom onset.¹²

Networked configurations with HASUs have led to a 5% relative reduction in mortality at 90 days and reduced length of stay.¹³ An evaluation of networked provision in Northumbria demonstrates value from a networked approach in rural areas. The average annual benefit of full national reconfiguration is estimated to be around £48m, accounting for a reduction in staff costs, increased ambulance costs, transition costs and future tariff payments.¹⁴

A second critical function of clinical networks is to coordinate, facilitate and sustain change. They may have responsibilities around workforce competency and development, and freedom to develop local data dashboards to inform the selection and focus of local priorities and monitor change. Research on implementing major system change in London and Greater Manchester describes how local clinical networks played important roles in planning, implementing and sustaining change.

Our own experience from meeting every acute stroke service in England is that local leadership and coordination across services is variable. The intention is that ISDNs provide a framework that will support stronger leadership to drive and manage change across their areas. Many of the recommendations highlighted in this report are the responsibility of ISDNs – partly because this local leadership role has historically been absent in many areas, and partly because ISDN leadership teams will be in a unique position to evidence, coordinate and lead change amongst members of their local providers.

The key delivery goals of ISDNs, highlighted in the national service model, are:

- **Best practice personalised stroke pathways** configured and managed from pre-hospital care onward, including ambulance, thrombectomy, Integrated Community Stroke Service model and six-month reviews within initial implementation, building to include the full pathway from prevention through to life after stroke.
- **A flexible, future-proofed competency-based stroke workforce**, supported by a skills and capabilities framework and toolkit.
- **A comprehensive dataset** meeting the needs of clinicians, commissioners and patients describing the quality and outcomes of care provided.

¹² Morris S, Ramsey A, Boaden R et al, *Impact and sustainability of centralising acute stroke services in English metropolitan areas: retrospective analysis of hospital episode statistics and stroke national audit data*, BMJ 2019;364:l1 <https://www.bmj.com/content/364/bmj.l1>

¹³ See, for example, Davie C, Hunter RM, Mountford J, Morris S (2013) *London's Hyperacute Stroke Units Improve Outcomes and Lower Costs*. Available from <https://hbr.org/2013/11/londons-hyperacute-stroke-units-improve-outcomes-and-lower-costs>

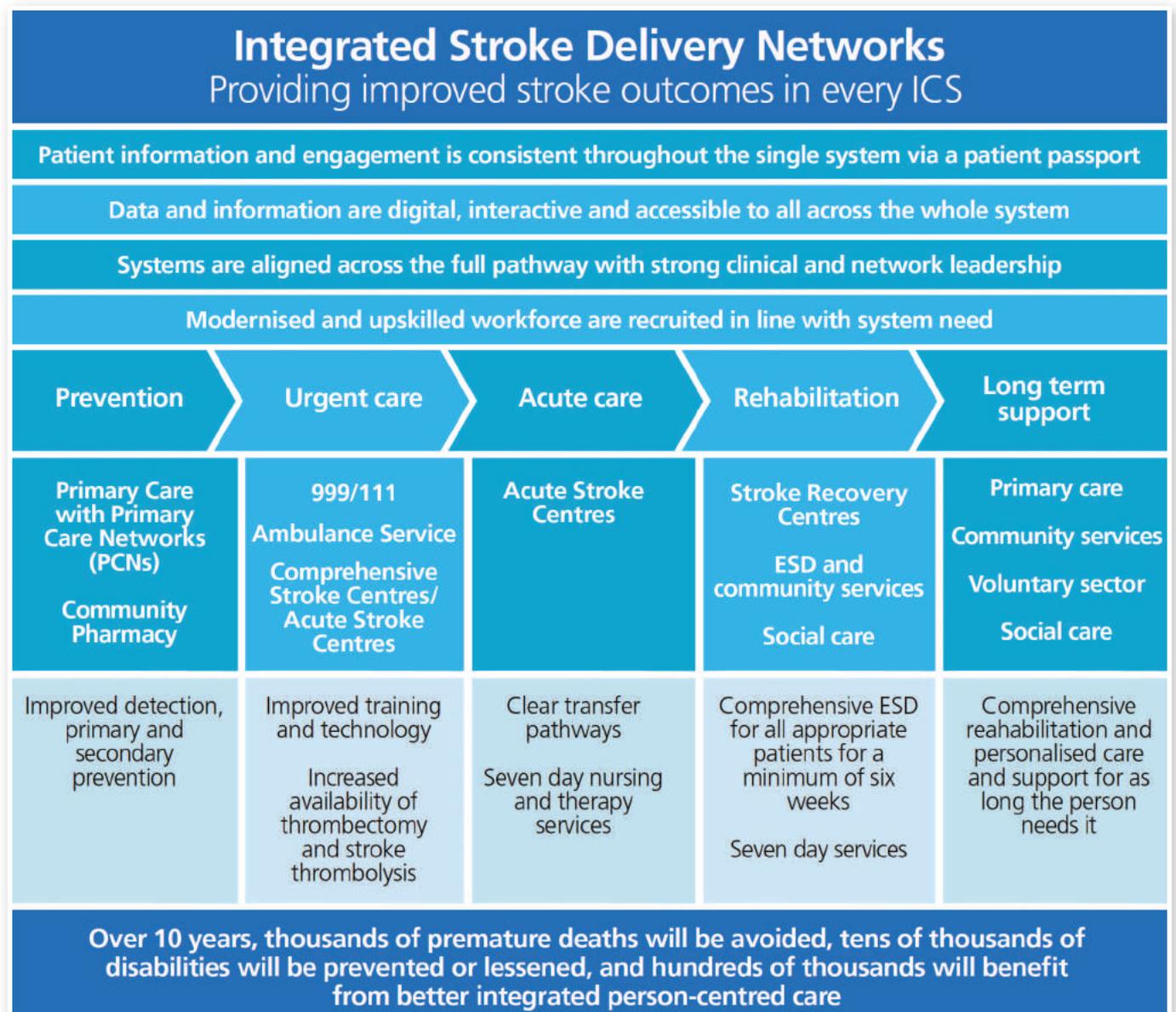
¹⁴ Evidence taken from the ISDN Service Specification (Latest draft is available on the Stroke Community Network on the FutureNHS collaboration platform (<https://future.nhs.uk/strokecommunity/group/home>))

Structure and responsibilities of ISDNs

The formation of ISDNs should be coordinated with Integrated Care Systems (ICSs) and Sustainability and Transformation Partnerships (STPs). Many ISDNs will align with existing network structures. However, a significant proportion are new entities and were only established from April 2021.

Figure 5 illustrates the responsibilities and breadth of ISDNs, which cover the entire stroke pathway.

Figure 5: Overview of Integrated Stroke Delivery Networks



Source: NHS England and NHS Improvement, National Stroke Service Model: Integrated Stroke Delivery Networks, May 2021

An important feature of the ISDN specification is that it defines a clear set of objectives that should be achieved. These objectives focus on the enabling factors that will support success, including ensuring representative leadership from across the stroke pathway. In summary, the immediate objectives of ISDNs are:

- 1. Leadership:** The provision of robust clinical and stroke programme leadership, which includes medical, nursing and therapy senior leadership to ensure both the acute and community pathways are given equal focus.
- 2. Strategic approach:** ISDNs should support ICSs, work collaboratively with ICSs and provider workforce leads to manage system capacity and demand and develop robust workforce plans. ISDNs should participate in national forums to ensure that as healthcare technologies advance and new intelligence is introduced, local workforce is supported to develop and deliver innovations in patient care.
- 3. Optimal configuration and collaboration:** ISDNs must support the delivery of an optimal configuration of stroke services within their geography and lead collaboration with stakeholders and partners. This collaboration should extend to agreed pathways and ways of working with adjacent specialisms (e.g. neurology and rehabilitation) and networks (e.g. imaging networks and vascular networks). They must also manage cross-boundary issues (both geographic and across primary, secondary, community and voluntary care sectors).
- 4. Data, monitoring and reporting:** ISDNs must ensure full engagement with national programmes such as the Sentinel Stroke National Audit Programme (SSNAP) and supporting the delivery of recommendations suggested from the NHS England and NHS Improvement and GIRFT Stroke Programme. ISDNs should use SSNAP dashboards to assure performance.

The ISDN National Stroke Service Model (NSSM) also includes a detailed summary of best practice care within each stage of the stroke pathway. This evidence is based on a review completed by King's College London,¹⁵ with supporting input from our visits. Whilst ISDNs are not expected to be meeting best practice on every step of the stroke pathway, the NSSM gives clear goals and guidance on what ISDNs should be aiming for and how.

Timeline for establishment

The ISDN National Stroke Service Model sets out a clear timeline for establishing ISDNs, including expectations for what should be achieved by April 2021. **Table 1** lists the goals that ISDNs should now have in place.

Table 1: ISDN establishment timeline

August 2020 to November 2020	
1. Agreement	Having jointly signed off terms of reference (see ISDN structure and governance), confirm ISDN boundaries with cross-boundary issues identified with mitigating actions.
2. Funding	Confirm funding and hosting arrangements for employment of relevant staff.
3. Mobilising	Operationalising teams, which includes agreeing hosting arrangements for core ISDN staff in line with an agreed network management structure, to include at least: <ul style="list-style-type: none">• A clinical director to provide the clinical leadership (this may be shared clinical leadership between medical, nursing, therapy leads).• An ISDN manager and administration support. Have access to a support team including data analytics and administration.
4. Governance	Embedding robust governance at a regional level. Have clinical and/or managerial, patient, and carer representation from key/nominated stakeholders through the entire patient pathway from acute care, to rehabilitation and ongoing care, and prevention.
5. Flow	Establishing links with neighbouring ISDNs to manage any cross-boundary flows. Have agreed plans to develop clear patient pathways including for pre-hospital assessment, thrombectomy, stroke unit care, and early supported discharge, into community and social care and voluntary sector support, building on current service provision.
6. Links	Establishing links to all other relevant networks including regional GIRFT implementation teams, Primary Care Networks, Academic Health Science Networks, Strategic Clinical Networks and Senates and into voluntary sector links.
December 2020 – March 2021	
7. Priorities	Having agreed priorities that focus on delivery of the stroke components of the NHS Long Term Plan and improving outcomes for patients with stroke across all aspects of care, from prevention through to life after stroke and end of life care.
8. Operation	Having an operational plan to develop clear patient pathways including pre-hospital assessment, thrombectomy, stroke unit care, and early supported discharge, into community and social care and voluntary sector support building on current service provisions.

ISDN priorities must be guided by evidence and data, which in turn will enable quality improvement processes. Data dashboards are pivotal for ISDNs, providing a consistent view of metrics across local geographies that are aligned with the priorities of the Long Term Plan, and augmented with bespoke local objectives. We anticipate that these dashboards will include evidence on:

- prevalence and detection of the risk factors associated with stroke across each ISDN, with metrics of health inequalities that exist;
- SSNAP data for all providers that serve each ISDN;
- use of secondary care;
- transfer of care metrics;
- patient reported outcome and experience data (PROMs and PREMs);
- outpatient activities;
- expenditure data.

Current status of networks

During our visits, we found that networked configurations of acute stroke services to optimise treatments are often incomplete or insufficient in some areas. We saw huge variation in how networks were organised and led locally, which impact their effectiveness. In some cases, networks have been set up but are passive. In others, networks are established and are working together using data to identify variations and opportunities for improvement. Some had focused on the acute pathway, but with limited networking across community rehabilitation care delivery. Only a few were working effectively and enacting meaningful change as part of a constant cycle of evaluation and improvement.

What we learnt from our visits is that the most successful networks are those that have a culture driven by clinical leadership, behavioural change and knowledge transfer, with a mindset for continuous improvement and always solution-focused (discussed earlier). In regions we visited with a culture of collaborative working, it was relatively straightforward to understand the delivery and performance of stroke services and identify quality improvement opportunities. In regions where no formal structure existed, it was much harder to understand performance and the culture of quality improvement was weak.

Actions and progress made during GIRFT's stroke programme

During GIRFT's stroke programme, the following actions have been completed or are in progress:

- Co-design of the function, configuration, governance and establishment of the new ISDNs.
- Co-authored The National Stroke Service Model.
- Stroke services have been working to implement recommendations from our GIRFT deep-dive visits and regional improvement days, which focused on supporting units to become compliant with NICE 2019 and RCP 2016 stroke guidelines.
- Stroke services continue to audit and review their performance against these guidelines.

Recommendations to support the implementation of ISDNs and adoption of best practice across localities

Recommendation	Actions	Owners	Timescale
2. Review regional guidance produced from GIRFT visits, implementing recommendations to ensure local services meet NICE 2019 and RCP 2016 guidance.	a ISDNs and providers to continue to review recommendations from their visits and agree local implementation.	ISDNs, supported by NHSE&I regional implementation teams	Within 12 months of publication
3. All regions will have fully functioning stroke networks (ISDNs) by April 2021 and must focus on establishing operational and governance best practice.	a ISDNs to have fully operational leadership and management teams, with clear governance and reporting structures in place.	ISDNs, overseen by NHSE Regional Medical Directorates	Within 12 months of publication
	b Develop materials on leadership and cultural change that localities can use to enable change.	NHSE&I/GIRFT programme	Within 12 months of publication
	c Define a minimum set of data and support development of key performance indicator (KPI) data dashboards to support quality improvement across networks. Support integration of patient reported outcomes and experience (PROMS and PREMS).	NHSE&I National Stroke Programme to coordinate	Within 18 months (acute-focused dashboard available within six months)
	d ISDNs to develop and implement local data dashboards to inform and track local improvement activities. Dashboards to include the national KPIs (previous action), tailored with metrics to reflect local priorities.	ISDNs	Within 12 months of publication
	e Publish a concise statement of intent / ambitions for priorities of each ISDN (must include thrombectomy, access to needs-related not time-related community stroke rehabilitation, stroke prevention and address health inequalities) with trajectories for improvement using percentage change from baseline as a barometer of success.	ISDNs, overseen by NHSE Regional Medical Directorates (RMDs)	Within six months of publication
	f Review progress on the ambitions annually. These reviews should be used to identify support that can be targeted at local systems to support change.	ISDNs	Within 12 months of publication
	g Nominate and fund one individual per year to attend a stroke leadership academy.	ISDNs	Within 12 months of publication
	h Implement inpatient and home bed day calculators to inform systems of workforce requirements.	NHSE Regional Medical Directorates with ISDNs	Within 12 months of publication
	i Review service optimisation needs of regions and secure capital funding for delivery of infrastructure changes.	NHSE Regional Medical Directorates	Within 12 months of publication

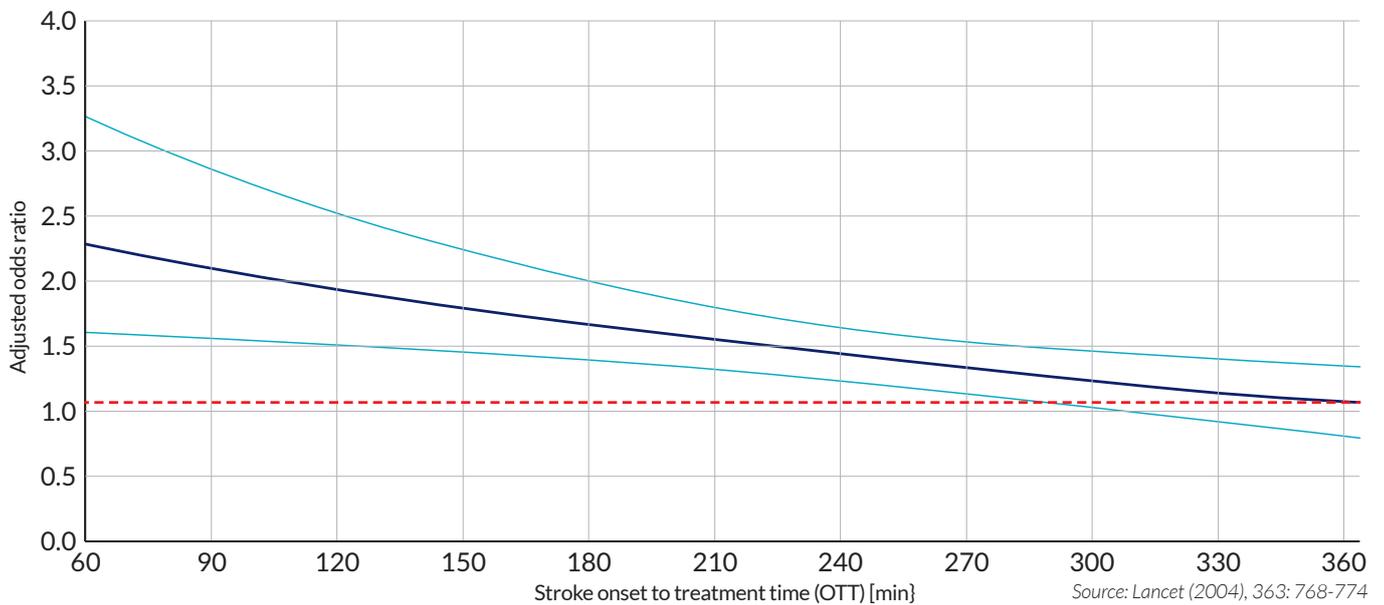
Pre-hospital pathway

Time is brain

Time is brain: the chances of survival after a stroke – and surviving with little or no impact on quality of life – increases significantly if patients get to organised emergency care quickly. We have known the importance of speed for many years with regards to patients who suffer the most common form of stroke, secondary to cerebral infarction.

Widely cited data from the original NINDS, ECASS I & II and ATLANTIS studies demonstrate the inverse relationship between time from stroke onset to start of intravenous recanalization treatment for ischaemic stroke patients and three-month functional outcomes (**Figure 6**). These findings have been confirmed in more recent thrombectomy studies. Confirming delays to starting treatment materially impacts the likelihood of a good functional outcome for stroke survivors.

Figure 6: Relationship between time to treatment and outcomes following stroke



Adjusted odds ratio of Global Good Outcome (mRS 0-1, BI 95-100, NIH 0-1) at day 90, with 95% confidence interval by stroke onset to treatment time (OTT) (N=2776)

Most of the time, when patients suffer a stroke, they are not in hospital. One of the keys to rapid treatment is therefore fast recognition of the signs of stroke and a coordinated emergency response. To maximise the opportunity for this to happen, patients need to be identified early when they show symptoms (recognised by the public), the symptoms need to be acted upon (emergency services called), and first responders and paramedics need to act quickly to assess and move the patient to a hospital with specialised hyper acute stroke expertise (CSC, ASC). On arrival patients need rapid access to an early diagnosis, including cerebral imaging and access to MDT specialist care in an organised stroke unit.

Although at the time of our review there was an evaluation of the benefit of mobile stroke units (MSU: CT scanners in the back of an ambulance with the capability to administer IV thrombolytics on scene) being undertaken in the east of England, no data was available to inform our visits. Recent interest in their use, comparing tissue plasminogen activator (tPA)-eligible patients managed by MSUs vs standard ambulance/stroke unit care, suggests that there may be a correlation with increased rates of and speed of administration of IV thrombolytics and reduced time to thrombectomy, with a corresponding reduction in disability with their use in certain areas. Their relative benefit, both in terms of personnel required to staff the MSU, cost effectiveness and geographic nuances, warrants further evaluation before their routine use may be recommended in England.¹⁶

¹⁶ Grotta, James C., Yamal, Jose-Miguel, Parker, Stephanie A. et al, Prospective, Multicenter, Controlled Trial of Mobile Stroke Units, New England Journal of Medicine September 9, 2021 385(11):971, available at <https://www.nejm.org/doi/full/10.1056/NEJMoa2103879>

Data from SSNAP clearly shows that nationally, the time between symptom onset and arrival at hospital has deteriorated over the last seven years by 41 minutes.

Following our initial visits and to support the pre-hospital pathway, a Pre-hospital Consensus Group was convened by the Clinical Policy Unit at NHS England, with members of the clinical and academic pre-hospital community, adapting a pre-hospital pathway, with the aim for it to be clear and widely understood (see **Figure 7**). We generally consider six distinct phases of the pre-hospital pathway:

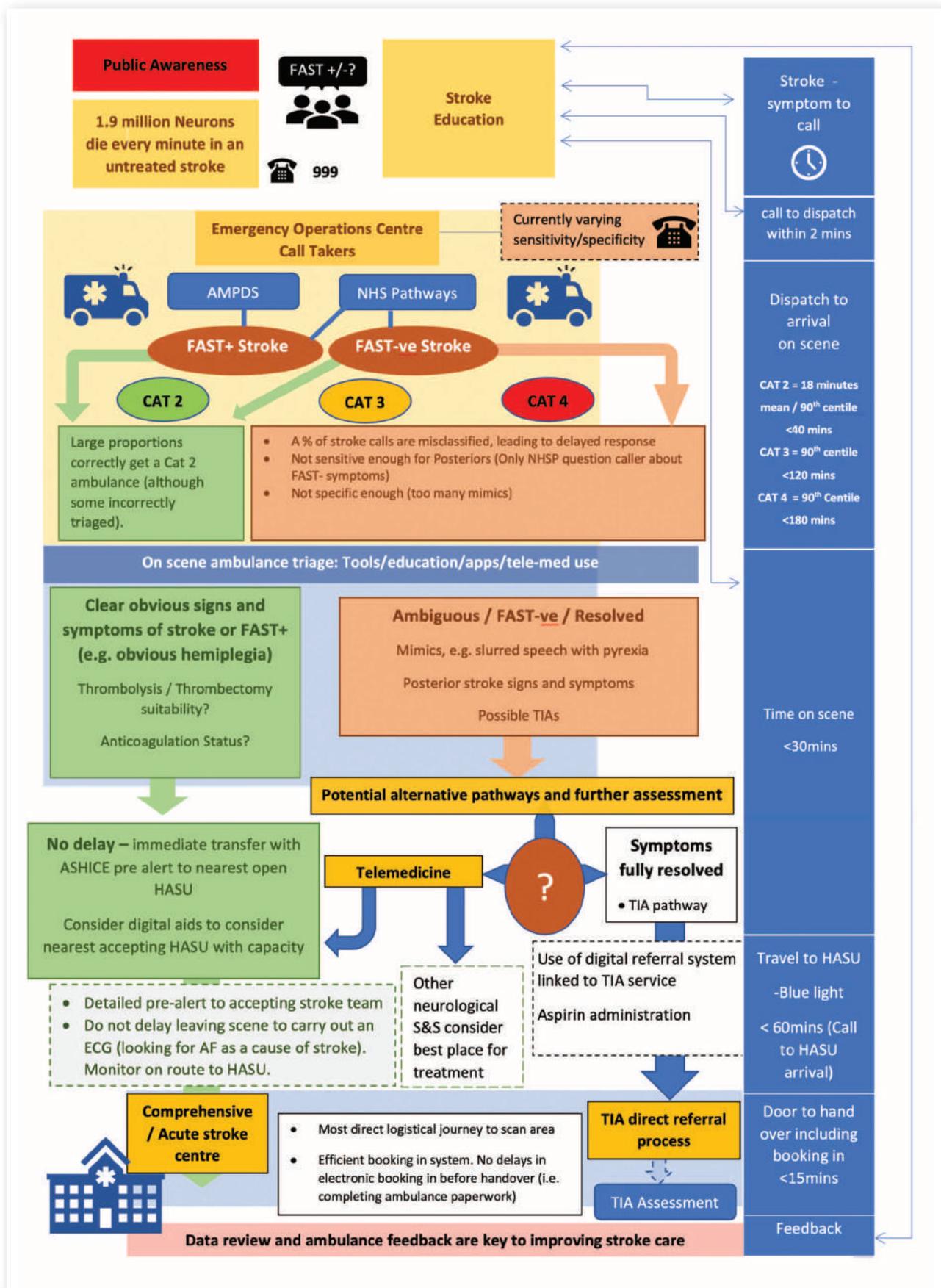
- time from initial symptoms of stroke to emergency call;
- time from when the call is received to an ambulance being dispatched;
- time from ambulance dispatch to arrival on scene;
- time on scene, spent assessing and stabilising the patient prior to conveyance;
- travel to a Comprehensive Stroke Service or Acute Stroke Centre; and
- arrival to handover to the stroke team.

Consistent data on the pre-hospital pathway is generally not readily available, but the data we do have shows wide variation across geographies in the time that some of these steps take. During our visits, we saw examples of local good practice, which provide some insight into how systems can learn from one another. SSNAP is collecting additional data related to the pre-hospital pathway, which will help further analysis and give insight into variation. **Table 2** summarises the measures that will be collected and made available.

Table 2: Additional pre-hospital metrics being collected by SSNAP

Measure	Description
Total	Total number of linked records (number of acute records that were able to be linked to ambulance records)
Total known onset	Total linked records with precise or best estimate onset recorded
Onset to call (median)	Stroke onset to time of 999 call
Onset to wheelstop (median)	Stroke onset to time that ambulance stopped at first hospital
Onset to arrival (median)	Stroke onset to time of arrival as recorded by first hospital (clockstart)
Call to thrombolysis (median)	999 call to thrombolysis for patients thrombolysed
Call to scan (median)	999 call to time of brain scan
FAST positive (%)	Percent patients recorded as FAST+
FAST negative (%)	Percent patients recorded as FAST-
Other (%)	Percent patients with different clinical impression or not assessed

Figure 7: Pre-hospital stroke pathway



Source: NHS England and NHS Improvement Pre-Hospital Group

Symptom to call time

Early recognition of the symptoms of stroke and quick action by the public is critical. The Act FAST campaign has given the public a relatively good understanding and awareness of the symptoms and signs of stroke. What is much less clear is how this has translated into changes in response behaviour when a patient suffers a stroke. A recent systematic review of 11 studies (6 of which were focused on the effectiveness of the Act FAST campaign) concluded that ‘campaigns aimed at the public may raise awareness of signs of stroke, but have limited impact on behaviour.’¹⁷ One study found that Act FAST may have increased the number of emergency stroke admissions, with fewer referrals coming via general practice – consistent with improved recognition by the public – but evidence on whether individuals were reaching organised stroke care quicker is weak.¹⁸

Recent data, collected by SSNAP as part of the Ambulance Linkage Project, shows it takes over an hour on average from symptom onset before a call is made to the ambulance services (**Table 3** shows data for the month of March, from 2018-2021) which suggests the trend is relatively static.

Table 3: Time from stroke symptom onset to ambulance call (England, hr : min)

	March 2018	March 2019	March 2020	March 2021
Median onset to call	01:10	01:06	01:15	01:11

Source: Ambulance Quality Indicators Data

Call to dispatch

There are currently two systems in operation in England that allow call handling and determination of category of call in the NHS (AMPDS or NHS Pathways). Both systems have a detailed series of questions that operators adhere to with the caller to determine the type of response that ambulance services undertake. We found from our visits a varying degree of satisfaction from stroke teams to the order of priority of response offered by ambulance services.

Dispatch to arrival on scene

An ambulance response, when a stroke is suspected, is usually categorised as Category 2 (emergency), and sometimes as Category 3 (urgent). Whilst stroke is a medical emergency, calls are not typically Category 1 (life threatening) because it is more important to make sure patients get the right response (e.g. a double-crewed ambulance that can transport a patient to the right hospital) rather than the nearest available resource. The NHS Constitution¹⁹ sets out standards of pre-hospital dispatch to arrival on scene standards, which are:

- respond to Category 1 calls in 7 minutes on average, and respond to 90% of Category 1 calls in 15 minutes
- respond to Category 2 calls in 18 minutes on average, and respond to 90% of Category 2 calls in 40 minutes
- respond to 90% of Category 3 calls in 120 minutes
- respond to 90% of Category 4 calls in 180 minutes

Currently the national guidance upon categorisation of stroke calls places most patients within 4.5 hours of symptom onset into a Category 2 response which should have an average response time of 18 minutes. The Category 2 response time has however been deteriorating (see **Figure 8**).²⁰

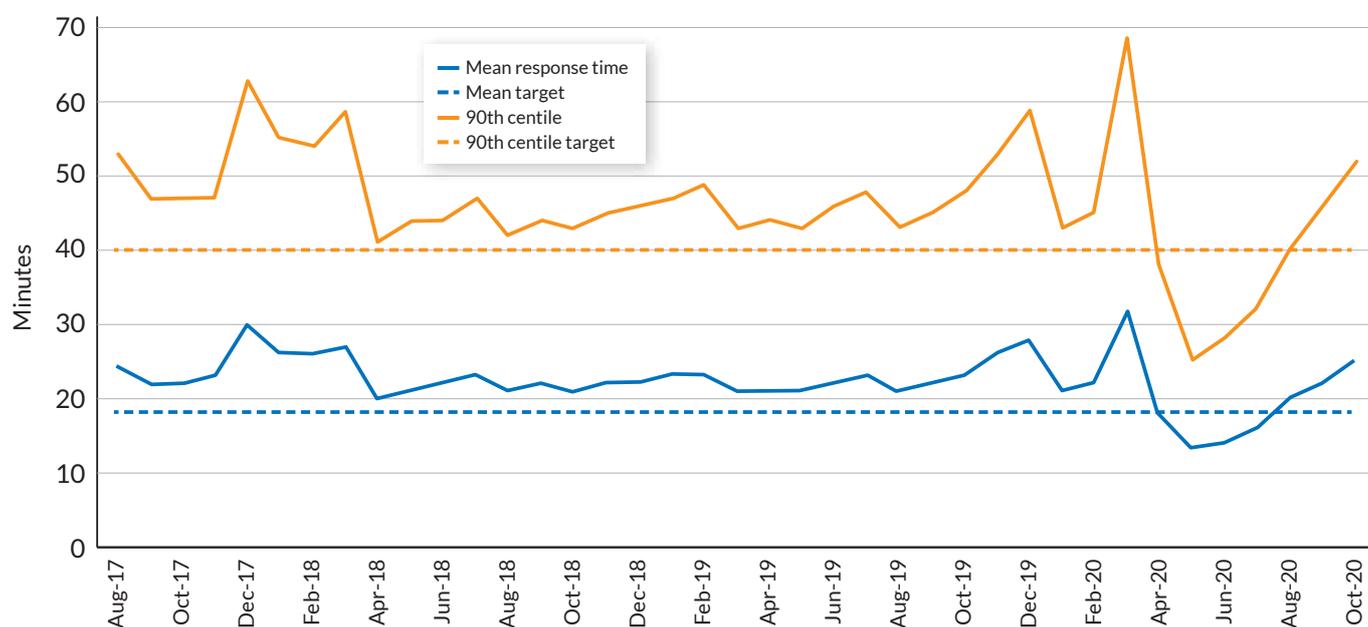
¹⁷ Sudirman H., Yuliyanti C., and Sari AI. Effectiveness of 'FAST' stroke campaign for fast stroke recognition and response: A systematic review *Proceedings of International Conference on Applied Science and Health* (No. 3, 2018)

¹⁸ Flynn D, Ford GA, Rodgers H, Price C, Steen N, Thomson RG. A time series evaluation of the FAST National Stroke Awareness Campaign in England. *PLoS One*. 2014;9(8):e104289. Published 2014 Aug 13. doi:10.1371/journal.pone.0104289

¹⁹ <https://www.gov.uk/government/publications/supplements-to-the-nhs-constitution-for-england/the-handbook-to-the-nhs-constitution-for-england> (last accessed December 2020)

²⁰ <https://www.england.nhs.uk/statistics/statistical-work-areas/ambulance-quality-indicators/>

Figure 8: Ambulance response time for Category 2 calls (August 2017-October 2020, England)



Source: Ambulance Quality Indicators

In practice, some of the biggest influences on ambulance response times (geography and road network) fall outside the control of local ambulance services. The established evidence of some patients benefiting from recanalization therapy (both IV thrombolytics and thrombectomy) over and above 4.5 hours from symptom onset necessitates an urgent review of the current response times and is one of our key recommendations.^{21,22}

On-scene time

The role of those healthcare workers attending to patients in an emergency setting outside of acute hospitals (usually paramedics or ambulance technicians – often referred to as pre-hospital clinicians), is to identify those patients who show signs of stroke and, after exclusion of those conditions that may mimic a stroke diagnosis and require alternative and urgent treatment, transport them to a CSC or ASC as soon as possible. One of the challenges facing paramedics is differentiating between patients having a stroke and those with symptoms that mimic a stroke. Sometimes, it will be relatively clear that a patient has had a stroke, but often it is not clear-cut and some patients with stroke will not exhibit any of the FAST symptoms. This presents a difficult balance for paramedics—it takes time to reach a more conclusive diagnosis in some cases of suspected stroke and it is important to avoid unnecessary conveyances to hospital, but speed is also of the essence. Technologies that could further help with decision-making on-scene are still in their infancy. A recent systematic review examined technologies (e.g. blood biomarkers and pre-hospital imaging) with existing care for diagnosis or stratification of patients in the pre-hospital setting, but concluded that the evidence to support their routine use was not yet sufficient.²³

Educating pre-hospital clinicians in the identification of stroke has not always been consistent. There has never been a minimum standard education package that these clinicians could access either within their own trusts or within their own time. A new educational website has been developed that had the endorsement of the Prehospital Stroke Consensus Group. The website has been adopted by a number of ambulance trusts across England, to be rolled out as the main source of education in stroke. Although initially intended to be for pre-hospital clinicians in the form of ambulance staff, it has been adopted by a number of other clinicians that work within the community setting.

²¹ Ragoschke-Schumm A, Walter S. DAWN and DEFUSE-3 trials: is time still important? *Radiologe*. 2018 Nov;58(Suppl 1):20-23. English. doi: 10.1007/s00117-018-0406-4. PMID: 29808241

²² Thomalla G, Boutitie F, Ma H, Koga M et al. Intravenous alteplase for stroke with unknown time of onset guided by advanced imaging: systematic review and meta-analysis of individual patient data. *The Lancet*, Vol 396, Issue 10262, pp. 1574-84, November 2020

²³ Lumley, H.A., Flynn, D., Shaw, L. et al. A scoping review of pre-hospital technology to assist ambulance personnel with patient diagnosis or stratification during the emergency assessment of suspected stroke. *BMC Emerg Med* 20, 30 (2020). <https://doi.org/10.1186/s12873-020-00323-0>

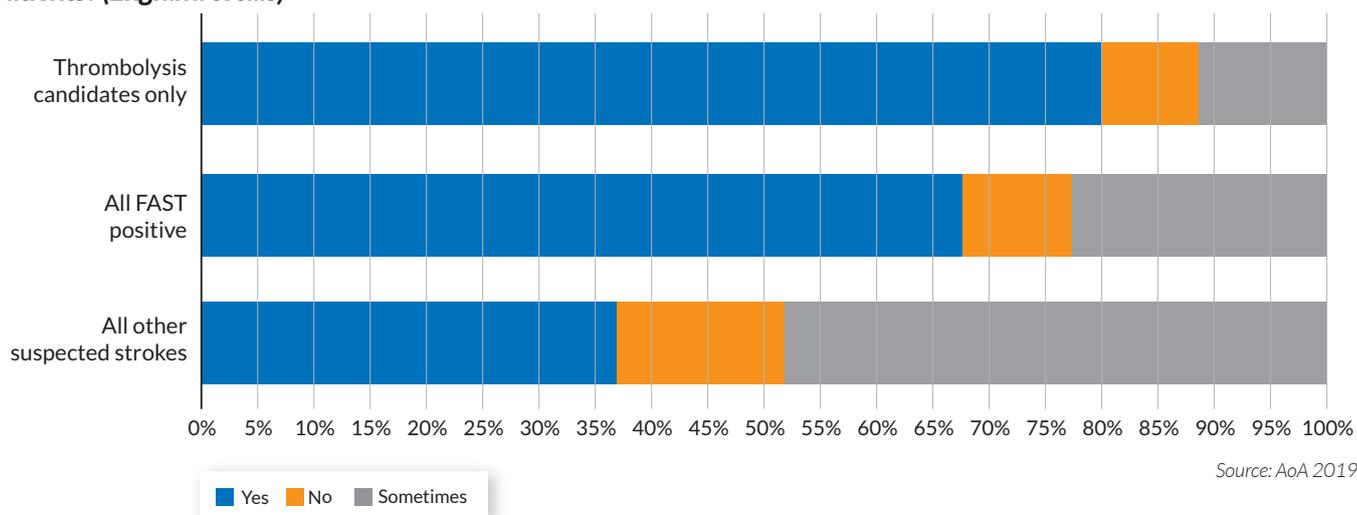
The website www.stroke-awareness.com is free to access and is being updated with new modules. The Prehospital Consensus Group envisages that the educational package that is on offer may be used by ambulance trusts across the country for their stroke education and universities that conduct training and instruction for pre-qualified ambulance staff.

Much can be done to support pre-hospital clinicians, with access to specialist advice so that they are not delayed at scene unnecessarily doing tests and can make rapid judgements about where to convey patients. There are examples of models of pre-hospital consultation where paramedics can speak with stroke consultants to reduce unnecessary conveyances to hospital for patients with a stroke mimic or TIA, that could otherwise quickly overwhelm services. Telemedicine assistance between the stroke consultant and the ambulance service (on tablet devices) has been tried with success in some sites – although to work effectively, stroke consultants need to be immediately available to give an opinion (paramedics cannot be expected to make multiple contact attempts) and systems must be easy and quick to use. Initial pilots across several large geographical areas have been successful to date (see case studies on pages 52 and 53).

In addition to helping pre-hospital triage, technology may also help speed up access to specialist assessment and treatment for patients with stroke upon arrival. Evidence suggests that pre-alerting increases speed once a patient arrives in hospital. For instance, one recent study looked at the association between pre-hospital assessments and notification by emergency medical service staff on the subsequent acute stroke care pathway. The authors found, after controlling for other factors, that patients who were FAST-positive or were pre-alerted, were more likely to receive a timely CT request in hospital.²⁴ **Figure 9** shows national (England) data on cases of stroke or suspected stroke where the stroke team is pre-alerted. Although pre-alerts are seen in up to 80% of patients that paramedics perceive as possibly amenable to IV thrombolysis, less than 40% of all patients are phoned through as a pre-alert. The pre-alerting of acute stroke teams for the impending arrival of all potential patients with stroke enables them to prepare for the arrival, coordinate imaging resources and for the ambulance team to be met on arrival. This was particularly pertinent in the COVID-19 pandemic era where additional precautionary measures may be required to prevent the nosocomial spread of infection.

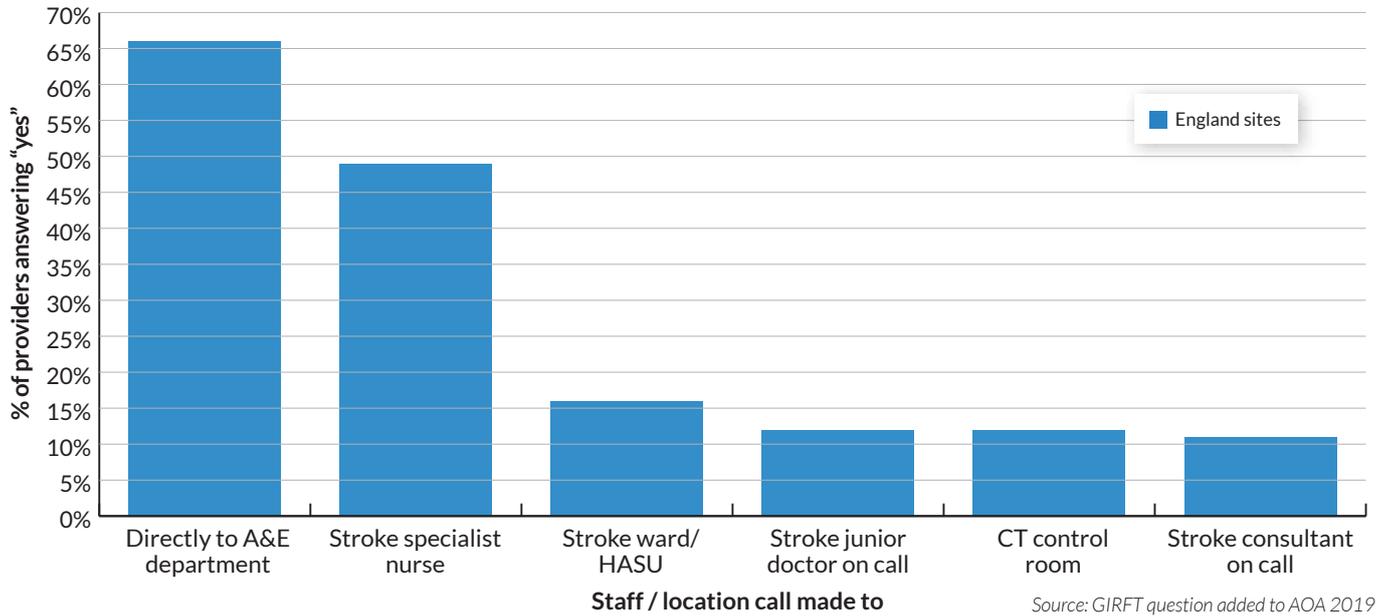
Most commonly, pre-alert calls are made directly to A&E rather than to a specialist stroke team member (**Figure 10**). From our visits we would recommend the latter, to enable an appropriate depth of detail to be ascertained from the call and allow an appropriate level of preparedness and response to follow.

Figure 9: Do the stroke team receive a pre-alert (telephone call) from your ambulance crews for suspected stroke patients? (England totals)



²⁴ Sheppard JP, Mellor RM, Greenfield S on behalf of the CLAHRC BBC investigators, et al The association between prehospital care and in-hospital treatment decisions in acute stroke: a cohort study *Emergency Medicine Journal* 2015;32:93-99.

Figure 10: If the stroke team receive a pre-alert, who is the call usually made to? (England totals)

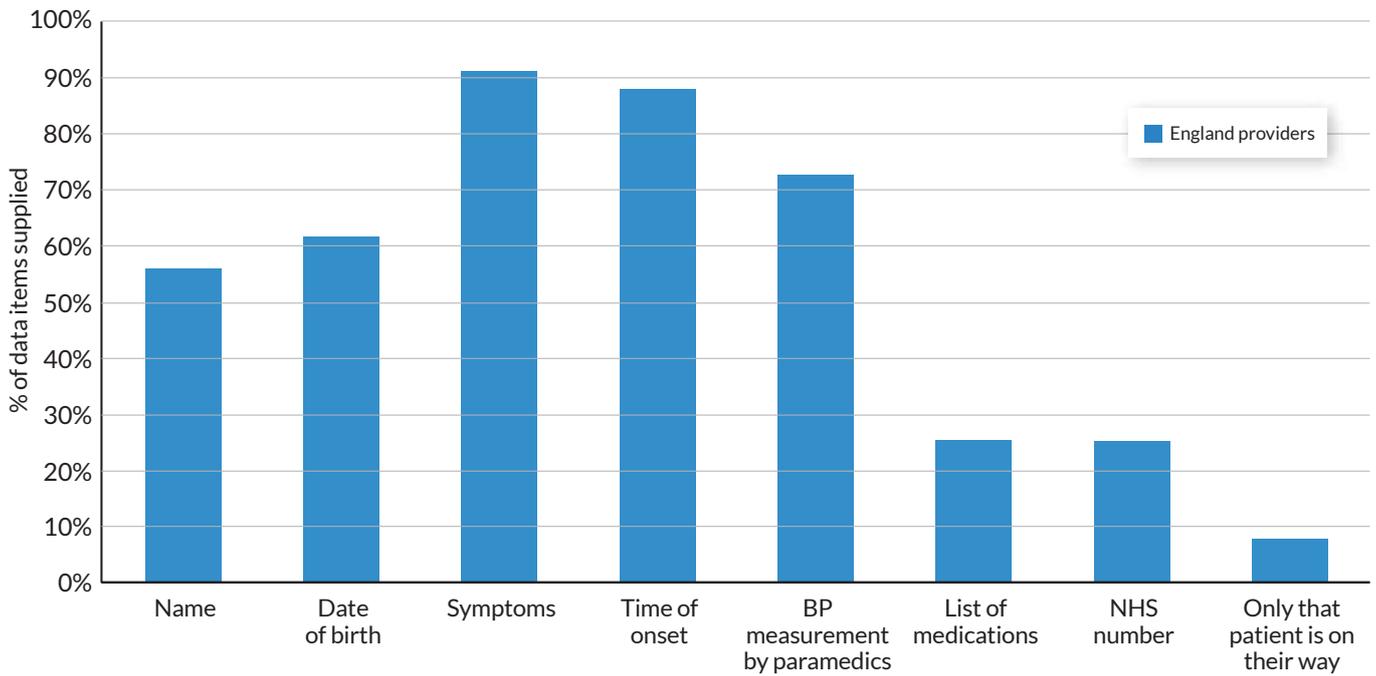


We also found that the information given to teams during the pre-alert call is variable (Figure 11). Notably, NHS number or local hospital number is often not included, meaning that imaging and any other time-critical diagnostics may not be consistently and reliably pre-ordered. As a consequence, very few units report patients being taken directly to CT on arrival by ambulance, nor are they able to pre-order scans.

Insight from GIRFT's data

Less than 12% of patients are taken directly to CT on arrival to hospital.

Figure 11: What information is usually provided by the paramedic crew when making pre-alert calls?



Source: GIRFT question added to AOA 2019

Whilst telephone-based pre-alerting is relatively common, it is much less common to use video-enabled telehealth services to review patients. Pilot data suggests greater specificity and sensitivity when pre-hospital assessment is video-assisted by secondary care stroke specialists.

Insight from GIRFT's data

Only 1% of units report using telehealth to review suspect stroke patients with ambulance crews.

IN PRACTICE

Telemedicine-enabled triage

South East Coast Ambulance Service and East Kent Hospitals University NHS Foundation Trust

The use of stroke telemedicine is an expanding field of research that has not been widely adopted or evaluated in the UK. A brief proof of concept pilot study, performed locally in November 2018, suggested that it would be feasible to utilise telemedicine in East Kent Hospitals University NHS Foundation Trust (EKHUFT). Telemedicine may be able to optimise the pre-hospital stroke pathway in several ways, including:

- Reducing time to assessment of patients presenting with acute neurology by a senior decision maker.
- Enabling appropriate triage to the local emergency department, hyper-acute stroke unit or thrombectomy centre.
- Reducing delays to treatment.
- Avoiding extended conveyance.

In the pilot, ambulance staff were provided with a live video-link (FaceTime) to either a Stroke Consultant or Registrar (out of hours). Stroke specialists recorded the details of consultations on an internal data collection form. Consultations were analysed over a 22-week period and patient outcomes were obtained from discharge and clinic letters.

The study reviewed 496 cases of suspected stroke and found that:

- 1/3 (34%) of calls were for patients who ended up with a confirmed stroke diagnosis.
- 7.6% of patients avoided ED or HASU attendance and were referred to TIA clinic.
- 36% of patients were diverted to a local ED, closer to them than transfer to the HASU.
- The mean call length was six minutes.
- Only 1 in 10 stroke specialists found the telemedicine system difficult to use.
- 86% of stroke specialists felt that telemedicine influenced decisions on patient destination.

The study concluded that up to one fifth of patients with stroke may have been missed if only FAST and ROSIER were used. Pre-hospital assessment of potential patients with stroke avoided local ED bypass and HASU attendance in 0.6/1000 pop/yr. The technology led to minimal delays on scene (six minutes) and the approach appeared to be a safe and efficient use of resources, with significant measurable benefits for the patient, ambulance and HASU staff.

IN PRACTICE

Video assisted triage

University College London Hospitals NHS Foundation Trust and the London Ambulance Service

As a collaboration between University College London Hospitals NHS Foundation Trust (UCLH) and the London Ambulance Service, a pilot video-assisted triage of patients with suspected acute stroke or Transient Ischaemic Attack (TIA) commenced in May 2020. The objective of the pilot service was to reduce stroke mimic presentations to the hyperacute stroke unit, optimise care for TIA and improve hyperacute acute stroke treatment delivery.

Following the delivery of a bespoke training programme to the London Ambulance Service crews, cases assessed at scene in North Central London and suspected of an acute stroke or TIA were discussed via a video platform with a duty stroke consultant based at UCLH. The consultation followed an agreed protocol with focus on the clinical history, obtained observations and a formalised abbreviated examination of the patient. The consultant and crew then agreed a management pathway of direct transfer to the hyperacute stroke unit (HASU), diversion to a local ED, diversion to a next day TIA clinic or for general practitioner follow up. Direct handover was then provided to the stroke team at the hyperacute stroke unit for all incoming patients and to the local ED for diverted patients. A standard data collection pro forma was completed for each patient to evaluate the safety of the pathway and the impact of the pathway on stroke care delivery.

Over a 4-month period, 362 suspected stroke or TIA cases were triaged of whom 204 (56%) were taken to their nearest HASU, 117 (32%) diverted to their local EDs, 22 (6%) to next day TIA clinics and 19 (5%) returned to LAS default pathway (Home/GP/Urgent care). Of the 204 cases taken to the HASU, the final diagnosis was stroke in 114 cases, TIA in 27, non-stroke in 60, and pending outcome in 3.

The median call time for HASU conveyances was 8 versus 11 minutes for diverted patients. There were five missed calls during this period and in 12 cases the video connection was judged poor though this only precluded assessment in two cases for which the default LAS pathway was followed. In only three cases was a diverted patient later transferred to the HASU.

The pilot suggests that the video triage-based system can be safe and effective at reducing stroke-mimic transfers to the HASU and technically possible using widely available technology.

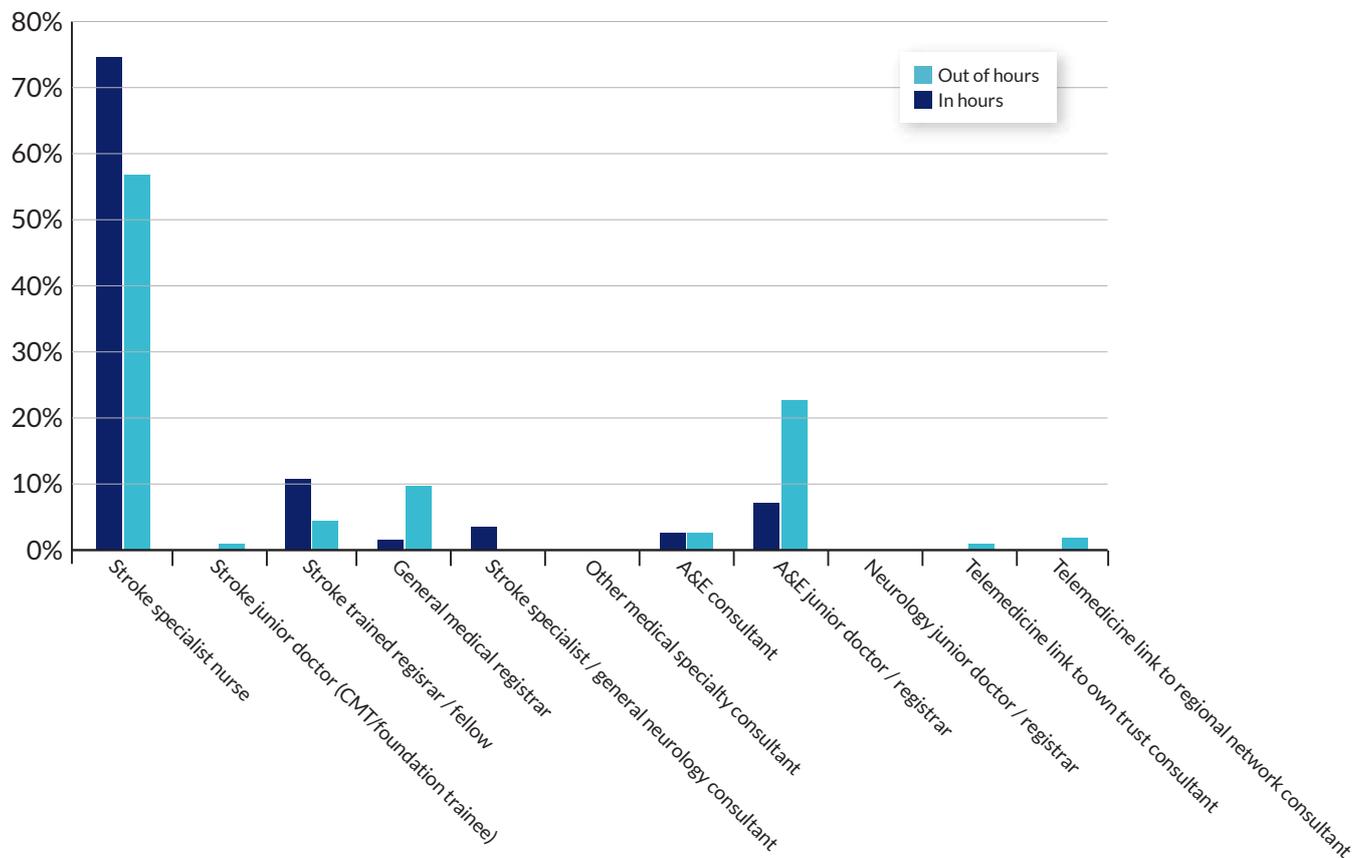
Travel from scene to CSC/ASC

National data on variations in the time taken to travel from scene to the nearest CSC/ASC was not available at the time of preparation for our visits, but anecdotally on our visits we heard concerns about delays. Whilst geography and road networks will have a big influence on this, we suggest that ISDNs review local data to identify if there are specific issues that impact local travel times.

CSC/ASC door to final handover

Ensuring that there is minimal delay from ambulance arrival at CSC or ASC to senior stroke decision maker assessment, brain imaging and intervention is paramount. Our data suggests that when patients with stroke arrive in core hours, they are very likely to be reviewed in the emergency department by a clinician trained in stroke medicine. Outside core hours, this likelihood drops and over a third of suspected patients with stroke are not assessed by a member of the stroke team (**Figure 12**). The consequence is likely to be a delay in accurate assessment, including access to imaging and appropriate treatment.

Figure 12: Who is the first person from any team to review a patient presenting to hospital with a suspected stroke?



Source: GIRFT question added to AOA 2019

From our meetings with providers, we detailed five distinct good practice steps to reduce handover times that we would recommend:

1. Rapid registration of patients (as soon as they arrive, details are entered onto patient administration systems (PAS) or before arrival in 'shadow form').
2. Met at 'front door' by stroke team.
3. Direct transfer to stroke assessment area either in the imaging department or close by.
4. Avoidance of moving patient from ambulance stretcher to hospital trolley before transfer to imaging suite.
5. Handover of patient details either undertaken on route / on scene / or simultaneously whilst moving through the hospital / onto the imaging table.

Those centres that employed all or some of the above also often spoke of the benefit of onward transmission to thrombectomy centre if paramedic teams are encouraged to complete documentation of response in the vicinity of the stroke assessment area. They are more likely to be on-hand if patients required onward conveyance to a thrombectomy centre.

IN PRACTICE

Stroke assessment hub

Mid Yorkshire Hospitals NHS Trust

Commencing in January 2019, Mid Yorkshire Hospitals NHS Trust put in place a project to deliver the local requirements to manage the increased stroke activity caused by reconfiguration of South Yorkshire HASU services by 1st October 2019. The stroke team realised that this was the perfect catalyst for improvements to its own pathways and that an innovative new approach would be required. The hub idea came alive as a way of ensuring all patients with stroke would access the stroke unit without the delays usually associated with bed availability. Not only would patients with stroke have access to thrombolysis immediately on arrival at the hospital, but also stroke mimic patients would be correctly assessed and placed according to their need in the right part of hospital.

To reconfigure its pathways to accommodate the increased activity and ensure the patient was first and centre of the service, a plan was proposed to develop a Stroke Assessment Hub (SAH). Key changes were:

- Increasing the number of beds used to assess patients with stroke from one to four.
- Transforming the TIA clinic into an ambulatory TIA service.
- Taking all patients with stroke and stroke mimics directly into the Stroke Assessment Hub, revolutionising the time taken to first stroke consultant assessment and thereby improving outcomes and saving lives.

As a consequence of the changes, patients now access a stroke assessment hub on the ward, delivering rapid assessment and treatment to all suspected patients with stroke. Mortality rates have improved and length of stay during rehab has halved. The shift has also delivered additional capacity.

The change relied on several enabling factors, including:

- Engagement with South Yorkshire around repatriation requirements.
- Transport and transfer learning events for paramedic colleagues to ensure they were prepared for this critical part of the new pathway.
- A new Patient Flow Policy setting out how teams would work to make sure patients are getting the care they need, when and where they need it.
- GP colleagues across the region were engaged with to explain the process for any patients who presented to primary care.

Actions and progress made during GIRFT's stroke programme

During GIRFT's stroke programme, the following actions have been completed or are in progress:

- Public Health England are refreshing a public health campaign to raise awareness of the symptoms of stroke and encourage the public to act on the first sign of stroke symptoms.

Recommendations to support improvements to the pre-hospital stroke pathway

Recommendation	Actions	Owners	Timescale
<p>4. ISDNs to draw up local emergency plans, informed by the data, to reduce symptom onset-to-door times. Work with regional and national ambulance teams to produce a 5% annual reduction from baseline and improve sensitivity and specificity of pre-hospital assessments.</p>	<p>a Train all ambulance crews in stroke recognition and ensure they are educated in the use of validated tools (e.g. FAST).</p>	Regional Ambulance Services	Within two years of publication
	<p>b Document and describe the case for rapid deployment of validated pre-hospital decision support aids, both digital tele-triage and physiological, and agree a timeline for implementation. Support the implementation of pre-hospital video triage for people with a suspected stroke in a selection of pilot areas. Share lessons learned with other areas and other clinical specialties to support implementation across the whole NHS in the long-term.</p>	GIRFT/NHSE&I National Stroke Programme, UEC Programme and ambulance trusts	Within 12 months of publication
	<p>c Review categorisation of 999 calls for patients with stroke symptoms. Determine the impact of extension of the recategorisation of stroke calls within each region to inform future categorisation changes.</p>	NHSE&I UEC Programme	Within 24 months of publication
	<p>d Approach royal colleges and HEE to agree upon content of training modules to support pre-hospital practitioners.</p>	NHSE&I/GIRFT programme	Within 12 months of publication
	<p>e Embed stroke competencies in paramedic training so staff can prepare patients appropriately for admission to hyper-acute stroke services according to agreed protocols.</p>	College of Paramedics	Within 12 months of publication
	<p>f Provide communication training to pre-hospital clinicians to help ambulance services manage patients with aphasia.</p>	College of Paramedics	Within two years of publication
	<p>g Provide ongoing stroke-specific training to pre-hospital clinicians as part of continuous professional development.</p>	HEE and College of Paramedics	Within 12 months of publication
	<p>h Establish a method to ensure that new evidence and guidance related to stroke care gets into front-line ambulance trust practice.</p>	NASMeD with Regional Ambulance Services	Within 12 months of publication
	<p>i Participate in local Stroke Research Network trials and studies.</p>	Regional Ambulance Services	Within six months of publication

Rapid access to appropriate imaging

The importance of imaging

Imaging is a fundamental component of the initial diagnosis and management of patients suspected of suffering a stroke. Imaging helps distinguish between haemorrhagic and ischaemic strokes, and provides important clinical data that will inform treatment such as the vascular territory of stroke, the aetiology of the stroke and alternative causes of the clinical symptoms.

Treatment interventions for patients having a stroke are dependent on the type of stroke they have had. It is therefore important that individuals suspected of having a stroke are given a brain scan as soon as possible to identify the type of stroke they have suffered and to make an assessment of whether brain tissue is salvageable. There was general appreciation during our visits of stroke teams' acknowledgement of the evidence for and desire to move away from time-based definitions of salvageable penumbra to an image-based strategy.²⁵

Different types of imaging give specific diagnostic insights. For example:

- CT scan is usually able to identify whether a patient has suffered a haemorrhagic stroke, whilst MRI gives a more accurate diagnosis for subtle or posterior circulatory ischaemic strokes.
- CT and MR angiogram identifies blood flow through cerebral arteries and is useful for assessing a patient's suitability for thrombectomy.
- CT and MR perfusion is used to identify salvageable brain tissue from irrevocably damaged brain tissue, which is useful when assessing a patient for recanalization therapy (thrombolysis or clot retrieval (thrombectomy)), particularly when patients are outside the standard criteria for either (i.e. wake up stroke, prolonged duration of symptoms, patients on anticoagulants).

Speed is also critical. Individuals with suspected acute stroke should have brain imaging with a non-enhanced CT as soon as possible, with current guidance advocating that this should be at least within one hour of arrival in hospital. For individuals with suspected Transient Ischaemic Attack (TIA), clinicians should use MRI after specialist assessment in a TIA clinic. The MRI should be performed on the same day as the assessment.

We also observed a shift in how imaging is being used by stroke clinicians. Historically, clinicians have used imaging to exclude other causes of the stroke-like symptoms, rather than to understand the brain in detail and positively confirm a stroke. There is a gradual shift from using imaging to exclude other pathologies as the cause of an episode and instead seeing imaging as a way of reaching a more sensitive and specific understanding of the aetiology of a stroke and benefit of treatment options.

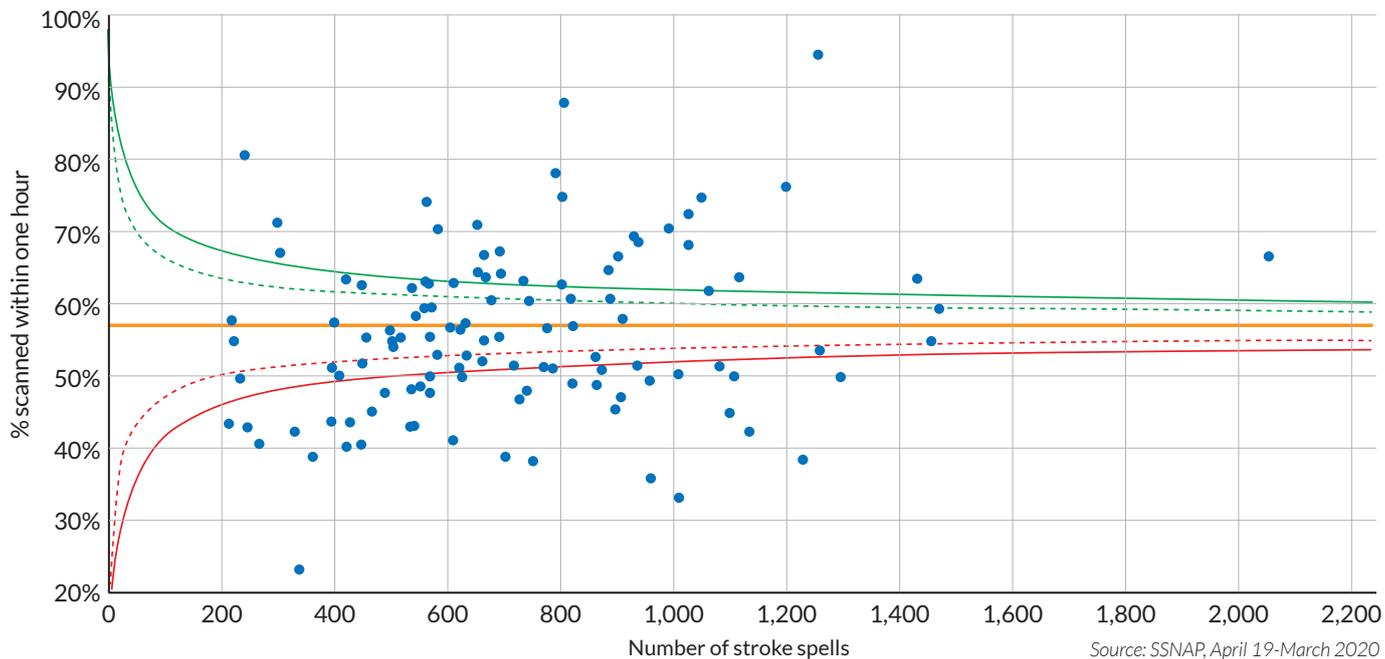
Standards for imaging are not being met

Data from SSNAP shows clearly that standards for rapid imaging are not currently being met. NICE guidance is to perform brain imaging immediately with a non-enhanced CT for people with suspected acute stroke.²⁶ **Figure 13** shows the proportion of patients with stroke being scanned within one hour of admission to hospital. Nationally, 43% of patients are not being scanned within the target, although data from SSNAP does suggest rates have improved over the last five years (in 2013/14 almost 60% of patients were not scanned within the hour of clock start).

²⁵ Ermine CM, Bivard A, Parsons MW, Baron J-C. The ischemic penumbra: From concept to reality. *International Journal of Stroke*. December 2020. doi:10.1177/1747493020975229

²⁶ *Stroke and transient ischaemic attack in over 16s: diagnosis and initial management, NICE guideline [NG128], 01 May 2019*

Figure 13: Proportion of patients scanned within one hour of clock start, by trust (England, April 2019 to March 2020)



Source: SSNAP, April 19-March 2020

Note: Green and red lines show +/- 2 standard deviations (dotted line) and 3 standard deviations (solid line)

During our visits, we found examples of localities that were achieving high rates of scanning of suspected patients with stroke within an hour of arrival to CSC or ASC.

IN PRACTICE

Excellent access to CT and door to needle times

Charing Cross Hospital, Imperial College Healthcare NHS Trust

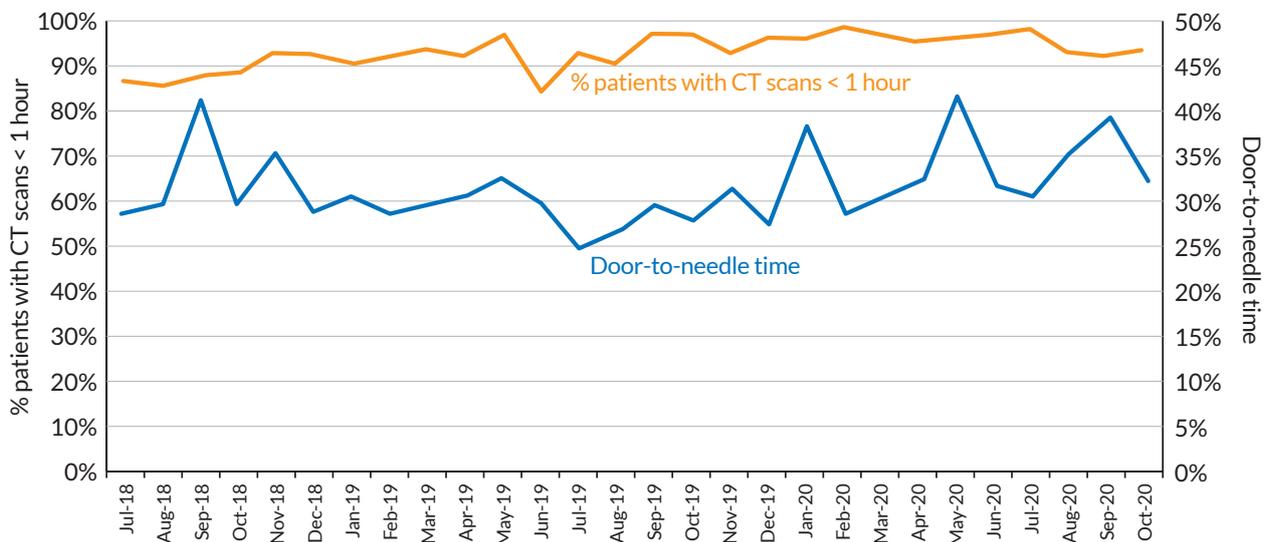
Charing Cross Hospital has an established stroke thrombolysis service which requires immediate access to CT brain for all FAST-positive admissions. Timely access to CT has long been recognised as pivotal to a high-functioning thrombolysis service. During the initial set-up of the HASU in 2010, integrated pathways with neuro-radiology input and buy-in was recognised to be an essential component of the thrombolysis service.

It was noted that door-to-needle times often varied over time, and the case for establishing a monthly door-to-needle (DTN) meeting was made, where every single stroke thrombolysis case and the interval times for door-to-CT and DTN are discussed. The DTN meeting is organised by a multidisciplinary team of stroke clinical nurse specialists (CNS) and one stroke registrar. It is well attended by all stroke consultants, trainees and specialist nurses who are present to explain any barriers or delays for their own cases that they have managed. The potential reasons for any delay for each patient are well documented, audited, and reported in the monthly scorecard that is signed off by the Department Manager and submitted to the Trust Management Team. Any thrombolysis delay of over 45 minutes for non-clinical reasons requires a root causes analysis.

There is also a monthly SSNAP & Clinical Quality meeting to monitor patient care process and clinical performance, discuss any barriers to good practice and agree on clear action plans and targets. There is also a weekly stroke education programme for the entire stroke multidisciplinary team, covering the entire stroke curriculum over a 6-monthly period on a rolling basis. The vital importance of 'time saved is brain saved' is repeatedly emphasised.

The chart below summarises the unit's performance on the proportion of patients with stroke receiving a CT scan within one hour and door-to-needle times. The unit is out-performing national norms on both measures.

Charing Cross Hospital: % patients with CT scan in less than 1 hour; door to needle time (July 2018-Oct 2020)

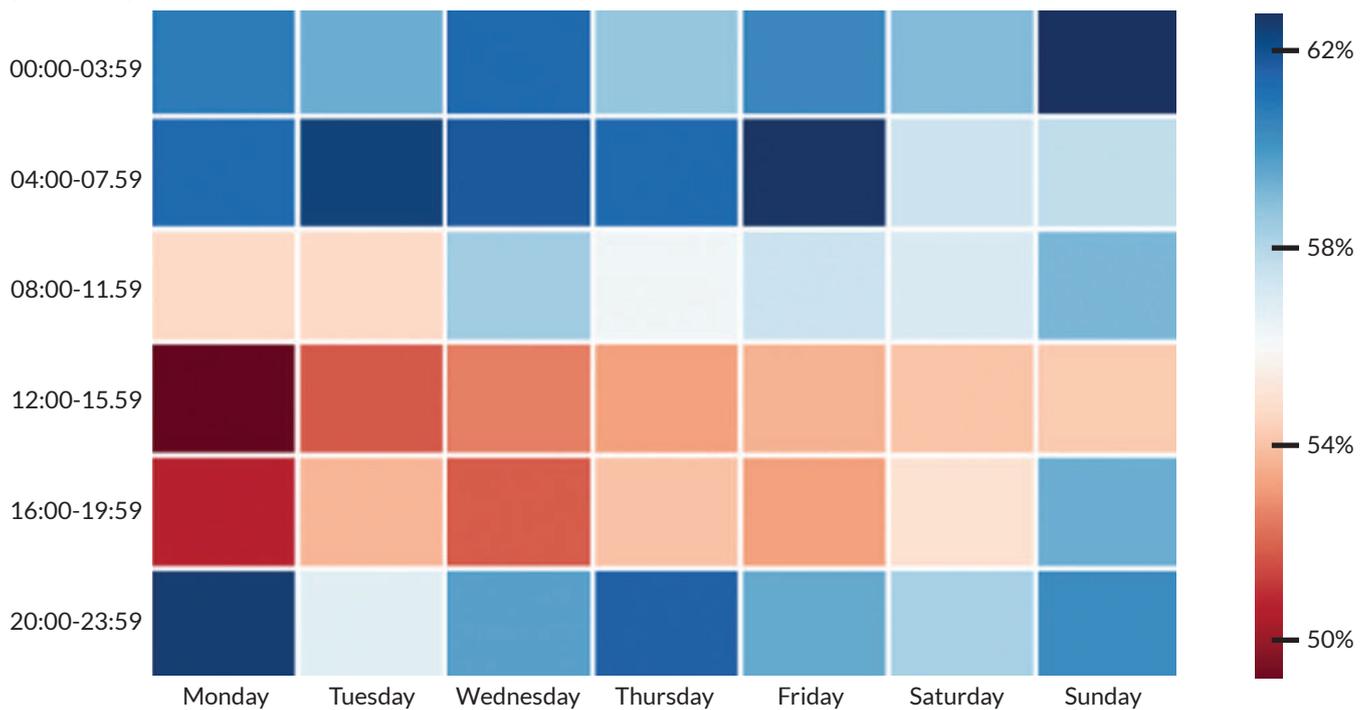


As seen for other specialties, there are also clear unwarranted variations in the time of day and day of week in access to CT brain imaging. For example, brain imaging within one hour of admission is less likely from noon to early evening (Figure 14), which is not only driven by radiology capacity. Other factors include consultant job planning, the availability of specialist stroke nurses with the ability to order brain scans, and priority relative to other specialties. There is also inequity in review of scans – inside core hours, scans are typically reviewed by a stroke consultant but, we found this less likely out of hours, with many services outsourcing image interpretation to a radiology third-party provider.

Insight from GIRFT's data

During core hours, 91% of units report that a stroke consultant on-site is responsible for reviewing images to inform decisions about thrombolysis and thrombectomy. Out of hours 21% of units used a remote radiology reporting HUB to interpret brain scans.

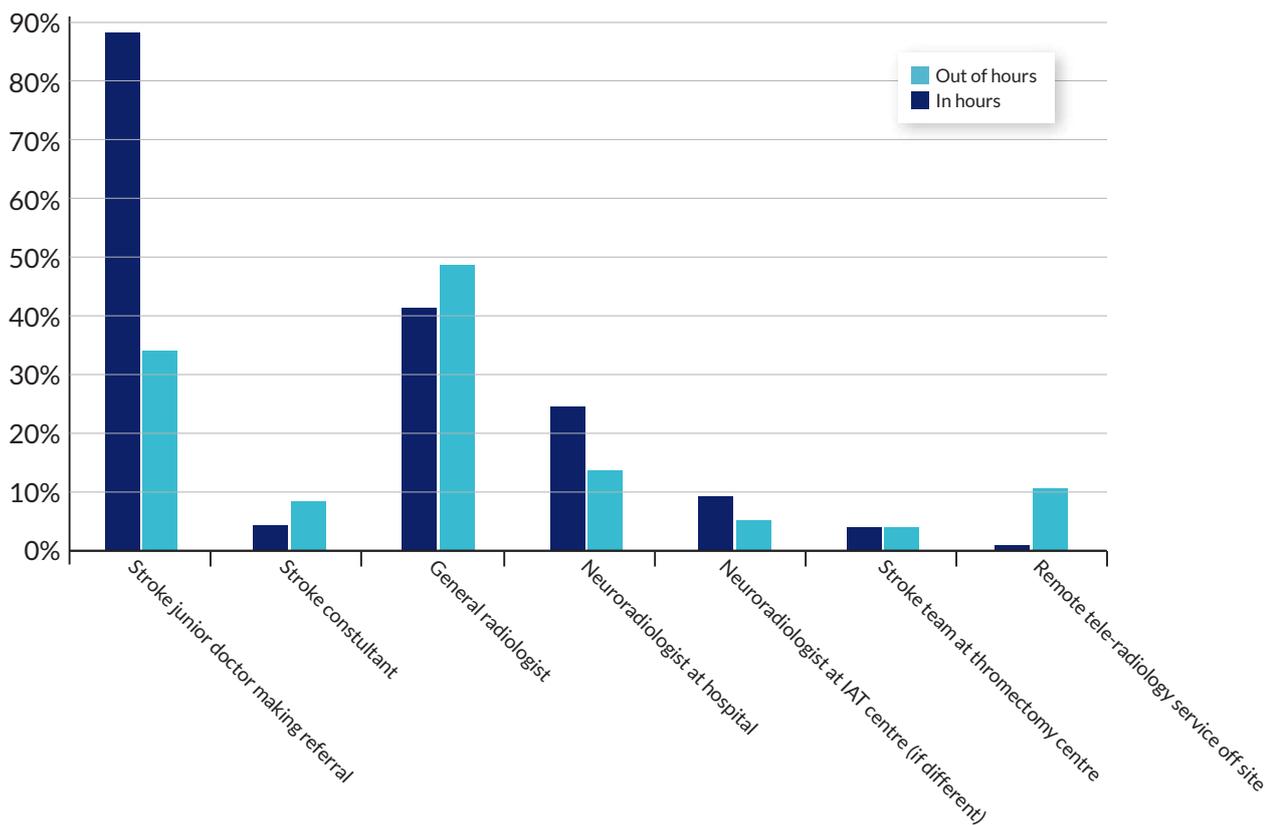
Figure 14: Daily and hourly variation in the likelihood of receiving a brain scan within one hour of admission (2019/20)



Source: SSNAP

There is also variation within and outside core hours on the individual making decisions about whether there is a large vessel occlusion on CTA imaging prior to transferring for thrombectomy. Within hours, this decision is usually made by a stroke doctor, but out of hours the decision is most likely made by a general radiologist or neuroradiologist (Figure 15).

Figure 15: Who makes the decision that there is a large vessel occlusion on CTA imaging prior to transferring for thrombectomy?

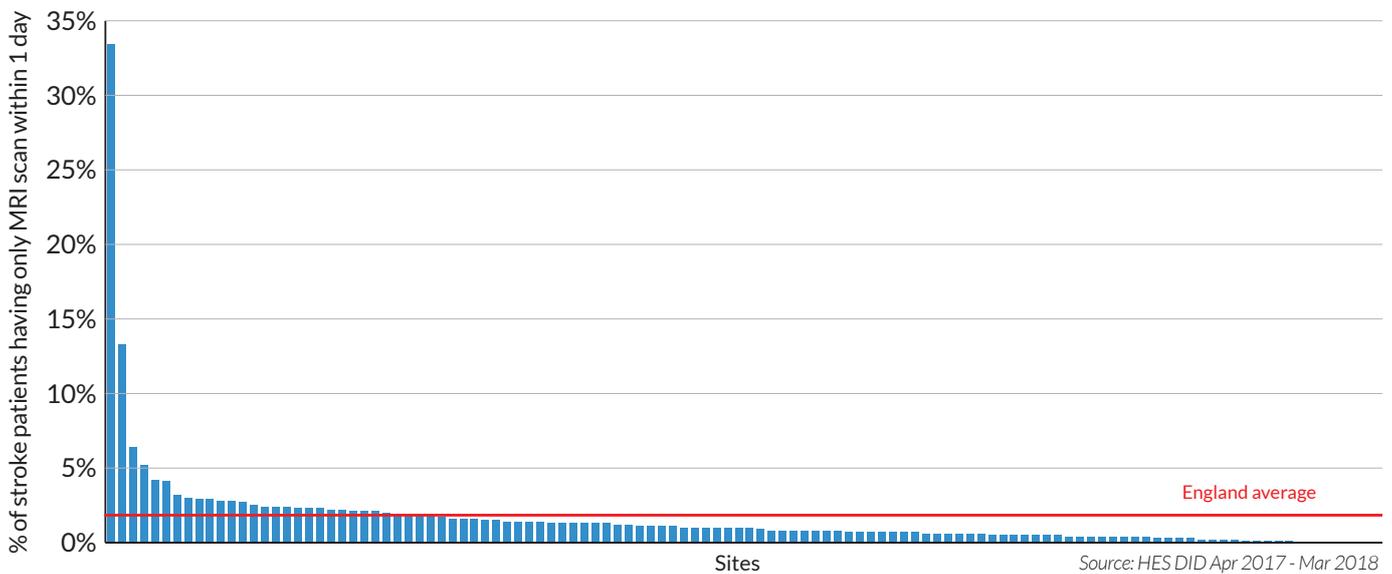


Note: percentages do not sum to 100% as units were able to select more than one option to reflect common local practices Source: GIRFT question added to AOA 2019

We also know that access to different types of imaging is highly variable, which impacts the ability to make accurate diagnoses. CT scans may not be sensitive enough to detect an infarct in patients with very early, subtle symptoms or in the posterior circulation. MRI is preferable to a CT to identify these patients. In one study, it was found that ischaemic stroke was accurately detected 83% of the time by MRI versus 26% of the time by CT.²⁷ However, MRI capacity tends to be more constrained than CT, and our use of DID data shows that use of MRI only as first-line scanning within 24 hours is low (England average is 1.8%) and varies across sites. This variation suggests that in some cases the most appropriate type of imaging is not being accessed fast enough to inform a diagnosis and treatment plan. The use of rapid but limited MRI sequences to detect blood and acute ischaemia will decrease scanning time and therefore improve accessibility to MRI scanning.

²⁷ Chalela JA, Kidwell CS, Nentwich LM, et al. Magnetic resonance imaging and computed tomography in emergency assessment of patients with suspected acute stroke: a prospective comparison, *Lancet*, 2007 Jan;369(9558):293-298.

Figure 16: Diagnostic imaging - MRI only in A&E before or on day of admission or following day in spell



Access to CT Angiography (CTA) is vital for many patients, particularly when patients are to be selected for thrombectomy. From our visits, 24/7 access to CTA was variable with many teams citing the lack of access to 24/7 thrombectomy as a reason why imaging departments were reluctant to offer this. There are many reasons for undertaking a CTA and poor access to thrombectomy is not an excuse for limiting CTAs.

Access to penumbra identification in those patients who fall out of current guidance for in-licence use of IV thrombolytics or for thrombectomy intervention over six hours was generally poor, based on feedback from our visits. We recommend a nationally adopted imaging strategy to overcome this.

Insight from GIRFT’s data

Less than 10% of units use CTP as initial imaging in cases of suspected stroke more than 4.5 hours from onset despite good evidence of its value.

The National Optimal Stroke Imaging Pathway (NOSIP)

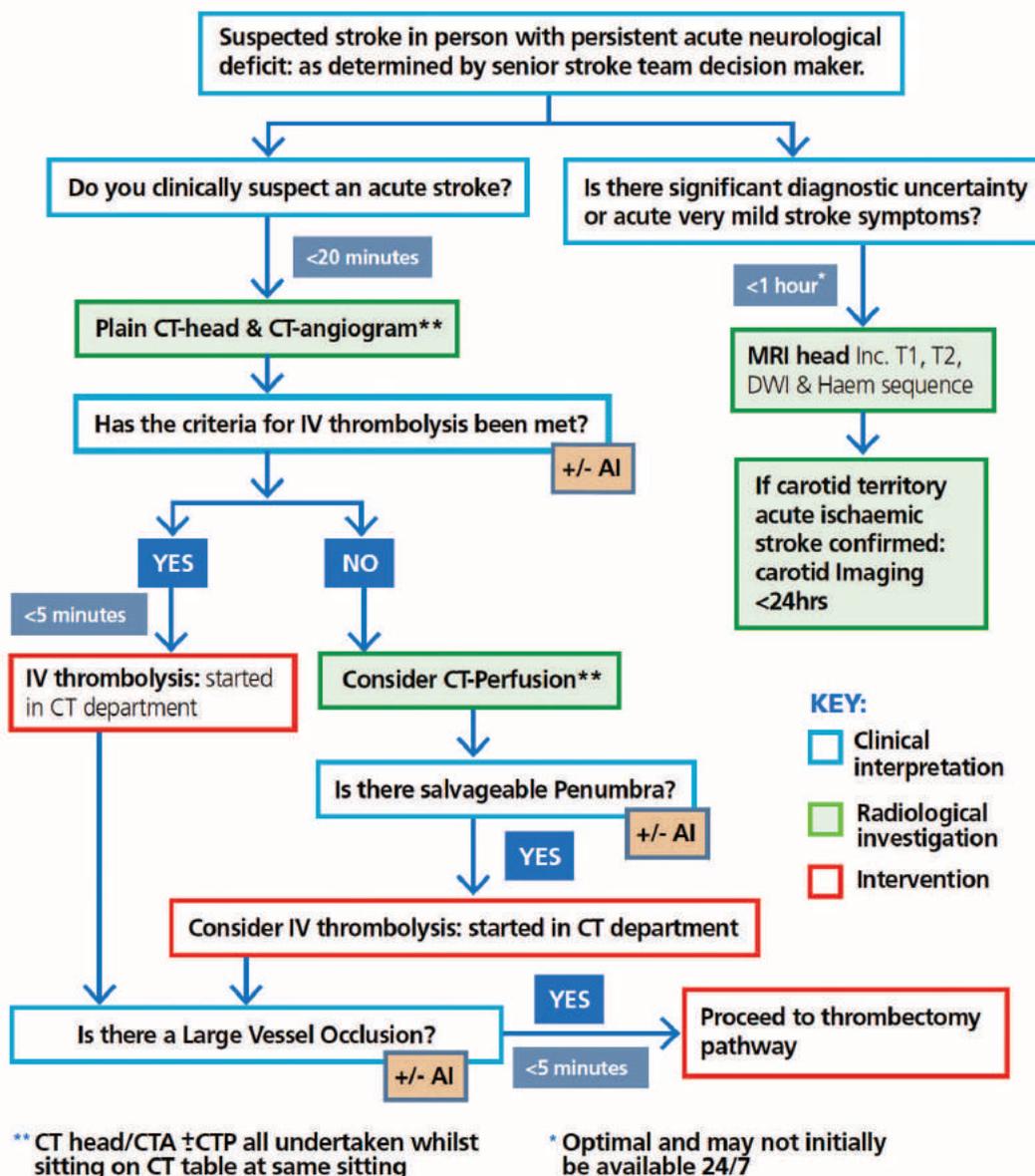
Neurovascular imaging, of both the brain and vessels supplying it, underpin the diagnosis and management decisions for the modern treatment of stroke disease. ISDNs should ensure that there is a networked agreement, as to the pivotal role of rapid imaging, using the most appropriate modality. This must be aligned to the most up to date evidence and national guidance. This will ensure limited imaging resources are used effectively whilst also enabling stroke teams to deliver cost efficient, time dependant interventions which reduce disability and/or extended hospital admissions. The use of artificial intelligence (AI) in stroke care should be encouraged and deployed in line with its certified and pre-specified use or within a research environment. Image sharing between centres within and external to each ISDN should be optimised to provide timely patient-centred decisions and align with ICS imaging networks.

A National Optimal Stroke Imaging Pathway (NOSIP) has been developed, based upon our visits and the best evidence and extensive expert consensus. Those consulted include the NHS National Imaging Board and the Intercollegiate Stroke Working Party. The evidence underpinning the pathway is available in NICE guidance and a review of the evidence about the commissioning of stroke services, completed by King’s College London.²⁸

²⁸ King’s College London, Stroke pathway – Evidence Base Commissioning: An Evidence Review, December 2020

The pathway is shown in **Figure 17** and is intended as a guide to best practice, accepting that there may be variations in individual cases. Elements of the pathway are aspirational and may not be fully achievable in the short term without local and regional investment (e.g. MRI within one hour), but it sets a clear standard that puts the interests and needs of patients first. This pathway is now published as part of the National Stroke Service Model.

Figure 17: National Optimal Stroke Imaging Pathway (NOSIP)



Source: NHS England and NHS Improvement, National Stroke Service Model: Integrated Stroke Delivery Networks, May 2021

Localities must make best use of available imaging capacity to ensure rapid access. Recognising there are constraints around the capacity of imaging services and given the importance of speed, localities will need to come together to ensure the pathway is implemented. This should be coordinated through the ISDNs and diagnostic networks.

We recognise that this will present challenges around imaging capacity, and also that implementing an effective pathway is not just a question of physical capacity – interpreting imaging and having the infrastructure to share images easily within clinical teams is also important. The remainder of this section identifies practical steps that may deliver improvements in timely access to appropriate imaging for patients that may have had a stroke.

Actions to improve rapid access to imaging

There are several actions that systems can take to support implementation of the National Optimal Stroke Imaging Pathway (NOSIP).

Gap analysis

So that there is a common understanding of the difficulties in current access to imaging, we recommend that ISDNs lead a gap analysis so that there is a locally agreed view of the current position regarding access to imaging services for patients with stroke. We suggest starting with data from SSNAP as in theory this should give a consistent trend of data, but we recognise that will need to be augmented with local intelligence. Importantly, ISDNs should agree the metrics they will use to track and monitor access to imaging and must agree local protocols for recording data. This helps to ensure it is consistent across a geography and has a meaningful input in local planning and quality improvement discussions. We recommend the routine use of DID data to supplement SSNAP datasets.

Improving access to imaging

The need to improve access to imaging was acknowledged in the NHS Long Term Plan in 2019. Professor Sir Mike Richards was subsequently commissioned to prepare a report for NHS England about practical steps that could be taken to improve this. Sir Mike's report, published in October 2020, sets out several practical recommendations related to patient pathways and shifting imaging resources towards community settings rather than being predominantly acute-focused. His key recommendations include:²⁹

- Acute and elective diagnostics should be separated wherever possible to increase efficiency.
- Acute diagnostic services (for A&E and inpatient care) should be improved so that patients who require CT scanning or ultrasound from A&E can be imaged without delay. Inpatients needing CT or MRI should be able to be scanned on the day of request.
- Community diagnostic hubs should be established away from acute hospital sites and kept as clear of COVID-19 as possible.
- Diagnostic services should be organised so that as far as possible patients only have to attend once and, where appropriate, they should be tested for COVID-19 before diagnostic tests are undertaken.
- Community phlebotomy services should be improved, so that all patients can have blood samples taken close to their homes, at least six days a week, without needing to come to acute hospitals.

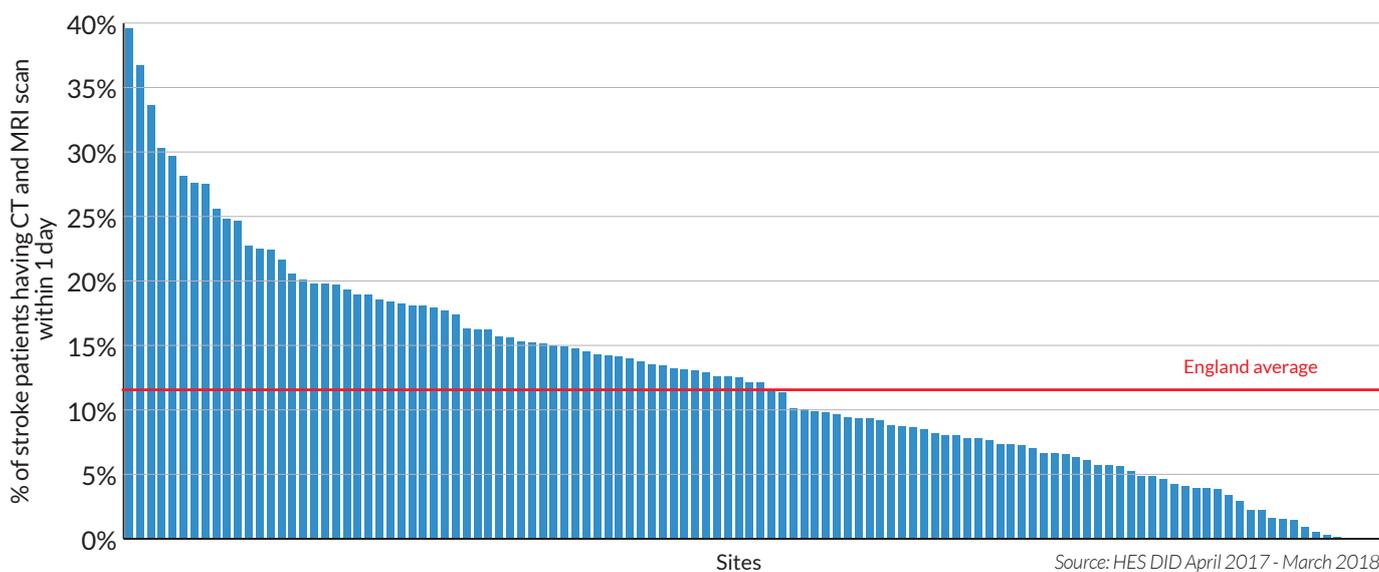
These recommendations will require significant investment in workforce and facilities to deliver improvement. In the November 2020 Spending Review, the Chancellor announced an additional £325m of investment to upgrade imaging equipment. An expansion in the co-capabilities of radiographers may assist. We note there are actions that localities can begin to address now, which will have a material impact on access to imaging by making more effective use of the limited capacity that is currently available.

Most patients that are suspected of having a stroke will generally need a CT or MRI scan, but usually not both initially. In many centres the appreciation of the need for MR imaging initially as a first line investigation was acknowledged although access was limited so patients received an initial CT and then subsequent MRI within a few hours or days of admission. Many teams acknowledged from our visits that this was an unnecessary duplication and waste of imaging resources without clear patient or system benefits from having both. Data from the Diagnostic Imaging Dataset (DID) shows that a significant proportion of individuals (12% of confirmed patients with stroke) receive both a CT and an MRI within the first 24 hours.

²⁹ Sir Mike Richards *Diagnostics: Recovery and Renewal*, available at <https://www.england.nhs.uk/publication/diagnostics-recovery-and-renewal-report-of-the-independent-review-of-diagnostic-services-for-nhs-england/>

This is equivalent to 8,850 patients per year (based on imaging data for 2017/18) and varies widely across trusts (see **Figure 18**). Adherence to the NOSIP will ensure that more patients get the right scan first time round, removing duplication and freeing up CT capacity. We recommend that local systems monitor duplication and target support where the data shows that improved initial assessment and triaging could reduce duplication of imaging. Careful oversight from the senior stroke team decision maker is required in adoption of the NOSIP to ensure that there is a clear rationale, that is likely to improve the patient experience or outcome, when ordering a first-line urgent MRI scan.

Figure 18: Diagnostic Imaging - CT and MRI in A&E before spell or on day of admission or following day in spell



Similarly, during our visits we noted that some localities have higher rates of MRI usage for first-line imaging (see **Figure 16**). We recommend that localities with higher usage of MRI share their imaging delivery models so that other centres can explore opportunities to replicate this. CT and CTA is still the preferred imaging modality for reperfusion identification as outlined in the NOSIP.

To improve patient access to reperfusion strategies and meet national imaging targets, CSCs and ASCs must be able to offer 24/7 scanning. From our meetings with all stroke providers we noted that very few centres are currently able to offer 24/7 access to MRI outside of the 24 neuroscience centres in England. Nationally there is some way to go before a 24/7 scanning of all modalities is available for all suspected patients with stroke. As a pragmatic first step, we recommend that all networks should work towards offering 8am to 10pm MRI routine scanning available seven days a week for all TIA and minor stroke patients, as outlined in the NOSIP.

IN PRACTICE

Rapid access to MRI

University College London Hospitals NHS Foundation Trust

In April 2017, the University College London Hospitals (UCLH) NHS Foundation Trust Stroke Service initiated a model of providing MRI for all appropriate patients admitted via the hyperacute stroke team with stroke, high-risk TIA or a possible stroke mimic presentation. This service development had been made possible by initial pump priming funding provided by the UCLH/UCL Biomedical Research Centre and increased the daily MRI scan resource available to the hyperacute stroke service from approximately 18 MRI slots per week to approximately 40 MRI slots. In addition, several limited sequence scan slots were made available to the daily TIA service. In total approximately 80% of all patients admitted to the hyperacute stroke unit with stroke or possible stroke accessed acute MRI in this time with approximately 10% judged by the stroke team to be inappropriate and 10% with contraindication to MRI. The model continued up until the time of the hyperacute stroke service site move in March 2020 and has further evolved since unification of the service on one site. The model has allowed for a series of benefits in patient care and in bed management.

Through a process of iteration, the final model at the UCLH site allowed early morning slots to be made available for patients with uncertain or likely stroke mimic diagnoses and the afternoon slots to be made available to confirm stroke diagnosis and inform on infarct / haemorrhage pattern and likely mechanism or to allow for 'direct to MRI' presentations to our Emergency Department.

The specific gains that this model allowed for the service were as follows:

- Cases with uncertain diagnosis had definitive imaging early each day and this minimised time to diagnosis and facilitated discharge of stroke mimic cases within 24 hours of admission.
- Creation of a direct patient transfer pathway from the ED to the MRI department to reduce need for CT imaging, create a process of facilitated discharge from ED of stroke mimic and minor stroke and inform thrombolysis decision making in cases with unclear time of onset or with complex clinical presentation.
- Opportunity for confident imaging informed diagnosis in the majority of cases to facilitate Early Supported Discharge, Acute Stroke Unit referral and onward referral to medical teams.
- Transformation of team perspective on the value of MRI in CT visible haemorrhage cases to inform decision making about further investigation and antithrombotic treatment of co-existent comorbidity.

The impact of this model is noted in the HES 2017-2018 data set showing that UCLH stroke service had the shortest mean length of stay in England for all stroke spells and amongst the shortest in England for admissions for patients discharged to home.

The change relied in several enabling factors, including:

- Engagement with the neuroradiology department to develop the initial model and test feasibility of increasing patient access to MR scans and associated additional scan reporting requirements.
- Engagement with the porters, ED and with radiography to maximise scan time and scan tolerance.
- Engagement with trust management to agree continuation of the system at the end of the pump priming funding period.
- Engagement with radiology departments across the trust to ensure MRI capacity following the move to a new hospital site.

Enabling interpretation of imaging

Reliable interpretation of imaging is a critical part of the stroke pathway. The initial interpretation of brain scans, within minutes of a patient having had the brain scan, is usually undertaken by the specialist stroke doctor treating the patient who has competency to interpret images. A formal radiology report follows, with good joint working between stroke and radiology professionals.

Insight from GIRFT's data

46.5% of units report that brain imaging is always reviewed by a radiologist with a specific competency in neurovascular imaging at some point in the patient journey.

We recognise that there are workforce issues associated with increasing capacity to meet imaging targets and to implement the NOSIP and 24/7 models of imaging. Technology may help. Specifically, we are now seeing examples where artificial intelligence (AI) can be used to support image interpretation. This is not akin to replacing clinical interpretation with machines, but using AI-driven decision support models to aid clinicians in interpreting stroke images.

AI decision-support tools may reduce the time to decision making for both thrombolysis and thrombectomy, possibly increasing the numbers of patients eligible for both interventions and improving the likely benefit from the intervention (inverse relationship between time to treatment and outcome). Currently it takes only 2-3 minutes for interpretation of a brain perfusion scan using AI, against 25-30 minutes using non-AI conventional formatting.

AI image interpretation in stroke care has been studied since 2000.³⁰ There is now a consensus in the stroke and neuro-radiology community that AI is as at least as good as, and upon occasions possibly better than, treating stroke doctors³¹ and experienced neuroradiologists³² in interpreting specific elements of the CT brain scan that are needed to select patients for disability-saving interventions (thrombolysis and thrombectomy).

³⁰ Fiez JA, Damasio H, Grabowski TJ. Lesion segmentation and manual warping to a reference brain: intra- and interobserver reliability. *Hum Brain Mapp.* 2000;9:192-211

³¹ See for example:

- Performance of e-ASPECTS software in comparison to that of stroke physicians on assessing CT scans of acute ischemic stroke patients. *Int J Stroke* 2016 <https://doi.org/10.1177/1747493016632244>
- Guberina N, Dietrich U, Radbruch A, Goebel J, Deuschl C, Ringelstein A, et al. Detection of early infarction signs with machine learning-based diagnosis by means of the Alberta Stroke Program Early CT score (ASPECTS) in the clinical routine. *Neuroradiology.* 2018;60:889-901
- Chriashkova J et al. e-ASPECTS Improves Sensitivity to Early Ischemic Injury on Acute Computed Tomography Scans. *Stroke.* 2019;50 presented at the International Stroke Conference 2019
- Grunwald IQ, Kulikovski J, Reith W, Gerry S, Namias R, Politi M, et al. Collateral Automation for Triage in Stroke: Evaluating Automated Scoring of Collaterals in Acute Stroke on Computed Tomography Scans. *Cerebrovasc Dis.* 2019:1-6

³² See for example:

- Neuhaus A, Seyedsaadat SM, Mihal D, Benson J, Mark I, Kallmes DF, et al. Region-specific agreement in ASPECTS estimation between neuroradiologists and e-ASPECTS software. *J Neurointerv Surg.* 2019
- Austein F, Wodarg F, Jurgensen N, Huhndorf M, Meyne J, Lindner T, et al. Automated versus manual imaging assessment of early ischemic changes in acute stroke: comparison of two software packages and expert consensus. *Eur Radiol.* 2019
- Nagel S, Sinha D, Day D, Reith W, Chapot R, Papanagiotou P, et al. e-ASPECTS software is non-inferior to neuroradiologists in applying the ASPECT score to computed tomography scans of acute ischemic stroke patients. *Int J Stroke.* 2017;12:615-622

IN PRACTICE

Insight into the brain – artificial intelligence in stroke management

University Hospitals of North Midlands NHS Trust

An artificial intelligence (AI) platform for stroke imaging was introduced at the University Hospitals of North Midlands (UHNM) NHS Trust. The AI platform in acute stroke facilitates clinical decision-making, optimises patient triage and transfer, and improves workflow efficiency allowing patients with stroke to be diagnosed and treated rapidly and thereby improving clinical outcomes. The technology also facilitates communication and collaboration between district hospitals and specialists at tertiary hospitals in making appropriate patient selection and thus expediting transfers to these specialty centres. AI imaging also helps in treating wake-up strokes and strokes of unknown symptom, by providing positive diagnostic insight through perfusion imaging to the treating clinicians and thus ensuring accurate therapeutic intervention in the shortest possible time.

The AI technology in acute stroke has been used at the UHNM for many years, but was incorporated into the stroke/thrombectomy imaging pathway and stroke workflow on a routine basis in 2019 through AI imaging solutions. AI is one of the fastest and most advanced imaging technologies, reducing image processing and analysis time to less than two minutes. Effective stroke treatment must be planned with an optimised workflow, reducing delays and bottlenecks and maximising prompt treatment. Implementing a successful treatment protocol requires coordination of multiple providers and specialists into teams.

A teamwork between AI manufacturers and clinical teams currently exists, with a distribution agreement to provide AI software packages to centres using their stroke solution products. UHNM have secured the AI package through their annual manufacturer user contract, and there were no additional costs incurred for its installation.

These tools are in existence and have great potential to streamline pathways across a network but mechanisms for integration with existing diagnostic systems are still under development/evaluation. At the time of our visits, very few (<5) of the stroke units were using AI routinely, outside of a research setting, to assist in the diagnosis and treatment decisions for patients with stroke. This has been in part due to a lack of funding, lack of national governance assurance and regional IT support. There were a further 40 or so units who have elements of AI that they use for patients who are recruited into research studies and ad hoc for others; there are now over 72 stroke centres routinely using AI decision-support tools. To facilitate the roll-out of AI to support stroke services, GIRFT has worked with the NHS Shared Business Services to complete a Framework Agreement that aims to give a simple, effective, efficient and compliant route that NHS organisations may use to purchase/supply the range of stroke AI products and services. We recommend that AI software is procured in this manner and not upon a dependency of using the provider's other products.

IN PRACTICE

AI for patient selection for intracranial thrombectomy

There are commercially available decision support tools for assessing stroke signs on plain CT brain scans. It is an AI-enabled software that classifies the signs of ischemic damage and automates and standardises ASPECT scores (these scores are a 10-point scale for assessing mild cerebral artery stroke). ASPECTS is recommended as one of the essential imaging criteria for thrombectomy by the American Heart Association, American Stroke Association, European Stroke Organisation and European Society of Neuroradiology guidelines. Studies have shown significant inter- and intra-rater variability and most UK hospitals do not have 24/7 specialist neuroradiology support. Endovascular stroke treatment is only available in specialist centres and patients need to be stratified based on imaging prior to transfer but with a minimum delay.

Initial studies of the effectiveness of AI shows that it provides near instant scoring of non-contrast CT and instant transmission of score and imaging results, facilitating fast decision to treatment times (20.8 minutes within, 67.5 minutes out of hours). It correlated with expert neuroradiologist ASPECT scoring.

AI tools easily integrate into the thrombectomy pathway. It should be used in peripheral centres (where neuroradiology opinion is not immediately available) to decide on transfer to specialist centres or in specialist centres to streamline and speed up endovascular pathways.

Sharing of images across hospitals

To allow clinicians to accept patients at Comprehensive Stroke Centres, there needs to be a rapid transfer of imaging of sufficient quality. This requires the ability to share images amongst clinicians, including staff working remotely, at high speed and with good image quality. Staff need to be trained to use the relevant systems. GIRFT's national specialty report for radiology highlights that 'there are still too many challenges with sharing images and reports between trusts, and with any private sector providers.' Often this is because picture archiving and communication systems (PACS) are incompatible with one another or out of date.³³ This is consistent with our findings - delays in sharing images was raised as a concern in many localities during our visits, particularly in identifying patients that would benefit from thrombectomy. As discussed elsewhere in this report, rates of thrombectomy in the NHS are well below international norms - in part because patients are not being identified early enough in the pathway for thrombectomy to be effective. We specifically heard examples where delays in the transfer of images from ASCs (spokes) to CSCs (hubs) raised significant difficulties for patients accessing thrombectomy.

Systems that share images as part of their artificial intelligence software package to support decision making may also be used. These have the advantages of offering rapid image interpretation to support early referral for thrombolysis or thrombectomy, and rapid image transfer.

IN PRACTICE

Use of AI-driven software to support imaging³⁴

Royal Berkshire NHS Foundation Trust

The Royal Berkshire Hospital, supported by the Oxford Academic Health Science Network, has started using AI-driven imaging support software to support physicians in identifying patients with stroke who would most likely benefit from specific interventions such as thrombectomy. The software includes tools for non-contrast CT and CT angiography brain scans, connecting physicians and facilitating information transfer. Previously, CT brain scans had to be reviewed by a specialist in limited locations. Now they can be seen within a few minutes of being processed - anywhere, any time - and advice given immediately. This reduces time to intervention, which is crucial to ensuring patients have the best recovery after a stroke.

³³ GIRFT Radiology: National Specialty Report, November 2020

³⁴ <https://www.oxfordahsn.org/our-work/covid-19/covid-19-case-studies/ai-technology-speeds-up-stroke-care-and-reduces-costs/>

Actions and progress made during GIRFT's stroke programme

During GIRFT's stroke programme, the following actions have been completed or are in progress:

- The NOSIP has been developed, with active engagement from a range of stakeholders, and has been published within the NSSM.
- Units are working towards implementation elements of the NOSIP, based on feedback from our GIRFT visits.
- NHS Shared Business Services and NHSX are actively engaged in reviewing the use of AI technologies to support image interpretation and support a national roll-out.

We are also aware that GIRFT's radiology programme is progressing work to support many of the issues and recommendations highlighted in this report. The recommendations we have made below for stroke should be considered alongside those made in GIRFT's radiology report to build workforce and physical capacity, ensure consistency across units and make the best of technologies to support image interpretation.

Recommendations to ensure rapid access to imaging

Recommendation	Actions	Owners	Timescale
5. Implement the National Optimal Stroke Imaging Pathway, including: <ul style="list-style-type: none"> • working towards 24/7 access to imaging • aligning with NICE guidance for TIA • reducing unwarranted variation in poor access to MRI • improving brain imaging within one hour of arrival for all patients with stroke • reducing duplication of MRI and CT within 24 hours of arrival; • ensuring 24/7 access to CT angiogram and CT perfusion; and • incorporating guidance from Sir Mike Richards' diagnostic imaging review. 	a Develop detailed implementation plans for delivering the NOSIP, with support from relevant stakeholders (including Royal College of Radiologists and Society of Radiographers).	NHSE&I National Stroke Programme	Within 12 months of publication
	b ISDNs to work with Imaging Networks to perform a gap analysis of current imaging practice against NOSIP, agree a local plan and actively monitor progress towards implementation.	ISDNs	Within 12 months of publication
	c Consider community diagnostic centres for the delivery of TIA imaging.	ISDNs	Within 12 months of publication
	d Review the workforce requirements of all radiology services to ensure their establishment is correct. All services should maximise recruitment and retention and all staff should be supported to work to the top of their licence (Recommendation 4 of GIRFT's radiology report https://www.gettingitrightfirsttime.co.uk/wp-content/uploads/2020/11/GIRFT-radiology-report.pdf).	GIRFT, HEE, NHSE&I, RCR, SoR and individual trusts (as per recommendation of GIRFT's radiology report)	For progress within six months of publication (18 months for trusts to include dedicated CPD time in job planning)
6. Provide infrastructure, training and technology to share images between hospitals and clinicians to support image interpretation (see also Recommendation 9 from GIRFT's Radiology National Specialty Report - All trusts must meet the RCR standards for the use of IT).	a Support ICSs, ISDNs and trusts to ensure rapid inter-hospital sharing of imaging is available.	Diagnostic Networks, NHSX and NHS Digital	Within 12 months of publication
	b Develop training to support stroke clinicians to interpret imaging, leveraging Imaging Network subspecialist expertise and opinion. Encourage and promote the delivery of stroke-specific training workshops, reporting into the Thrombectomy Implementation Group (TIG) for oversight purposes	ICSs, ISDNs, and provider organisations	Within 12 months of publication
	c Increase regional availability of AI decision-support tools and training.	NHSE&I National Stroke Programme	Within 12 months of publication
	d Provide national support for regional roll-out of AI working closely with ISDN footprints.	NHSE&I National Stroke Programme	Within 12 months of publication

Hyper acute and acute inpatient stroke care

Access to organised inpatient stroke care

There has been strong evidence for many years that treatment at specialised stroke units, offering rapid access to the range of appropriate assessments and multidisciplinary expertise and intervention, is associated with lower mortality and lower rates of post-hospital disability.³⁵ Hyper acute stroke care brings together expert clinical assessment, rapid brain imaging, the ability to deliver interventions such as recanalization therapy, and seven days a week rehabilitation care.

Over the course of the GIRFT programme, it became apparent that the English established classification of providers (hyper acute stroke units, acute stroke units and rehabilitation units) was not satisfactory for patients nor for international comparisons. Following extensive consultation with patients, carers, third sector partners and clinicians, there was support for reviewing the classification. (**Figure 1** summarised the consensus of designation of acute providers and the differences between them using new nomenclature, see page 26).

Every patient that suffers a stroke should have access to hyper acute stroke care (either at a Comprehensive Stroke Centre (CSC) or Acute Stroke Centre (ASC)) within four hours of arrival at hospital. There were 122 CSCs and ASCs across England at the time of our review. They should be designed to be of a size that ensures services are of sufficient size to be clinically sustainable and able to maintain an expert workforce to ensure excellent clinical outcomes. Larger stroke services are more likely to be financially viable, better able to meet the workforce challenges of organising 24/7 cover and with some evidence to suggest they deliver better access to interventions.³⁶

People with stroke who receive organised, high-quality hyper acute stroke care are more likely to be alive, living at home, and independent in looking after themselves one year after their stroke. There is lots of evidence to support this. A recent review by Cochrane³⁷ summarises this evidence, concluding that '[the] apparent benefits [of organised stroke care] were seen across a broad range of people with stroke. Various types of stroke units have been developed. The best results appear to come from stroke units based in a dedicated stroke ward.'

A wealth of evidence and expertise has gone into developing best practice guidance to ensure that patients with suspected stroke get rapid access to high-quality care based on agreed evidence-led pathways (e.g. NICE Guideline 128 published in 2019³⁸; Fifth Edition of the Royal College of Physicians Stroke Guidelines published in 2016³⁹). As well as setting out the evidence on pathways and organisation of care, much of this guidance is specific about minimum standards that should be met around workforce availability, time to treatment, diagnostic tests, and rehabilitation models. Consequently, there is a strong consensus view about the skills, treatment and after-care that patients with stroke should have access to, much of which is tracked through SSNAP (and discussed below).

There is a consensus that patients should have access to organised acute stroke care within four hours of clock start (arrival at hospital). National data shows that there is wide variation in the ability of local systems to meet this target (**Figure 19**). The average median time is three hours and 43 minutes but three in ten units are not meeting the target. There is also significant variation in the likelihood of meeting this standard depending on day of week and time of admission (**Figure 20**), with admissions taking far longer at peak weekday times. This underscores the importance of ensuring both that pre-hospital pathways are effective—regardless of time of admission—and ISDNs will be working effectively to coordinate local protocols to ensure rapid access to CSCs and ASCs.

³⁵ See, for example, Langhorne P, Ramachandra S. Organised inpatient (stroke unit) care for stroke: network meta-analysis. *Cochrane Database of Systematic Reviews* 2020, Issue 4. Art. No.: CD000197. DOI: 10.1002/14651858.CD000197.pub4. Accessed 27 November 2020.

³⁶ Bray BD, Campbell J, Cloud GC et al on behalf of the Intercollegiate Stroke Working Party Group, *Bigger, Faster? Associations Between Hospital Thrombolysis Volume and Speed of Thrombolysis Administration in Acute Ischemic Stroke*, *Stroke*, November 2013, pp. 3129-35

³⁷ *Ibid*

³⁸ <https://www.nice.org.uk/guidance/ng128>

³⁹ <https://www.rcplondon.ac.uk/guidelines-policy/stroke-guidelines>

Figure 19: Median time between clock start and arrival on stroke unit

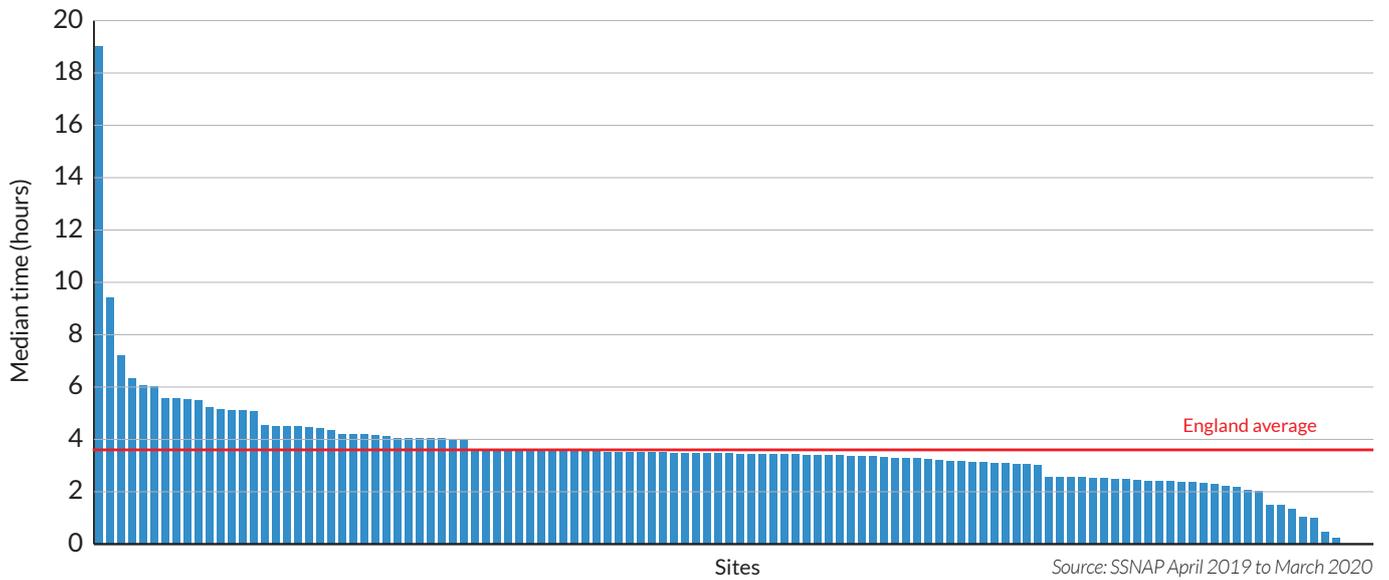
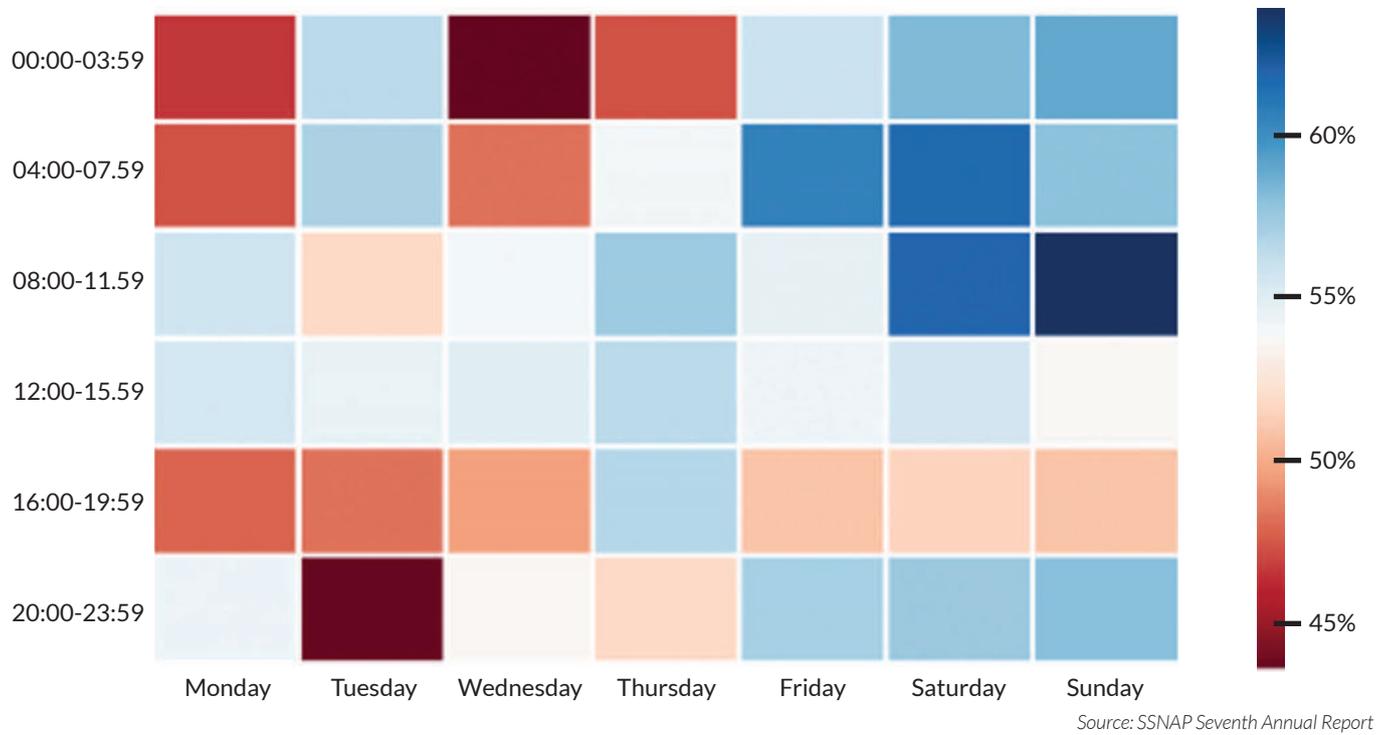
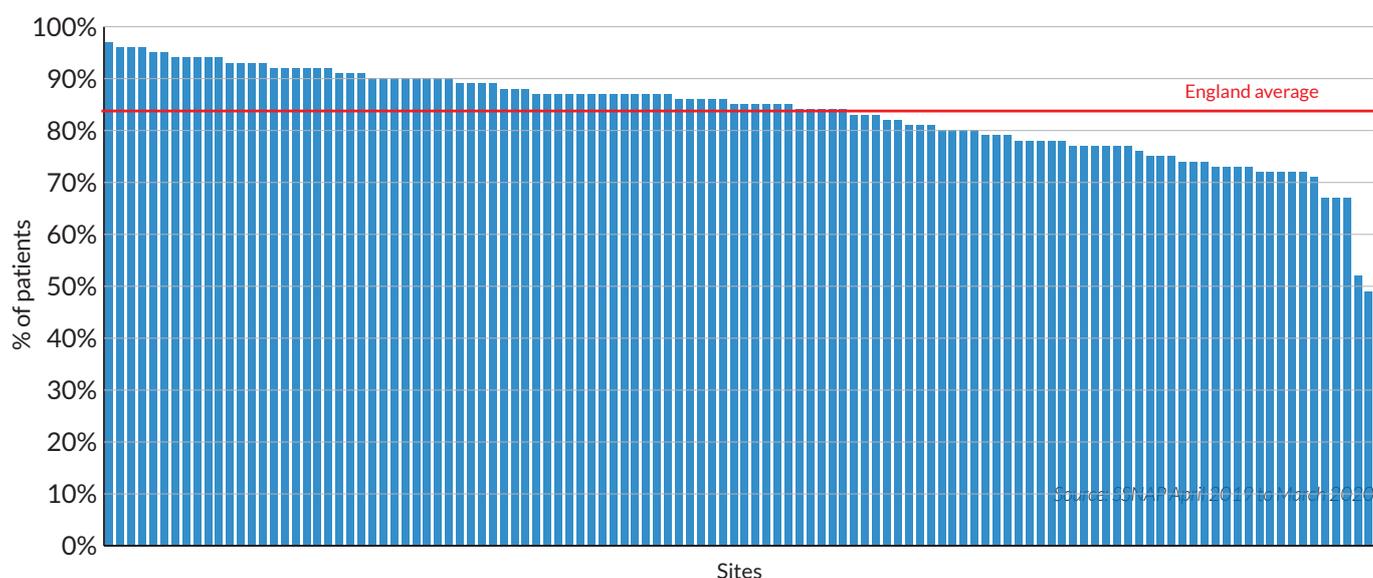


Figure 20: Heatmap showing likelihood of admission to stroke unit in less than 4 hours



As well as the variation in the time it takes for individuals to access organised stroke care, there is also variation in the proportion of a patient's acute stroke care that is delivered by a specialist stroke unit. It is entirely appropriate that patients receive all their care upon designated stroke units, only leaving them for alternative specialist input not provided routinely upon a stroke unit (e.g. intensive care, coronary care, vascular surgery). Evidence exists to support this, with those admitted quickly to stroke units more likely to spend >90% of their time on a stroke unit, have fewer severe complications and being less often discharged to institutional care, when compared to those spending less than 90% of their inpatient stay on stroke units.⁴⁰ The target is that patients who suffer a stroke should spend at least 90% of their hospital stay on a specialist stroke unit.

Figure 21: Proportion of patients who spent at least 90% of their stay on stroke unit (England, April 2019 to March 2020)



In addition to speed of access to specialist stroke units, data suggests variation still exists in the delivery against NICE and RCP standards whilst on stroke units in England. Our particular areas of focus in the following sections include access to specialist staff, consistent delivery of specialist stroke services seven days a week, and early identification and management of the complications of stroke.

Delivering organised stroke care

There are several standards that are generally seen as prerequisites for providing good quality acute stroke care. These standards are tracked in biannual acute organisational audits that SSNAP undertakes. These provide a national picture of how stroke services are performing against a range of organisational, workforce and capacity metrics. They include:

- staffing of stroke beds;
- 24 hour and 7 day working;
- access to consultants and stroke specialist nurses;
- access to therapists to support rehabilitation;
- stroke unit beds being used by general medicine patients.

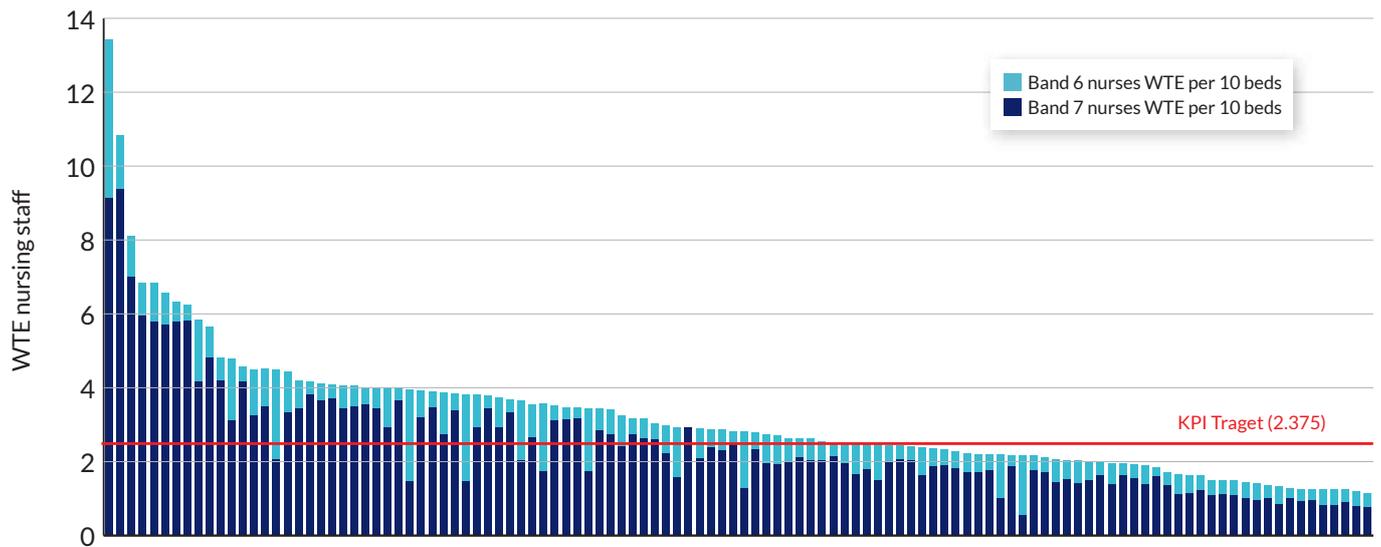
Data from SSNAP shows high levels of variation in how stroke units are organised to meet each of the standards. Our visits were an opportunity to see examples of good practice and also to correlate the data reported in SSNAP with the evidence we saw in practice. SSNAP data shows there is variation in how stroke units are meeting standards, confirmed in our visits, and there are also instances where data are not being reported in a consistent and reliable way (discussed in the audit and review section of this report).

⁴⁰ <https://bmjopen.bmj.com/content/8/11/e022536>

Staffing of beds

Nationally, 35% of stroke units are not meeting recommended standards for the levels of nursing required for stroke beds (Figure 22). This has serious implications upon the quality of care delivered to patients but also has potential adverse impacts on staff working in those units, which may compromise care further.

Figure 22: Minimum establishment of band 6 and band 7 nurses per ten beds (by trust site, 2019)



Notes: KPI Target: Sum of band 6 and 7 (WTE) nurses per ten stroke unit beds is equal to/above 2.375 per 10 beds for ALL stroke beds.

Source: AOA 2019

We did see examples of well-staffed units from our visits, with common themes emerging regarding how this was achieved. They included:

- Trust executive support with clear advocate for stroke care.
- High profile non-medical leadership within the organisation.
- Highly engaged local commissioners co-designing stroke pathway.
- Low general nursing vacancy rates.
- Proactive stroke specific recruitment campaigns.
- High profile stroke nurses attracting others.
- Clear local career progression framework.
- Active educational opportunities and support for development.
- Positive multidisciplinary team culture with a 'we can' and 'no blame' ethos.
- Clear ring-fenced stroke beds with few medical patients outlying upon the stroke unit.

We recommend all units self-assess themselves against the above themes and develop local action plans to develop areas where they are deficient.

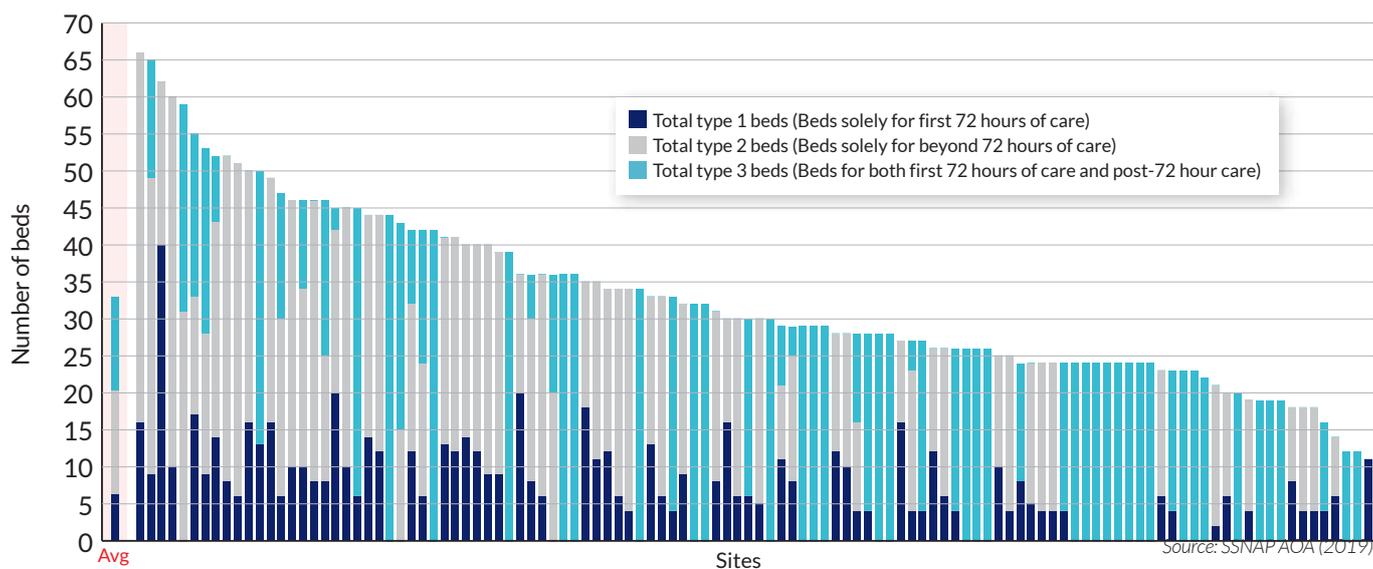
Stroke beds

Having the correct number of beds to staff is critical if the highly skilled stroke workforce, which has limited availability, is to be optimally deployed. **Figure 23** shows the distribution of stroke beds across units, by level. We found examples of teams that had correctly mapped their bed base and closed stroke beds when not needed, allowing the same workforce to focus on less patients, focusing their skills on those patients with stroke who benefit most. The drive to ensure all patients access a stroke bed within four hours may have had the perverse incentive to ‘over bed’ some units, with the misconception that these beds would be ring fenced and not used for equally deserving general medical patients desperate to be admitted from A&E.

Insight from GIRFT’s data

At the time of our visits, level 1 beds are funded under block contract in 55% of units and by Payment-by-Results in 26% of units.

Figure 23: Total number of stroke unit beds (Level 1, 2 & 3)

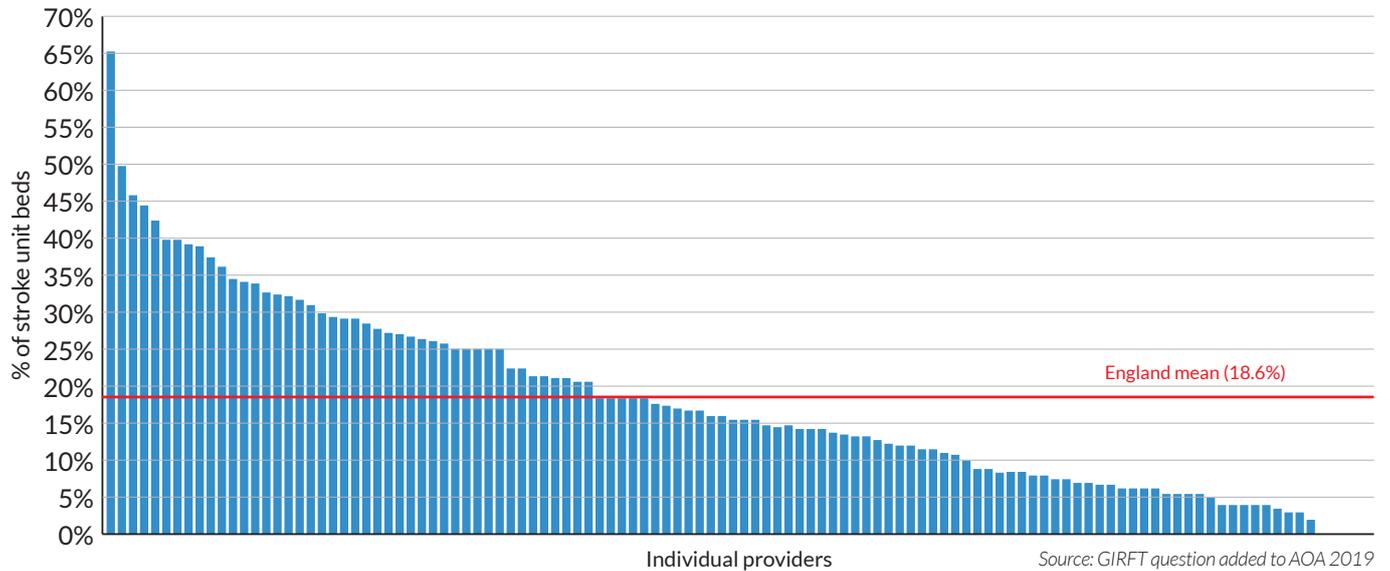


Our data also suggests that around one in five stroke beds are occupied by patients who are medically and therapy fit for transfer of care from the acute provider (**Figure 24** shows the distribution across trusts, based on a snapshot in July 2019). The causes for this are complex but common themes, reported from our visits were a lack of social service carer provision in patients’ own homes, delays in accessing nursing and residential care home beds and a paucity of consistent social services support to stroke units. This likely impacts on the ability of units to make stroke beds available to new admissions, and is particularly poignant given most units report they do not routinely move patients with stroke, who are no longer receiving a stroke specific intervention, if the bed is needed for another stroke patient.

Insight from GIRFT’s data

Only 15% of units report they move patients no longer receiving stroke interventions from stroke beds, even if they need the bed for another stroke patient. 16% say they never do this and the remainder will only do so in exceptional circumstances.

Figure 24: On 3rd June 2019, how many patients on your stroke ward are medically fit for discharge?

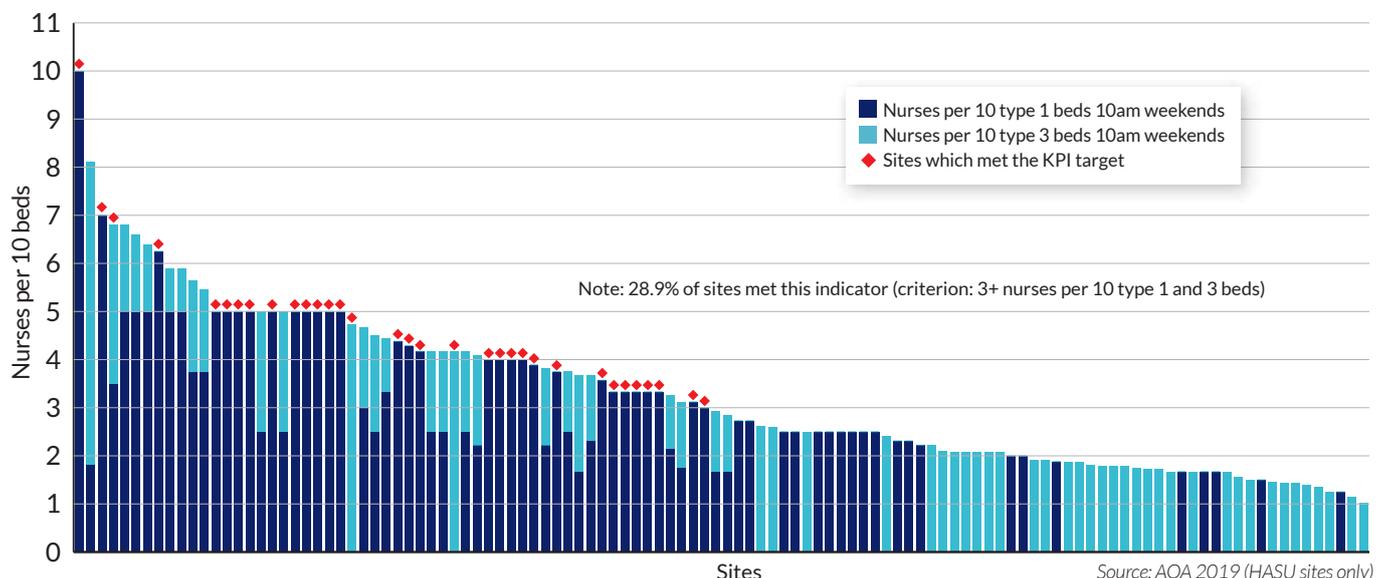


Seven-day services

Good quality stroke care relies on rapid access to specialist expertise, backed by comprehensive multidisciplinary teams. This support should be available seven days a week. Our visits suggest that many services have some way to go to meet this goal.

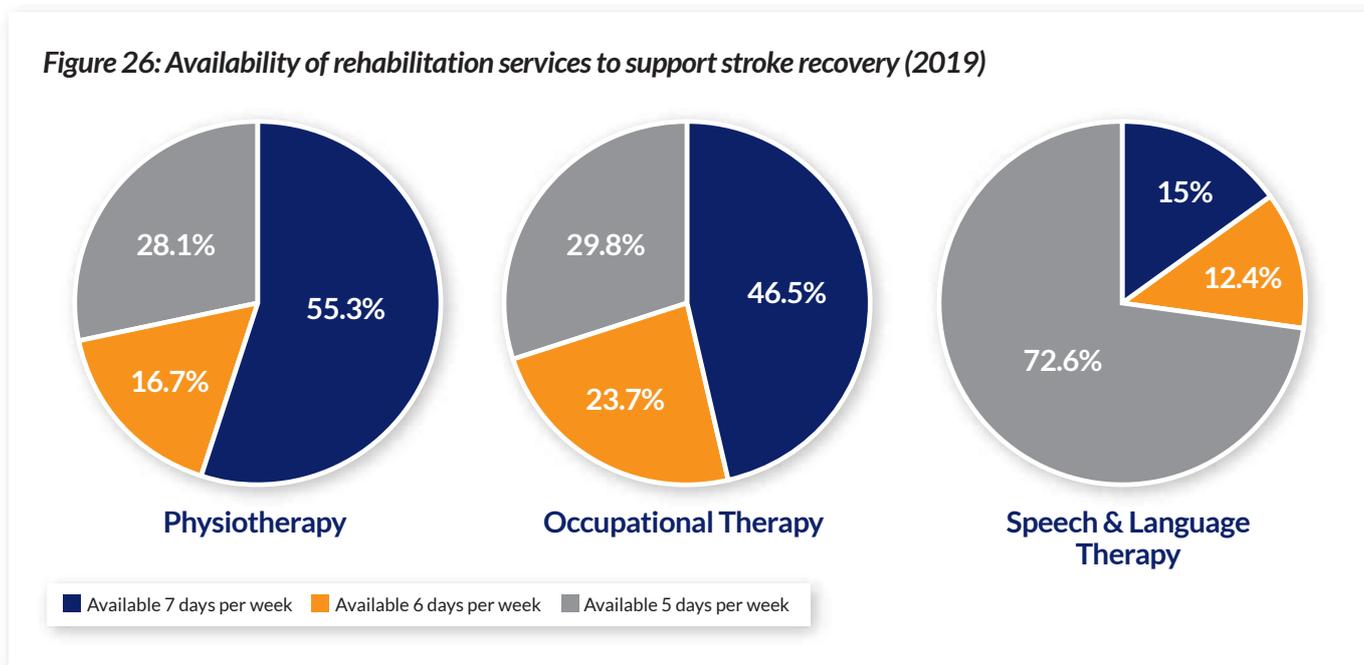
As an example, SSNAP data on nurses available to staff stroke beds over the weekend shows wide variation across units (**Figure 25** shows data on nurses per bed (type 1 and type 3 beds) by unit). Just under 30% of sites meet the SSNAP standard. There is evidence that having enough appropriately trained nurses per 10 beds is associated with improved outcomes. Recent research using SSNAP data looked at the association between specialist stroke nursing and 30-day mortality rates. It found that hospitals with high ratios of nurses trained in swallow screening also had lower rates of mortality (although the authors are careful to note that this shows correlation rather than causation).⁴¹

Figure 25: Minimum number of nurses on duty at 10am weekends (by site, 2019)



⁴¹ Liz Paley, MSc, Elizabeth Williamson, PhD, Benjamin D. Bray, MD, et al Associations Between 30-Day Mortality, Specialist Nursing, and Daily Physician Ward Rounds in a National Stroke Registry Stroke Volume 49, Issue 9, September 2018, Pages 2155-2162

It is a similar story with the availability of therapy services to support early rehabilitation activities whilst in hospital. **Figure 26** shows national data on the availability of therapies 5, 6 and 7 days a week.



Source: AOA 2019

Insight: View from our visits

Physiotherapy: 83% of centres delivered 7-day services, but 53% of these were funded for five and stretched over seven days.

Occupational Therapy: 80% of centres delivered 7-day services, but 53% of these were funded for five and stretched over seven days.

Speech and Language: 32% of centres delivered 7-day services, but 71% of these were funded for five and stretched over seven days.

The SSNAP standard is that sites should have at least two of the therapies shown available seven days a week. Less than half of sites (47%) meet the standard. Evidence collected on our visits suggests the true picture of seven-day services is less optimistic than implied by this data. We suggest this may be because many services are funded for five days but the resource are stretched to deliver over seven days.

IN PRACTICE

Transforming stroke care across East Dorset

University Hospitals Dorset NHS Foundation Trust

The stroke services at Royal Bournemouth and Poole Hospitals have delivered a seven-day therapy service for many years; however, service provision at weekends was limited, and there was variation between the sites with regards to the level of provision and the disciplines involved. Specifically:

- Both sites delivered a weekend inpatient service for both occupational therapy (OT) and physiotherapy (PT), but with limited capacity and differences in skill mix.
- Only one site had a weekend service for speech and language therapy (SLT).
- Only one early supported discharge (ESD) service provided input from registered stroke specialist staff at weekends.
- Only one site has stroke specialist nursing as part of their ESD model.

In August 2020, the trusts began implementation of a phased transformation programme, which ultimately aimed to strengthen and future proof service provision in East Dorset, through bringing together the existing services from Royal Bournemouth and Poole Hospitals.

The first phase of this focused on the post-hospital pathway, aligning the two separate ESD teams under a single clinical and operational lead. By having an integrated team covering discharges from both acute hospitals, the hospitals are now able to provide an equitable service to all patients across East Dorset, and to use capacity more flexibly to meet demand at any given time. There was no additional resource to support this development, which was achieved by collaboration with system partners to realign existing resource into the ESD team – for example, an adult speech and language therapy (SALT) post that sat separately with the community provider was transferred into the ESD service, and funding for a social worker, which was no longer required, was converted into OT.

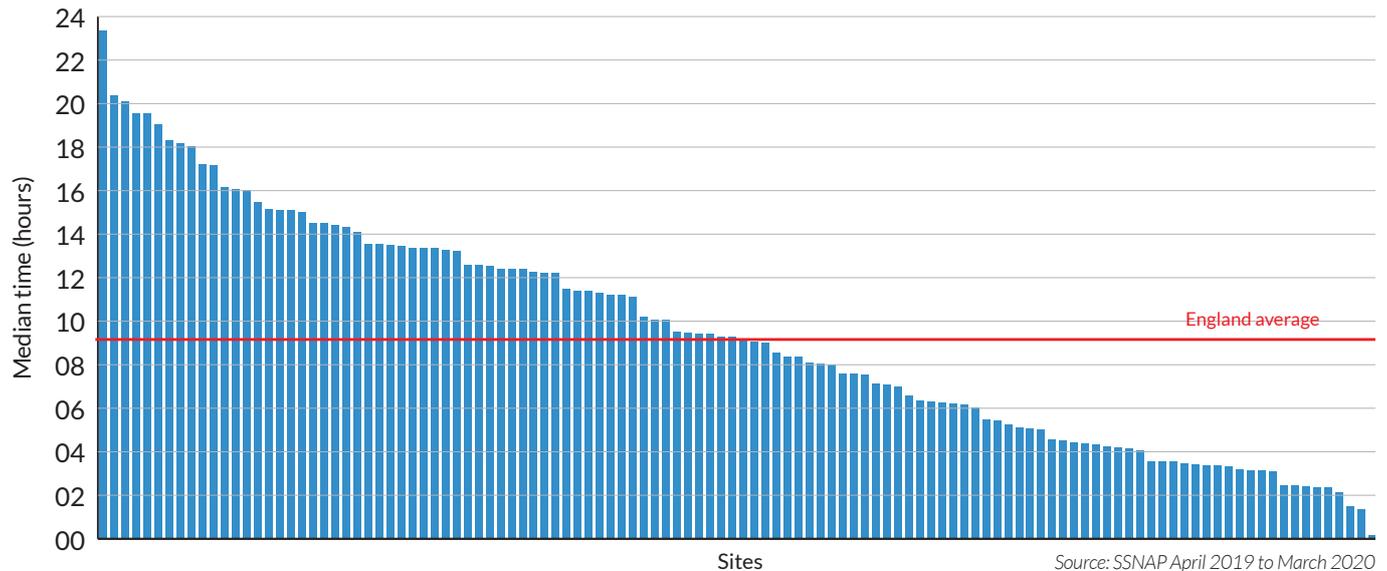
In addition, resource released from parallel inpatient transformation work was used to create a much-needed administrator post within the ESD team, which released further clinical capacity. All members in the new Bournemouth and Poole ESD Service (PT, OT, SALT, Nursing and Therapy Assistants) contribute equally to the seven-day roster.

Key to the transformation programme was the centralisation of HASU for East Dorset on the Royal Bournemouth site, with a Stroke Recovery Unit on the Poole site. The HASU is now compliant with the higher intensity of nursing and 7/7 stroke consultant ward rounds. This pathway change was implemented from October 2020 and has allowed further development of therapy provision for inpatient stroke care. Working practices have been adjusted to ensure equity across the units, according to clinical need and bed base. Weekend provision has been increased and core working hours extended during the week from 4pm-6pm. Prior to the transformation, it was not possible to maintain a SALT 7/7 service at both sites, but this is now achieved by working flexibly across units, according to clinical priorities.

Access to stroke consultants and specialist nurses

National data shows that there is wide variation in the time before a stroke patient is assessed in person by a stroke consultant. The median time is nine hours, but in a third of teams we met, the median time is more than 12 hours (Figure

Figure 27: Median time between clock start and being assessed by a stroke consultant in person (England, by site, April 2019 to March 2020)



Notes: Data shows median time between clock start and being assessed by stroke consultant (hours : mins)

The reason for delays in the patient seeing a stroke consultant are varied. An obvious factor is headcount and total programmed activities designated to stroke, although on our visits we witnessed examples where sites with small numbers of stroke consultants had good levels of cover. The best units were where job plans were structured in a way that allowed stroke consultants to prioritise initial assessment. Many stroke units ask their consultants to cover other clinical tasks simultaneously with front door assessments.

We recommend that consultant job planning is organised so that consultants covering acute 'front door' stroke assessments are not committed to other clinical tasks at the same time that may limit their ability to respond quickly. We also met teams where they had utilised others, with a similar skill set, but who's primary responsibility was not initially to patients with stroke e.g. acute physicians.

IN PRACTICE

Delivering a 24/7 stroke service and sharing workload

St George's University Hospitals NHS Foundation Trust

The aim was to create a stroke service that could deliver the highest level of evidence-based care to the large volume of patients with stroke presenting round the clock seven days a week, and which was sustainable for those who staffed it. We wanted to be inclusive and work collaboratively with colleagues based in the linked stroke units.

Colleagues were asked whether they preferred working on site doing ward rounds etc or covering out of hours. In general, about 10 colleagues do the daily ward rounds, including the weekends, and about 15 (mainly neurologists) cover most of the nights.

The team found that as the number of admissions to HASU increased, it became increasingly difficult for one person to manage them all. Therefore, there are now two consultants who can split the workload (including TIA referrals), collaborate in the management of difficult cases and provide teaching for the other staff on the HASU.

It was also becoming increasingly difficult to manage the workload based in the Emergency Department. It was difficult to see patients in sufficient detail under time pressure and make decisions on whether to admit or manage as an outpatient. Therefore, the trust appointed consultants to lead the stroke (and acute neurology) team in ED. This improved our delivery of thrombolysis and helped with the advent of thrombectomy. An added bonus was that patients benefitted from an expert opinion on arrival. Many could be managed without needing to be admitted to HASU. The appointment of the ED team resulted in there no longer being patients with stroke outlying on other wards (e.g. surgery) and thankfully, curtailed the need for safari ward rounds.

With the consultant managing the stroke unit, there are now normally four consultants available in the hospital on weekdays. This results in a highly motivated and flexible senior workforce who can help each other out so that no-one should be overwhelmed if the service suddenly becomes very busy. In the longer term, this policy should reduce the risk of burnout within the stroke team.

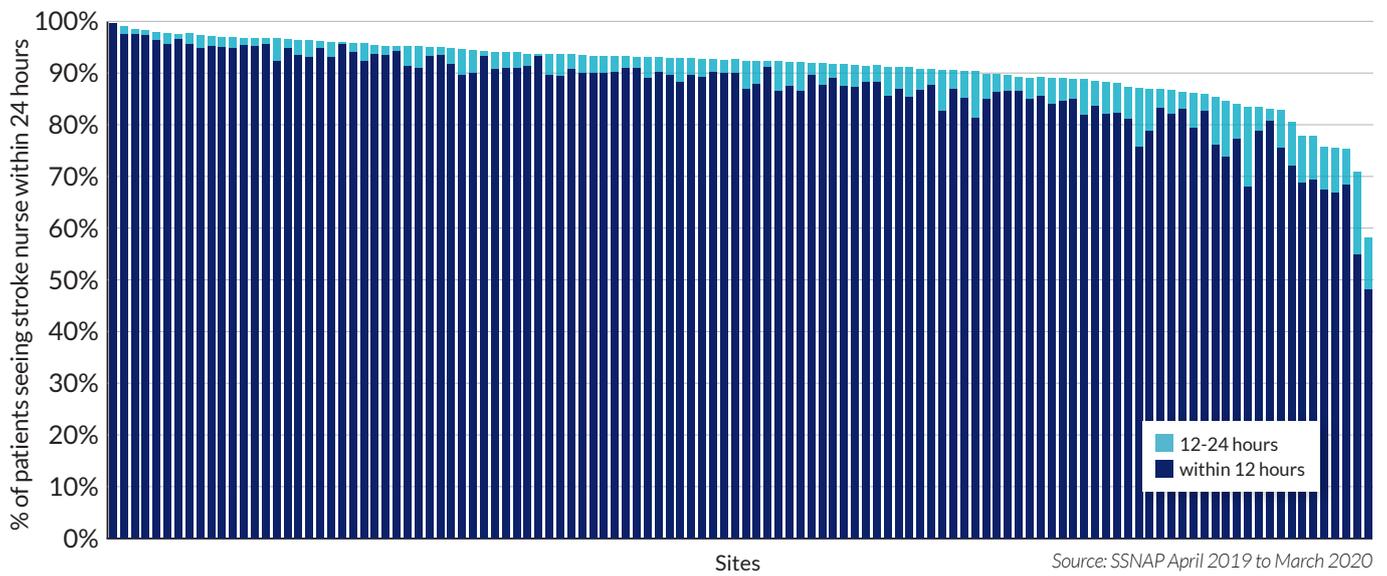
The team has held together well during the challenges commonly associated with any busy, frontline service. There is enough flexibility within the team to cope when the service is very stretched. There is great camaraderie within the team both within the trust and for those based in the linked stroke units, which fosters easy communication between consultants as well as between different units. This set-up has been running since 2016, underpinned by regular academic, governance and clinical updates and social meetings.

We saw similar issues in relation to the nursing workforce (**Figure 28**). On our visits, a common complaint was that stroke units were seen as another general medicine ward, meaning either beds are not protected for patients with stroke or staff are regularly asked to cover other wards. This suggests there is a misconception of the complexity and dependency of the stroke population. This appears to be a particular issue out of hours.

Insight from GIRFT's data

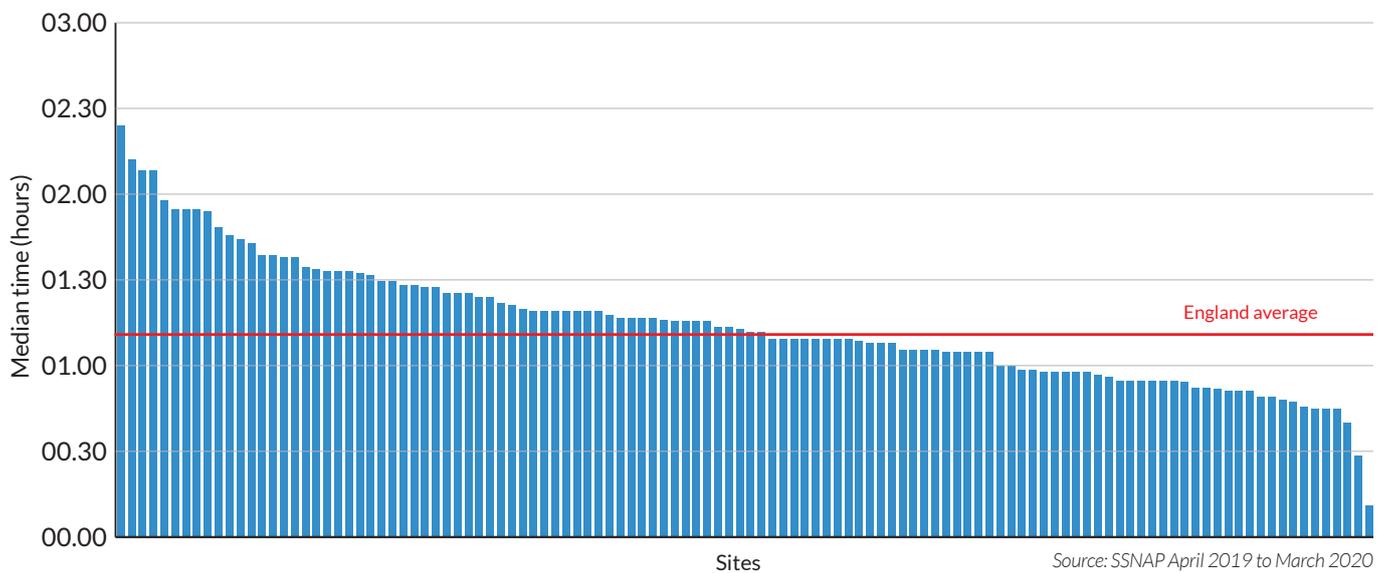
Within hours, stroke specialist nurses are counted within ward-based establishment in 80% of units and undertake assessments of suspected stroke patients in 95% of units. Out of hours, stroke specialist nurses are part of the ward-based establishment in only 29% of units and attend suspected stroke patients in A&E in only 18% of units.

Figure 28: % patients with stroke seen by a stroke nurse within 12 and 24 hours (by unit, April 2019 to March 2020)



The data shows similar patterns in access to other groups of specialists. As an example, **Figure 29** shows the variation across units in the median time between clock start and swallow screen.

Figure 29: Median time between clock start and swallow screening (by unit, April 2019 to March 2020)



From our visits we met teams who had been able to deliver excellent access to highly-skilled stroke specialist nurses through the delivery of a capability-based workforce model that enabled them to be able to deliver this pivotal aspect of hyper acute stroke care.

Thrombolysis

Thrombolysis is treatment to break down blood clots and improve blood flow to prevent damage to tissue and organs. It is used in ischaemic stroke patients to prevent damage to the brain. There is good evidence on the benefits of thrombolysis – although it is only appropriate to a subset of patients with stroke – 15-20% of patients with stroke may benefit from thrombolysis.

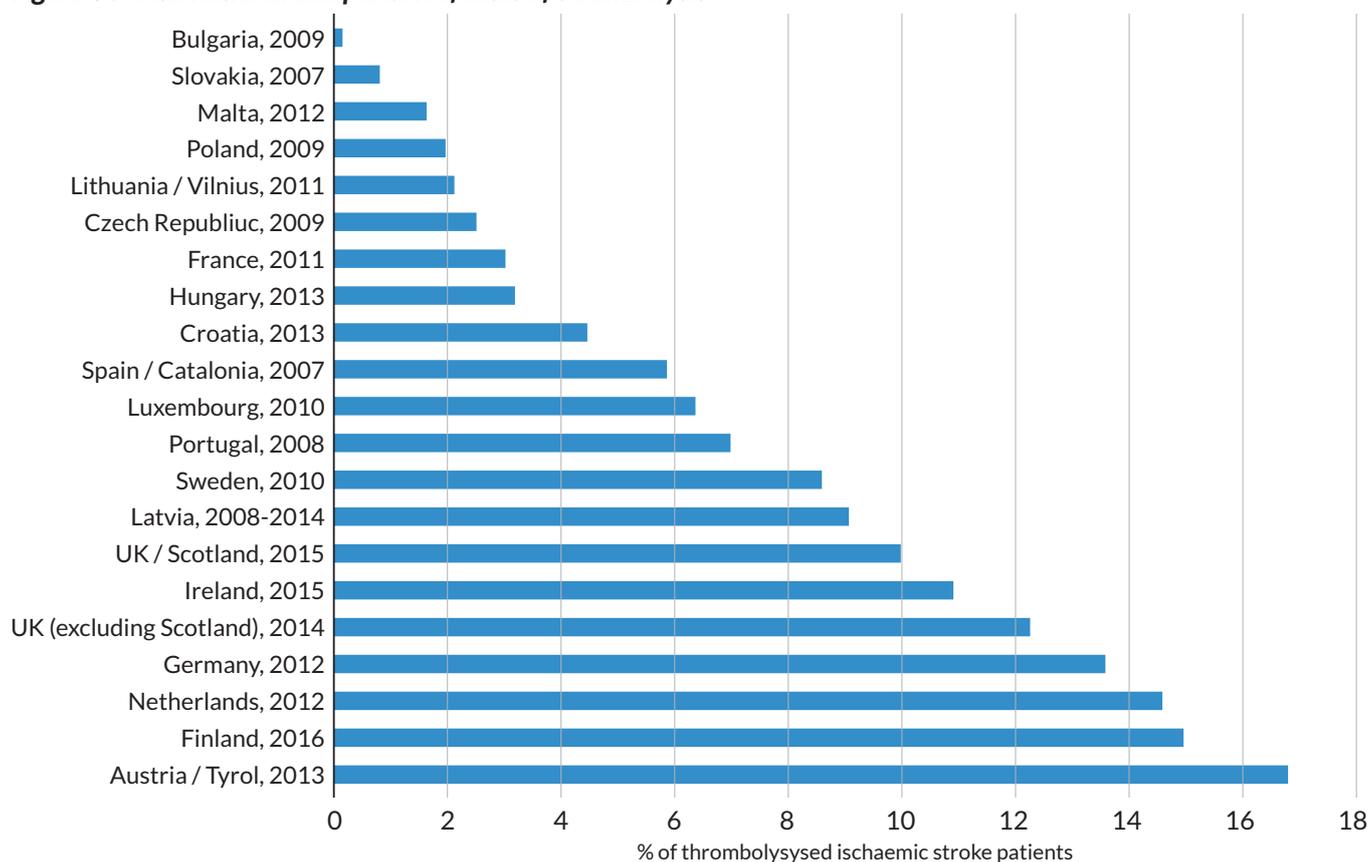
To be most effective, thrombolysis should be given as soon as safely possible and ideally within four and a half hours of the onset of a patient’s stroke symptoms. As time passes, thrombolysis becomes less effective—one of the many reasons why speed of access to organised stroke care is so important.

Guidance, set out in the National Stroke Service Model,⁴² is that thrombolysis should be provided 24/7 to patients with stroke who are deemed suitable for thrombolysis, and that centres must have an appropriate protocol in place to screen patients against the medical criteria for thrombolysis. Specific standards are:

- Appropriate patients with stroke to be scanned, assessed by a stroke specialist and if appropriate receive thrombolysis, ideally within 20 mins and at least within 60 mins of admission (door to needle time).
- Access should be available 24/7 to perfusion brain imaging (CTP or MRP) with rapid interpretation to support decision making, supported by AI and off-site expertise where appropriate.
- Thrombolysis should be provided to all appropriate patients, with up to 20% of stroke admissions amenable to this treatment.

There is clear room for improvement on rates of thrombolysis in the NHS. Whilst international comparisons are problematic, data suggest that other developed countries are achieving rates of thrombolysis that are closer to 20% (**Figure 30**). Significantly, rates of thrombolysis have been static in the NHS for the last seven years at 12% (**Figure 31**), well below best practice seen in other countries, and have decreased to 10.7% during the COVID-19 pandemic.

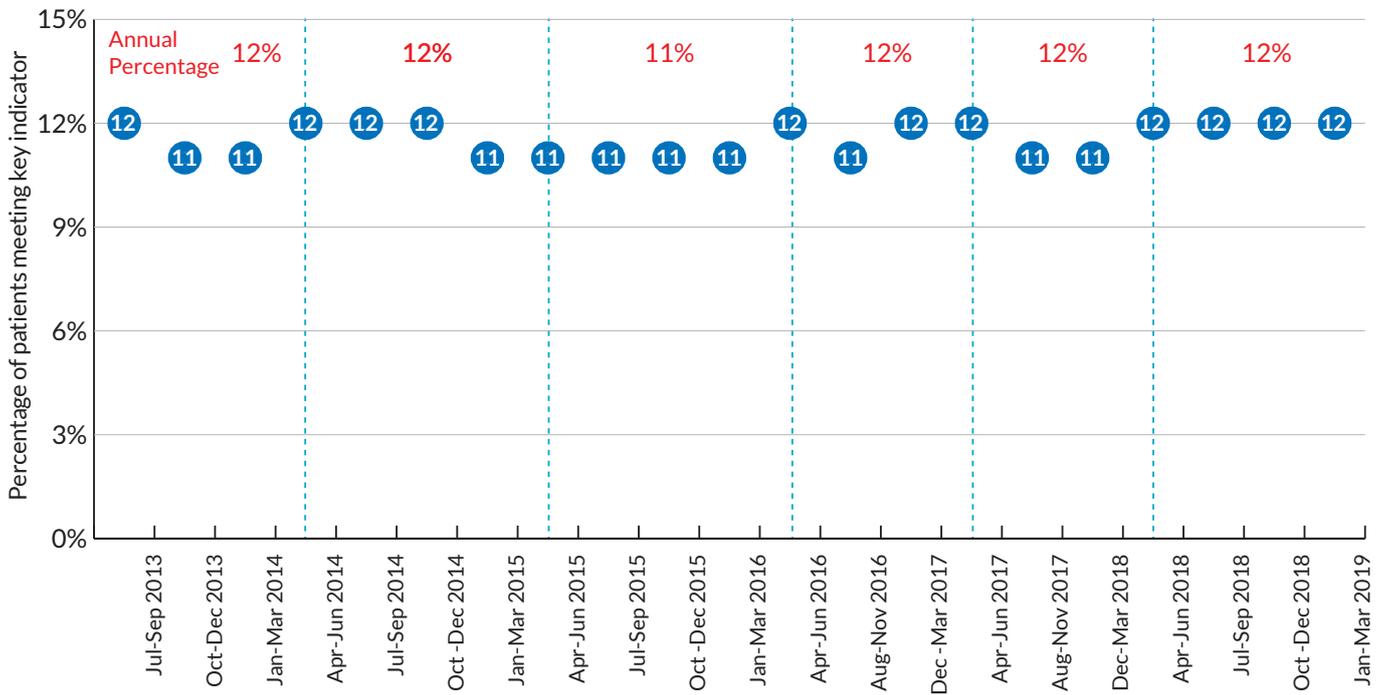
Figure 30: International comparison of rates of thrombolysis



Source: *The Burden of Stroke in Europe*, a report by King’s College London for the Stroke Alliance for Europe

⁴² Latest draft is available on the Stroke Community Network on the FutureNHS collaboration platform (<https://future.nhs.uk/strokecommunity/group/home>)

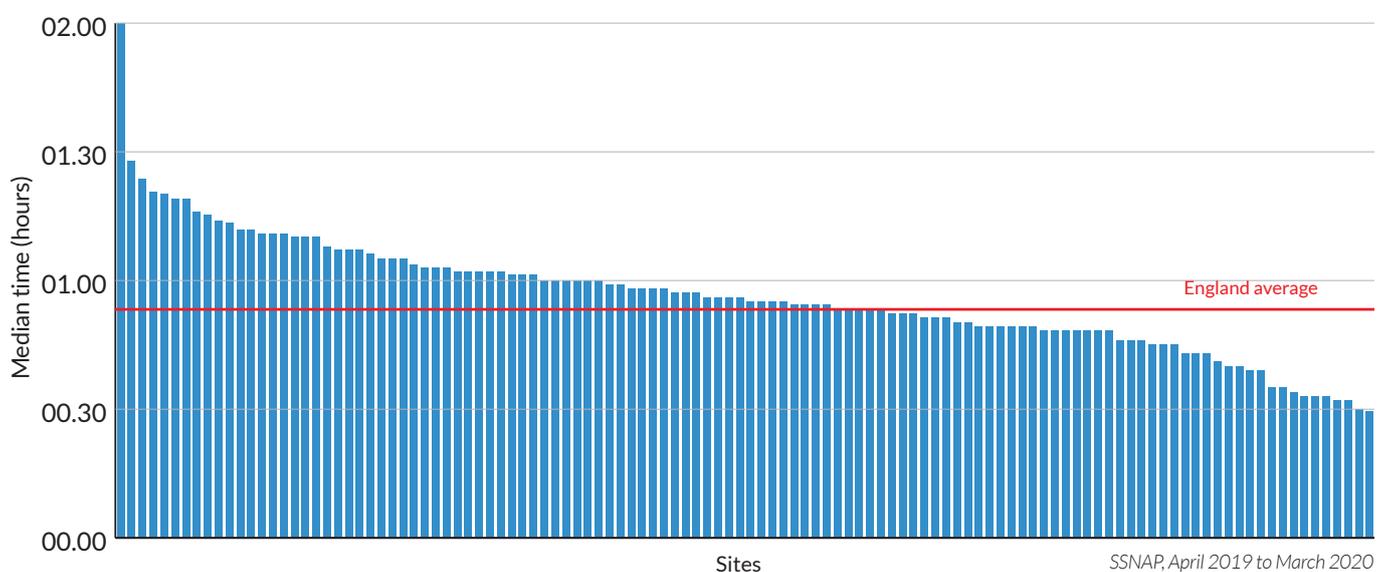
Figure 31: National rates of thrombolysis (all strokes, 2013-19)



Source: SSNAP

The data shows that there is wide variation in the time taken to deliver thrombolysis. Nationally, the average of median time between clock-start and thrombolysis at trust level is 53 minutes. But this trust level median can mask wide variations, with one-third of trusts not meeting the 1-hour median target (Figure 32).

Figure 32: Median time between clock start and thrombolysis

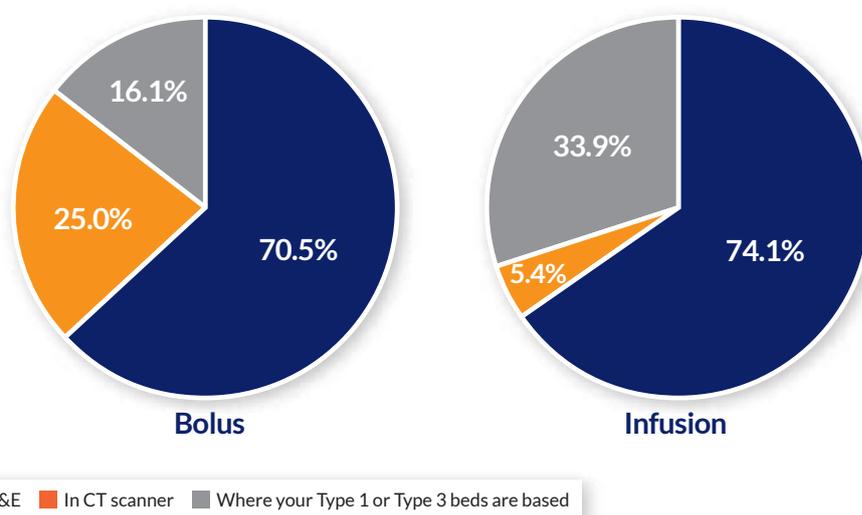


There is also variation in where bolus and infusion of the thrombolytic agent is undertaken (**Figure 33**). Any delay in administration of thrombolysis once the decision to treat has been made should be avoided.

View from our visits:

During our visits, the units who deliver the bolus of thrombolysis in the CT scanner did not report safety concerns nor significant disruption to CT scanning schedules when asked at our meetings with all stroke providers in England.

Figure 33: Where are the majority of patients thrombolysed?



Source: GIRFT question added to AOA 2019

Embracing the concept of the aggregation of marginal gains is paramount to ensure the continued improvement in door to needle times. Programmes, such as the Angels Initiative,⁴³ provide forums where international expertise is brought together to give practical advice on steps that can be taken to improve performance across many dimensions of stroke services, including speed of access. This includes checklists, simulation exercises (e.g. using mock patients), interactive training and resources that will help embed and sustain good practice.

⁴³ www.angels-initiative.com

IN PRACTICE

Achieving and maintaining short door-to-needle times for stroke thrombolysis

London North West University Healthcare NHS Trust

Thrombolysis for acute ischaemic stroke is highly beneficial when given as soon as possible after symptom onset. Every minute's delay leads to loss of brain tissue and harms recovery. LNWH designed a pathway which removes unnecessary procedures and has led to a world-class door-to-needle time which has been embedded into practice and has now been stable for more than ten years.

The trust's aim is to:

- have a median door-to-needle time for stroke thrombolysis of under 30 mins;
- meet all Sentinel Stroke National Audit Programme targets; and
- be in the top ten for median time in the world.

Consultants and Band 6 nurses see every patient for potential thrombolysis and manage them with every trainee until competence is confirmed. Nothing is done that is not essential to thrombolysis. The only essential items are history and examination to confirm stroke and check for contraindications, plain CT brain scan and cannulation and blood sampling. Examples of non-essential activities that are not completed include connecting to a monitor, repeating ambulance observations, doing an ECG, waiting for blood results and writing notes (done after the procedure is complete).

Once trainees are competent, they are given responsibility for the pathway but encouraged to contact the consultant as soon as the patient presents. Every detail of every case is recorded on a pro forma including all timings. Any glitch or delay must be included. All cases are reviewed monthly with the name of the doctor and nurse for that case, with discussion of ways to overcome blocks and confirmation when correct action taken.

Every new medical trainee needs to be personally taught how the process works by the consultant, to prevent them lapsing into time-wasting routine practice. New Band 6 nurses are trained by nurses experienced in the pathway. Every case is audited in detail to correct misunderstandings early and celebrate success. Cutting out unhelpful or time-wasting practices is deeply embedded in the unit culture and produces strong loyalty, helps retain staff and gives huge job satisfaction.

Managing the complications of stroke

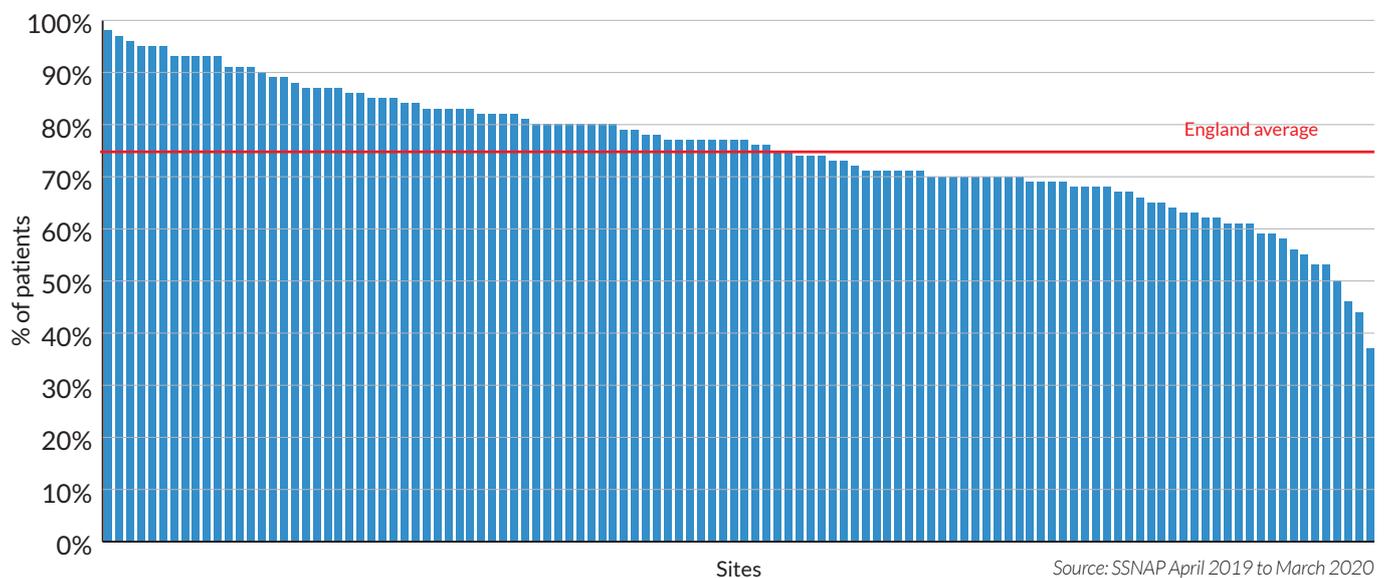
One of the benefits of organised stroke care is that it brings together a range of expertise required to identify, manage and support patients to recover from stroke, reducing the risk of complications and improving outcomes. This means stroke units must have access to the full range of multidisciplinary services to support the varied needs of patients that have had a stroke.

This is consistent with clinical guidelines for stroke, including the national clinical guideline and NICE guidance, which demonstrate that acute stroke services should have management protocols across the stroke pathway, including for the prevention and management of complications of stroke. There are three common and avoidable complications of stroke – pneumonia, deep vein thrombosis (DVT) and falls. SSNAP data suggests there is variation in how stroke units are pre-empting and managing these complications of stroke, which was supported by evidence from our visits.

Swallow screening - preventing pneumonia and poor nutrition

Difficulty in swallowing is a common complication in patients with stroke and, if not identified early, can lead to poor nutrition and stroke-associated pneumonia. There is an increasing body of evidence that early dysphagia screening reduces risk of stroke-associated pneumonia in acute stroke.⁴⁴ Delays in swallowing assessment are associated with an increase in the incidence of pneumonia of 3% in the first 24 hours. Delays beyond 24 hours are associated with an additional 4% increase in the incidence of pneumonia.⁴⁵ The latest European Stroke Organisation European Society for Swallowing Disorders guidance recommends that screening should be done as fast as possible after admission, ideally within two hours. Data shows that many units are not recording swallow screens within four hours (**Figure 34**).

Figure 34: Percentage of applicable patients with swallow screen within four hours



⁴⁴ Eltringham S, A, Kilner K, Gee M, Sage K, Bray B, D, Pownall S, Smith C, J: Impact of Dysphagia Assessment and Management on Risk of Stroke-Associated Pneumonia: A Systematic Review. *Cerebrovasc Dis* 2018;46:97-105. doi: 10.1159/000492730.

⁴⁵ Bray BD, Smith CJ, Cloud GC, Enderby P, James M, Paley L, Tyrrell PJ, Wolfe CD, Rudd AG; SSNAP Collaboration. The association between delays in screening for and assessing dysphagia after acute stroke, and the risk of stroke-associated pneumonia. *J Neurol Neurosurg Psychiatry*. 2017 Jan;88(1):25-30. doi: 10.1136/jnnp-2016-313356. Epub 2016 Jun 13. PMID: 27298147.z

IN PRACTICE

Cough reflex testing in acute stroke

Royal United Hospitals Bath NHS Foundation Trust

Up to 25% of acute stroke patients are silent aspirators. Silent aspirators are at 5.5 times greater risk of pneumonia than those who cough when they aspirate or non-aspirators. Bedside assessment can identify some factors associated with silent aspiration but is subjective.

In RUHB, they had very limited capacity for video fluoroscopy (VF) meaning some patients were experiencing significant delays in being able to start oral intake. Evidence from Australia suggests that cough reflex testing (CRT) using a nebulised irritant (citric acid) to test laryngeal sensation has good sensitivity and specificity for identifying silent aspiration.

All patients on the acute stroke unit referred to speech and language therapy were considered for CRT using methods mirroring those used in research. Permanent SLT staff were trained in CRT and a protocol was established. Those who passed CRT went on to have a standard bedside swallow assessment and SLT recommendations. Those who failed CRT were kept nil-by-mouth and underwent video fluoroscopy with subsequent recommendations.

CRT was able to identify the patients with stroke at high risk of silent aspiration and allowed them to be prioritised for instrumental assessment. CRT was used successfully to find 10% of patients were silently aspirating as confirmed by VF. No silent aspirators were found in the much smaller cohort of non-stroke patients on ASU who were referred to SLT.

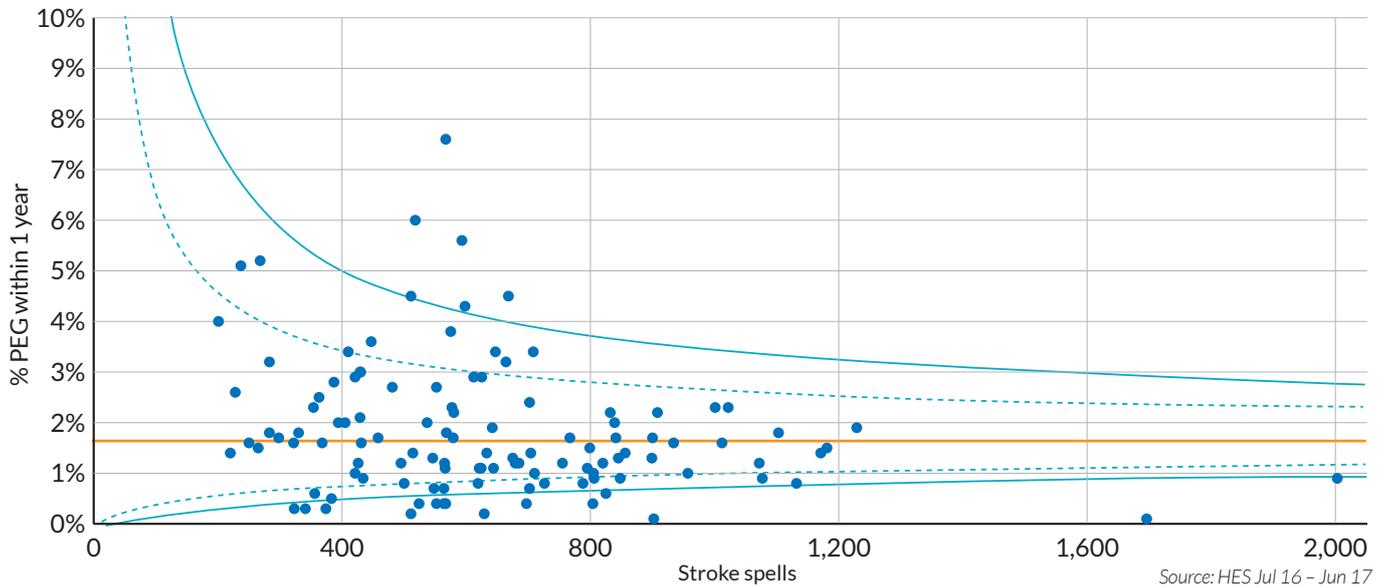
The process was easy to establish on an acute stroke unit and is likely to support reduced rates of nosocomial pneumonia in patients with stroke.

Patients that are dehydrated or have malnutrition have worse outcomes, including a higher risk of death, than those with adequate fluids and nutrition.⁴⁶ When and how to provide nutrition to those patients with prolonged dysphagia is a constant challenge to stroke teams. We found significant variation in the use of percutaneous endoscopic gastrostomy (PEG) and radiologically inserted gastrostomy (RIG) tube insertions across the country. There is clear guidance about the safe placement of PEGs,⁴⁷ when PEG tubes should be placed, but casemix is unlikely to explain the variation we saw. Variation in access to interventions and ongoing rehabilitation with nasogastric tube placement in situ are possible explanations. There is no current reliable evidence to support the routine use of total parenteral nutrition (TPN) in patients with stroke.

⁴⁶ See, for example, Bhalla A and Birns J (eds) *Management of post-stroke complications* (2015)

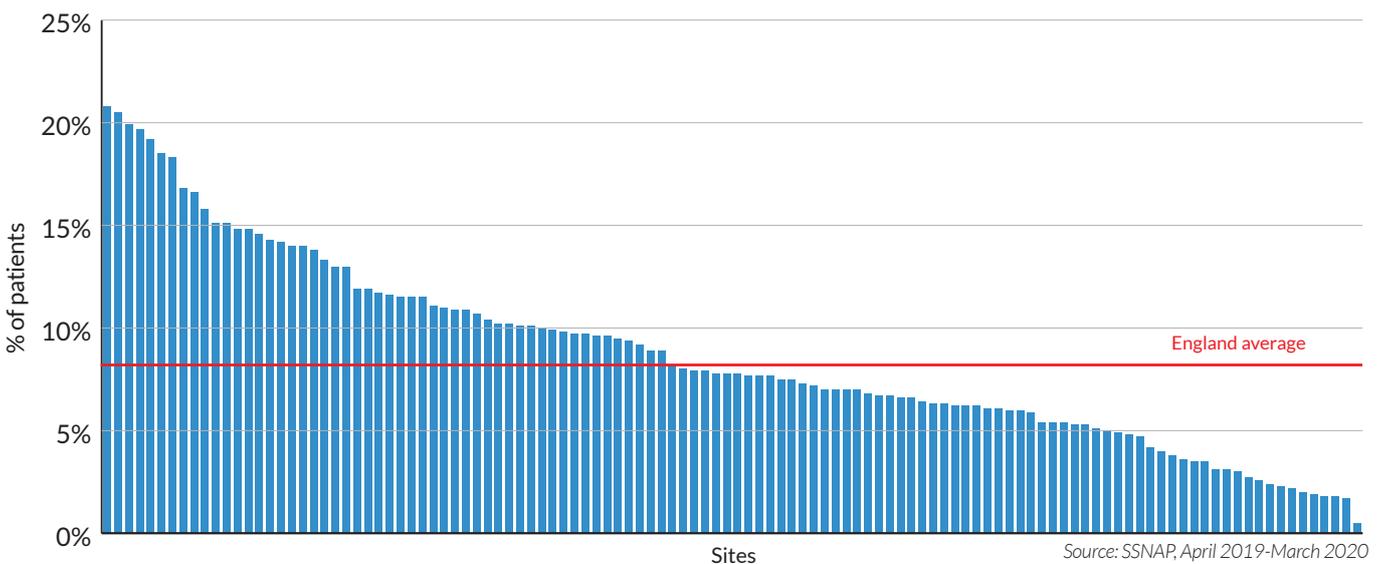
⁴⁷ <https://www.bsg.org.uk/covid-19-advice/joint-statement-from-bapen-bsg-on-endoscopic-gastrostomy-peg-insertion/>

Figure 35: Patients having percutaneous endoscopic gastrostomy in stroke spell or within 1 year of discharge (all stroke spells) (England, by site, July 17-Jun 18)



Urinary sepsis and pneumonia are relatively common complications of stroke, requiring antibiotics to treat. We found significant variation in the use of antibiotics in the first seven days of admission for presumed stroke-associated pneumonia, which was consistent and unlikely to be explained through casemix (**Figure 36**).

Figure 36: Percentage of patients receiving antibiotics for newly acquired pneumonia in the first 7 days from clock start



Ensuring that there are agreed protocols for the management of the common complications of stroke, including the stewardship of antimicrobial agents, is paramount.

DVT and pulmonary embolism risks

Venous thromboembolism (VTE) is a collective term for deep vein thrombosis (DVT) and pulmonary embolism (PE). It is a relatively common complication associated with patients with stroke, and patients who have had a stroke are at higher risk of VTE. It is a potentially avoidable cause of hospital mortality and accounts for up to 25% of deaths post-stroke.^{48, 49}

A recent inquiry by the Health Safety Investigations Branch (HSIB)⁵⁰ made recommendations about the management of VTE risk in inpatients following thrombolysis for an acute stroke and the detection of medical problems (that impact on VTE risk) occurring in inpatients following thrombolysis for an acute stroke. They concluded that current guidance and assessments for VTE risks are not tailored sufficiently for stroke and are not specific enough to reflect the specific circumstances of a patient who has had a stroke. They conclude that:

- There is no national guidance on a proactive, stroke-specific, VTE risk management system to monitor VTE assessments and check that the VTE assessment requirements and recommendations have been undertaken.
- The generic inpatient VTE assessment does not take into account the specific circumstances for patients who have had a stroke.
- The generic VTE assessment does not produce a stratified risk – that is, it does not determine the level of a patient's risk of VTE.

The HSIB made a recommendation, which GIRFT supports, that the Intercollegiate Stroke Working Party, with support from the Joint Stroke Medicine Committee and NHS England and NHS Improvement develop stroke specific VTE guidance.

Falls

Patients with stroke are at a high risk of falls post-stroke – 7% of patients with stroke have a fall within a week of their stroke and studies suggest 37% of patients fall between one and six months after their stroke.⁵¹ One of the worst complications following a fall is a fractured neck of femur. The mortality and morbidity, independent of the stroke, makes its prevention a priority for stroke teams and there are resources available to support stroke teams, including NICE guidance.⁵² However falls is a particular issue for patients with stroke because of the links between cognitive impairment, the need for early mobilisation as part of their recovery journey and the risk of falls. Patients suffering a stroke are also more likely to have risk factors associated with falls (e.g. diabetes, sensory impairment and cardiovascular risks). We found significant variation in the incidence of post-stroke fractured neck of femur (**Figure 37**). The causes are multifactorial but include failure to provide adequate bone health interventions, poor falls risk assessments, and premature or inadequate discharge planning.

The benefits of early mobilisation post-stroke are clear, although the very early mobilisation (<24hrs) of those most significantly disabled should be avoided given the lack of observed benefit and potential increased falls risk.⁵³

⁴⁸ Cohen AT, Agnelli G, Anderson FA, Arcelus JJ, Bergqvist D, Brecht JG, Greer IA, Heit JA, Hutchinson JL, Kakkar AK, Mottier D, Oger E, Samama MM, Spannagl M; VTE Impact Assessment Group in Europe (VITAE). Venous thromboembolism (VTE) in Europe. The number of VTE events and associated morbidity and mortality. *Thromb Haemost.* 2007 Oct;98(4):756-64. PMID: 17938798.

⁴⁹ J. Kelly, A. Rudd, R. Lewis, and B. J. Hunt, Venous Thromboembolism After Acute Stroke, *Stroke*. 2001;32:262-267, available at <https://doi.org/10.1161/01.STR.32.1.262>

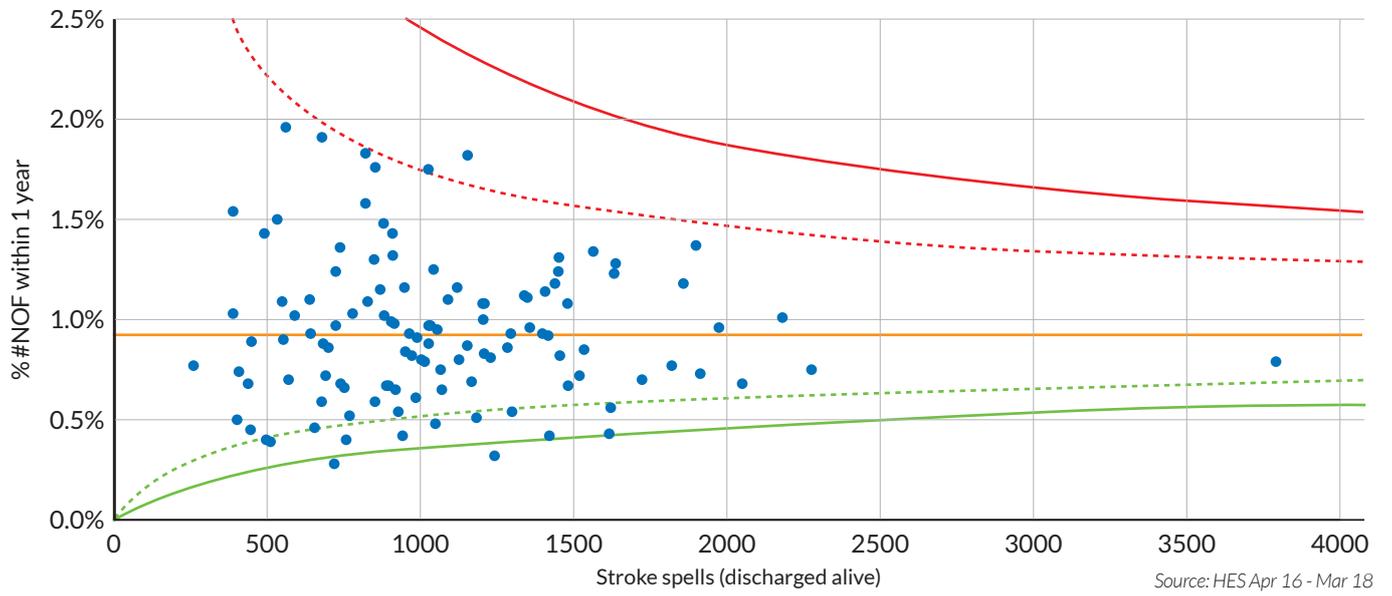
⁵⁰ Management of venous thromboembolism risk in patients following thrombolysis for an acute stroke Independent report by the Healthcare Safety Investigation Branch 12018/023 October 2020. Please also see additional clarification and the Best Practice Consensus for reducing Venous Thromboembolism post Stroke, available at: <https://www.hsib.org.uk/investigations-cases/management-vte-risk-patients-following-thrombolysis-acute-stroke/>

⁵¹ <https://eso-stroke.org/falls-after-a-stroke>

⁵² NICE Falls in older people: assessing risk and prevention, Clinical guideline CG161, published date: 12 June 2013; and NICE, Falls in older people, Quality Standard QS86, published date: 25 March 2015, last updated: 31 January 2017

⁵³ The AVERT Trial Collaboration Group, Efficacy and safety of very early mobilisation within 24 h of stroke onset (AVERT): a randomised controlled trial, *The Lancet*, Vol. 386, Issue 9988, pp. 46-55, July 2015

Figure 37: Percentage of patients admitted with fractured neck of femur within one year of stroke discharge (April 16 to March 18)



IN PRACTICE

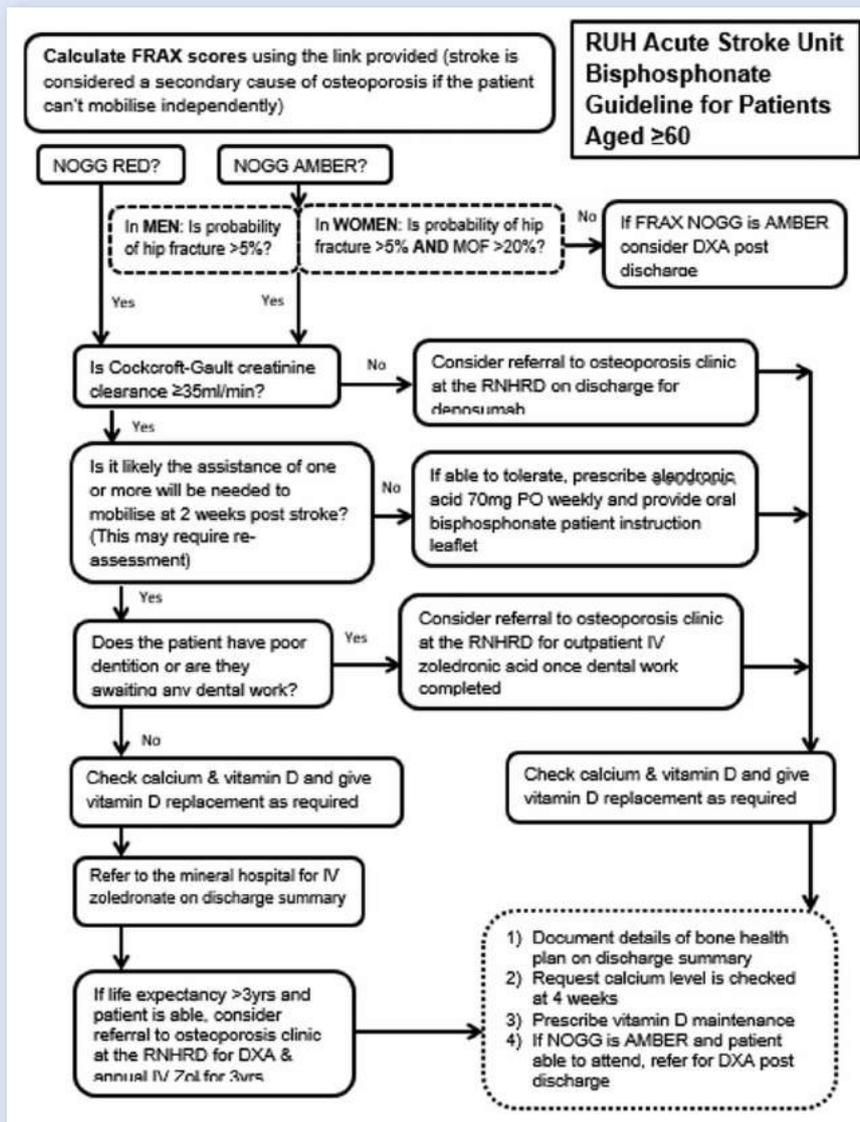
Promoting bone health in acute stroke patients

Royal United Hospitals Bath (RUHB) NHS Foundation Trust

Fracture risk is increased two to four-fold in patients after stroke, and there is a particularly high risk of hip fracture in the paretic leg in the first year post stroke. Reduction of quality of life post-hip fracture exceeds that for stroke. NICE guidelines recommend assessing fracture risk in those >50 years, with risk factors including ‘immobility due to neurological disease’, and the National Clinical Guidelines for Stroke 2016 state that, ‘People at high risk of falls after stroke should be offered a standardised assessment of fragility fracture risk as part of their stroke rehabilitation.’ Despite this, a survey of UK BASP consultant stroke physicians (response rate 73/140) showed only 1.5% of respondents had guidelines in place and the majority underestimated fracture risk.

RUHB’s first change was to implement a routine vitamin D check on all acute stroke admissions with a protocol to standardise safe replacement. We then developed a further pathway to assess fracture risk using FRAX, and then initiate bisphosphonate treatment where appropriate. First line replacement was oral, but where this was not suitable, for example due to swallowing difficulties, we developed a pathway for inpatient intravenous infusion of zoledronate during the stroke rehabilitation phase.

The pathway was initiated in 2018 and has become embedded within clinical practice and is incorporated in the ASU discharge summary.



Complications related to mental health and psychological wellbeing

After a stroke, survivors often experience emotional and behavioural changes. Patients can feel a range of behaviours including irritability, forgetfulness, confusion, anger, anxiety and depression. The management of mental health complications is an important part of overall recovery from stroke, particularly given the link between physical and emotional wellbeing. Those patients who suffer with communication difficulties have a higher risk of mental health complications.

Mental health problems are poorly identified post-stroke. NICE's Quality Standard for stroke recommends that patients with stroke have access to clinical psychologists with capabilities in stroke care, but the evidence is that this is not happening routinely.

View from our visits

Data collected from our visits suggests that 63% of stroke units have some access to psychological care.

ISDNs have a supporting role to play in organising services locally to ensure patients with stroke have access to psychological support. The ISDN Specification states that:

‘psychological and neuropsychological rehabilitation must be routinely available as part of core service provision throughout the patient journey, with all staff having an important role to play. The full multidisciplinary team must address the hidden burden of psychological, emotional, cognitive and neuropsychological effects commonly experienced by stroke survivors, which can greatly impact rehabilitation engagement, function, return to work and ultimately quality of life.’⁵⁴

The specification recommends an integrated and multidisciplinary care approach, with success measured through:

- **Consistent consideration of psychological needs throughout rehabilitation:** High-quality psychological screening, assessment and personalised interventions will be offered and tailored appropriately for all levels of need throughout the full patient pathway. This applies to all individuals that have patient contact and includes routinely monitoring changes in cognition, behaviour and emotional state, mental health and associated mood disorders.
- **Specialist psychologists will be part of the stroke team:** Establishing clinical psychologists or clinical neuropsychologists, with stroke expertise, as core members of the stroke team will enhance rehabilitation outcomes and patient experience. Access to senior decision-maker support and guidance, as well as interventions, will empower the multidisciplinary team to provide seamless psychological support to patients throughout their rehabilitation.
- **Psychological interventions will be measured for success:** When specialist intervention is required, standardised outcome measures should be used to measure the impact of interventions and patient experience across the pathway.

⁵⁴ Latest draft is available on the Stroke Community Network on the FutureNHS collaboration platform (<https://future.nhs.uk/strokecommunity/group/home>)

IN PRACTICE

Neuropsychological assessment and intervention for patients, families and the MDT

London North West University Healthcare (LNWUH) NHS Trust

The importance of understanding neuropsychological changes post-stroke is a priority. The Clinical Neuropsychology Service at LNWUH developed a cognition pathway to ensure that the full MDT know how to assess and support neuropsychological functioning. Training was developed and provided for occupational therapists (OTs) so they have knowledge, skills and confidence in administering and interpreting specific cognitive screens, including templates for sharing findings in notes and in written reports.

The pathway has been audited, highlighting risks associated with neuropsychological changes post-stroke (especially among those with not immediately obvious problems), the long-term impact for patients and families, with application of findings to inform rehabilitation and referral for follow-up support.

The work of the Clinical Neuropsychology Service has been recognised beyond the Stroke Unit. All qualified staff have been funded to complete the gold-standard Qualification in Clinical Neuropsychology, so that other services may benefit from neuropsychological assessment and intervention for patients, families and the MDT.

The introduction of the Stroke Unit Cognition Pathway provided the MDT with a framework to refer for neuropsychological assessment for people with covert through to significant cognitive impairment. Implementation has been dependent upon the full MDT attending training. While this was widely accessed by therapists, attendance at training by doctors and nurses was variable. The Stroke Unit Cognition Pathway was revised in late 2020 with input from OT, SLT and consultants to simplify it and increase attendance. Emphasis was placed on risks associated with neuropsychological changes post-stroke; impact of these for short and long term; standardised information on neuropsychological functioning by the MDT; provision of consultation clinics for cognitive rehabilitation for inpatients and referral for follow-up post discharge.

Actions and progress made during GIRFT's stroke programme

During GIRFT's stroke programme, the following actions have been completed or are in progress:

- Services have been working to implement recommendations from our GIRFT deep-dive visits, which focused on supporting units to become compliant with NICE 2019 and RCP 2016 stroke guidelines. Service should continuously audit and review themselves against these standards.
- A new nomenclature for stroke units has been developed.

Recommendations to support the delivery of hyper acute and acute inpatient stroke care

Recommendation	Actions	Owners	Timescale
7. Services to adopt the new nomenclature for acute stroke services.	a Adopt nomenclature, ensuring communication of changes and uniform use.	NHSE&I National Stroke Programme, ISDNs and providers	Within six months of publication
8. Consider an accreditation system for stroke services.	a Review the need for and benefit of an accreditation system for all stroke services. This would build on previous examples (e.g. Angels, Royal College of Radiology's Quality Standard for Imaging (QSI)) and include community and rehabilitation care.	ICSWP with all interested parties, e.g. BASP, RCP, UKNG and third sector providers	Within 18 months of publication
9. Reduce door to intervention times for all stroke subtypes.	a Support the development and implementation of a set of critical-time standards for acute stroke care.	NHSE&I National Stroke Programme and UEC Programme	Within six months of publication
	b Complete a review of the time-critical interventions of thrombolysis, thrombectomy, primary intracerebral haemorrhage. Produce a detailed service improvement plan and monitor progress.	ISDNs, with support from NHSE&I	Within 12 months of publication
	c Deliver carotid endarterectomy within the specified time frame.	Vascular Hubs	For immediate action
10. Ensure access to highly specialised stroke units for patients with stroke in <4 hours and for >90% of their stay.	a Improve awareness of the benefits of organised stroke care to executive and bed management teams to ensure rapid access to and maintenance of stroke units.	NHSE&I Regional Medical Directorates and provider organisations	Immediate
	b Reduce use of stroke unit beds by general medical patients – reclassify beds and reallocate staff where necessary.	Provider organisations	Within 12 months of publication
11. Ensure equitable and timely access to services that reduce the risk of complications following stroke, including: <ul style="list-style-type: none"> • reduce time to swallow screen, with or without speech and language team (SLT) assessment, and review relationship with the use of antibiotics in the first seven days; • deliver definitive feeding solutions for those patients with prolonged dysphagia; • avoid health inequity in access to multidisciplinary care across the days of the week; • reduce falls risk and subsequent harm from falls; and • implement stroke-specific VTE assessment and ensure treatment / intervention. 	a Investigate variation and improve timely access to initial swallow screen and speech and language therapy assessments and interventions.	Provider organisations with guidance from RCSLT and British Dietetic Association	Within 18 months of publication
	b Ensure all patients are cared for on units with a designated antimicrobial stewardship lead.	Provider organisations	Within six months of publication
	c Ensure percutaneous endoscopic gastrostomy (PEG) tube insertion happens within 72 hours of referral. Those units at the extremes of PEG tube insertion timing should ensure all activity is accurately coded and explore their variation in use.	Provider organisations with support from ASPEN, BAPEN and BDA	Within six months of publication
	d Improve time from referral to placement of definitive feeding solution.	Provider organisations with support from ASPEN, BAPEN and BDA	Within six months of publication
	e Offer 7/7 access for all patients to the stroke MDT using a capability-based workforce model to enable the delivery of physiotherapy, occupational therapy, dietetics and SLT assessments and interventions.	ICS/STP commissioners working with ISDNs and provider organisations	Within 18 months of publication

Recommendations to support the delivery of hyper acute and acute inpatient stroke care (continued)

Recommendation	Actions	Owners	Timescale
11. (Continued)	f Develop stroke-specific advice within current patient falls prevention programmes.	NHSE&I National Stroke Programme	Within 12 months of publication
	g Review rates of falls and fractured neck of femur.	Provider organisations (acute and community), with oversight from ISDNs	Within 12 months of publication
	h Embed a patient and stroke specific falls prevention programme consistent with NICE guidance and which transfers with the patient, following their recovery journey to home or a community setting.	Provider organisations (acute and community), with oversight from ISDNs	Within 12 months of publication
	i Embed an osteopenia prophylaxis pathway.	Provider organisations (acute and community), with oversight from ISDNs	Within 12 months of publication
	j Adhere to guidance on venous thromboembolism (VTE) assessment and treatment.	Provider organisations	For immediate action

Thrombectomy

Background and current access

Thrombectomy is a procedure used to treat some patients with ischaemic stroke. It is used when a blood clot is cutting off blood flow to a large part of the brain and involves inserting a catheter to remove the clot to restore blood flow. It is a catheter lab-based technique where a blood clot is directly removed from the brain's arteries.

There is strong evidence that in appropriately selected patients, thrombectomy significantly reduces the severity of disability caused by stroke to the anterior circulation. It is most effective the faster it is used (ideally within six hours of symptom onset) so agreed pathways and rapid access in imaging and intervention is paramount. A review commissioned and published by NHS England, reviewed evidence from seven clinical trials and found that, "all seven trials examined the effects of thrombectomy on patients who were functioning independently prior to their stroke. All reported strongly positive findings, with the proportion of people who could function independently at 90 days following stroke increasing by between 19-35%".⁵⁵

NICE quote analysis from a study that shows the incremental cost-effectiveness ratio of thrombectomy alongside intravenous thrombolysis was £7,648 per Quality Adjusted Life Year gained. Regarding the cost-benefit evidence of thrombectomy, the study concluded that 'thrombectomy had a 100% probability of being cost-effective at the minimum willingness to pay for a quality-adjusted life year commonly used in United Kingdom'.⁵⁶

For patients with delayed presentation, including patients with symptoms that they wake up with, up to 24 hours from last seen well, there is now increasing evidence for mechanical thrombectomy: DAWN trial⁵⁷ and DEFUSE 3⁵⁸ trials used perfusion-based imaging techniques. The use of this criteria has been supported by NICE 2019 stroke guidelines if there is potential to salvage brain tissue as shown by either CT perfusion or diffusion weighted MRI sequences delineating limited core volumes.

The evidence base for intervening in patients with posterior circulation stroke, including proximal basilar artery occlusion is not robust yet, although the occurrence of symptomatic intracranial haemorrhage (SICH) was not statistically different from current best medical management in two recent trials (BEST⁵⁹ and BASICS⁶⁰) in this patient group and therefore indicate that thrombectomy is likely to be safe in this setting. NICE 2019 stroke guidelines recommend consideration for intervention with mechanical thrombectomy up to 24 hours from last seen well: for patients with a severe stroke, defined as an NIH Stroke Score of 10 or greater when a basilar artery occlusion is demonstrated on non-invasive angiography, with evidence of limited core infarction.

We estimate that 10% or more of patients with stroke are appropriate for treatment with thrombectomy. Despite strong evidence on the cost-effectiveness of thrombectomy, current levels nationally across the NHS are low at 2.8% (to June 2021). Whilst this is significantly higher than recent years, this growth is slow (see **Figure 38**) with wide regional variation. The NHS Long Term Plan highlights the importance of improving access to thrombectomy and includes a goal of ensuring that the 10% of patients with stroke receive thrombectomy.

View from our visits:

79% of units reported having only daytime access to intra-arterial thrombectomy (IAT) services. For the majority (77% of units) this is limited to weekday access only.

25% of units report difficulty accessing their local IAT service.

⁵⁵ NHS England (2018) *Clinical Commissioning Policy: Mechanical thrombectomy for acute ischaemic stroke (all ages)*

⁵⁶ Ganesalingam et al (2015) *Cost-Utility Analysis of Mechanical Thrombectomy Using Stent Retrievers in Acute Ischemic Stroke*. 2015 Sep;46(9):2591-8 Available: <https://www.ncbi.nlm.nih.gov/pubmed/26251241>

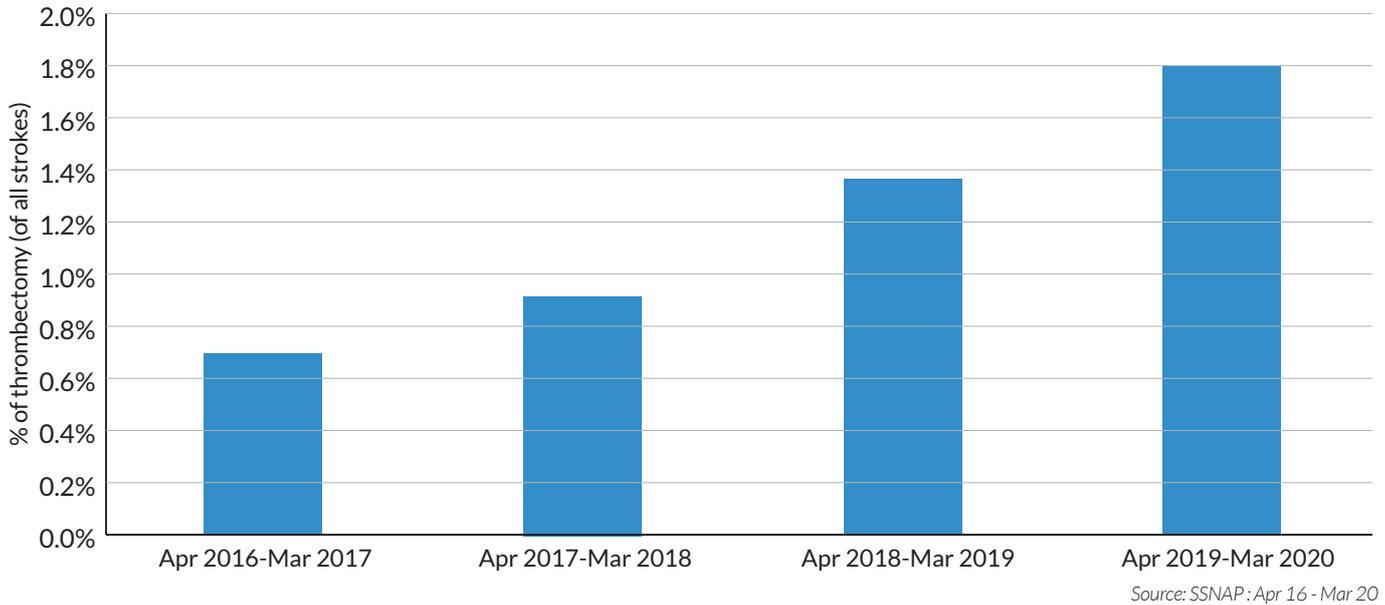
⁵⁷ Nogueira RG, Jadhav AP, Haussen DC, Bonafe A, Budzik RF, Bhuva P, et al. *Thrombectomy 6 to 24 hours after stroke with a mismatch between deficit and infarct*. *The New England Journal of Medicine*. 2018;378:11-21

⁵⁸ Albers GW, Marks MP, Kemp S, Christensen S, Tsai JP, Ortega-Gutierrez S, et al. *Thrombectomy for stroke at 6 to 16 hours with selection by perfusion imaging*. *The New England Journal of Medicine*. 2018;378:708-718

⁵⁹ Liu X, Dai Q, Ye R, et al. *Endovascular Treatment Versus Standard Medical Treatment for Vertebrobasilar Artery Occlusion (BEST): An Open-Label, Randomised Controlled Trial*. *Lancet Neurol*. 2020 Feb;19(2):115-122

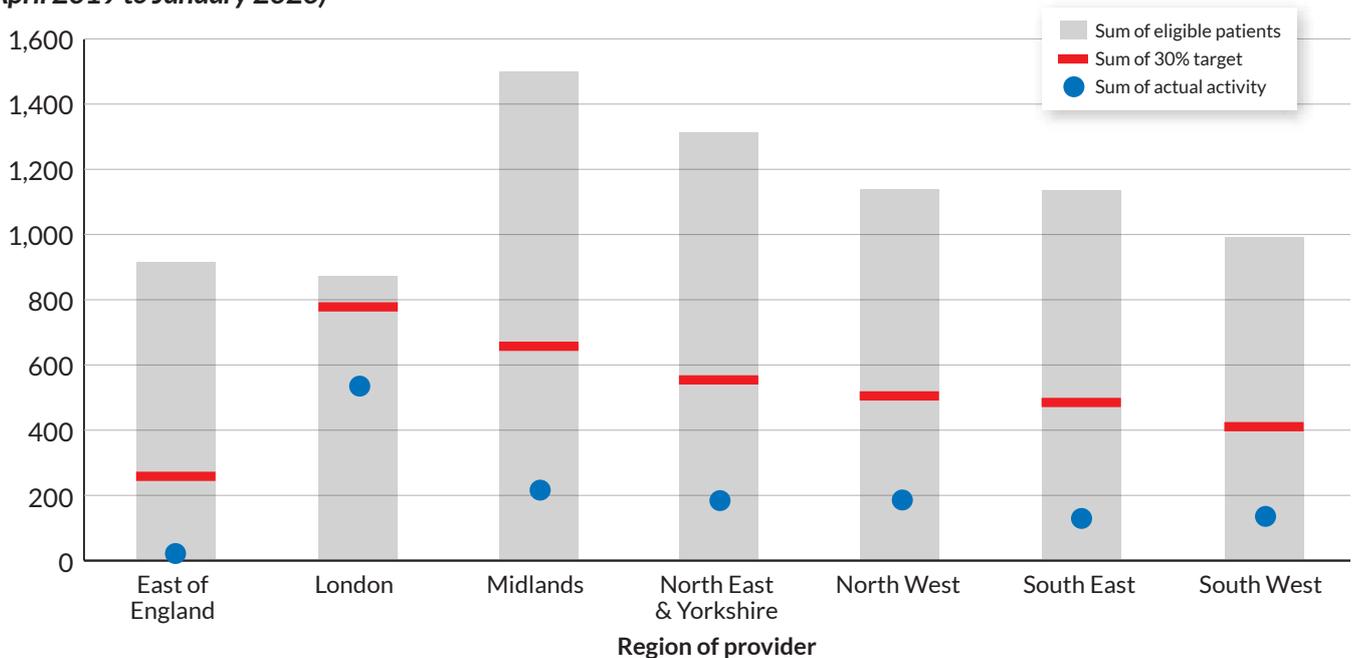
⁶⁰ Langezaal LCM, van der Hoeven EJ, Mont'Alverne FJA, de Carvalho JJF, Lima FO, Dippel DWJ, van der Lugt A, Lo RTH, Boiten J, Lycklama À Nijeholt GJ, Staals J, van Zwam WH, Nederkoorn PJ, Majoie CBLM, Gerber JC, Mazighi M, Piotin M, Zini A, Vallone S, Hofmeijer J, Martins SO, Nolte CH, Szabo K, Dias FA, Abud DG, Wermer MJH, Remmers MJM, Schneider H, Rueckert CM, de Laat KF, Yoo AJ, van Doormaal PJ, van Es ACGM, Emmer BJ, Michel P, Puetz V, Audebert HJ, Pontes-Neto OM, Vos JA, Kappelle LJ, Algra A, Schonewille WJ; BASICS Study Group. *Endovascular Therapy for Stroke Due to Basilar-Artery Occlusion*. *N Engl J Med*. 2021 May 20;384(20):1910-1920. doi: 10.1056/NEJMoa2030297. PMID: 34010530.

Figure 38: Trends in rates of thrombectomy (all stroke types) (England, Wales and Northern Ireland, 2016-20)



At regional level, there is variation in rates of thrombectomy, but overall the picture is that all regions are struggling to meet targets to improve access to thrombectomy. **Figure 39** shows, by region, the number of patients eligible for thrombectomy, a target to improve access (set at 30% of eligible patients) and actual performance. In six out of seven regions, thrombectomy rates are below plan.

Figure 39: Rates of thrombectomy by region – eligible patients compared to contract plans and actual activity (April 2019 to January 2020)

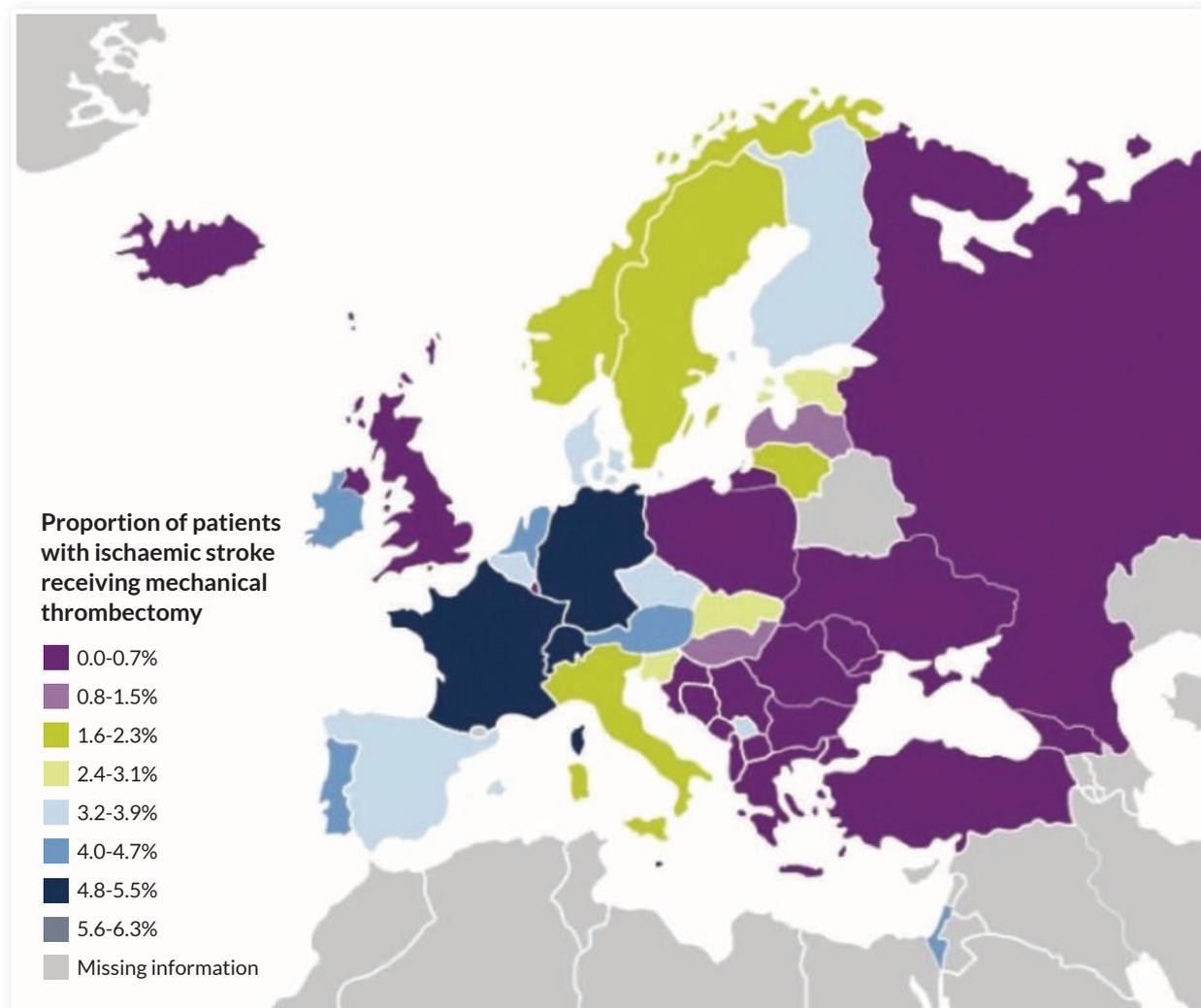


Note: 'Sum of 30%' target represents expected activity for year-end

Source: NHSE&I Mechanical Thrombectomy Dashboard

Compared to other developed health systems, rates of thrombectomy in the UK lag well behind rates seen elsewhere and in 2018 rates of thrombectomy were comparable to those in Eastern Europe and the Balkans (Figure 40).⁶¹

Figure 40: Map showing the proportion of patients with ischaemic stroke receiving thrombectomy across Europe, rates as of 2018⁶²



⁶¹ Aguiar de Sousa D, von Martial R, Abilleira S et al Access to and delivery of acute ischaemic stroke treatments: A survey of national scientific societies and stroke experts in 44 European countries, *European Stroke Journal* 2019, Vol. 4(1) 13–28

⁶² Oxford Academic Health Science Network, *Mechanical thrombectomy for acute ischaemic stroke: an implementation guide for the UK* (edited by Professors Gary Ford, Martin James and Phil White), April 2019

Barriers and challenges to delivering consistent access to thrombectomy

Based on **Figure 38**, rates of thrombectomy need to increase at least 5-fold to meet the target in the NHS Long Term Plan. There is currently inequitable access to 24/7 thrombectomy across England with an increasing number but still less than 50% of units offering a 24/7 service.

Current provision in England sees over 50% of all thrombectomy referrals and admissions for intervention occurring in the eight hours from 10am-6pm, although this is in part mirrors patient presentations, the data is also reflective of the reduced hours of current operation in many centres.

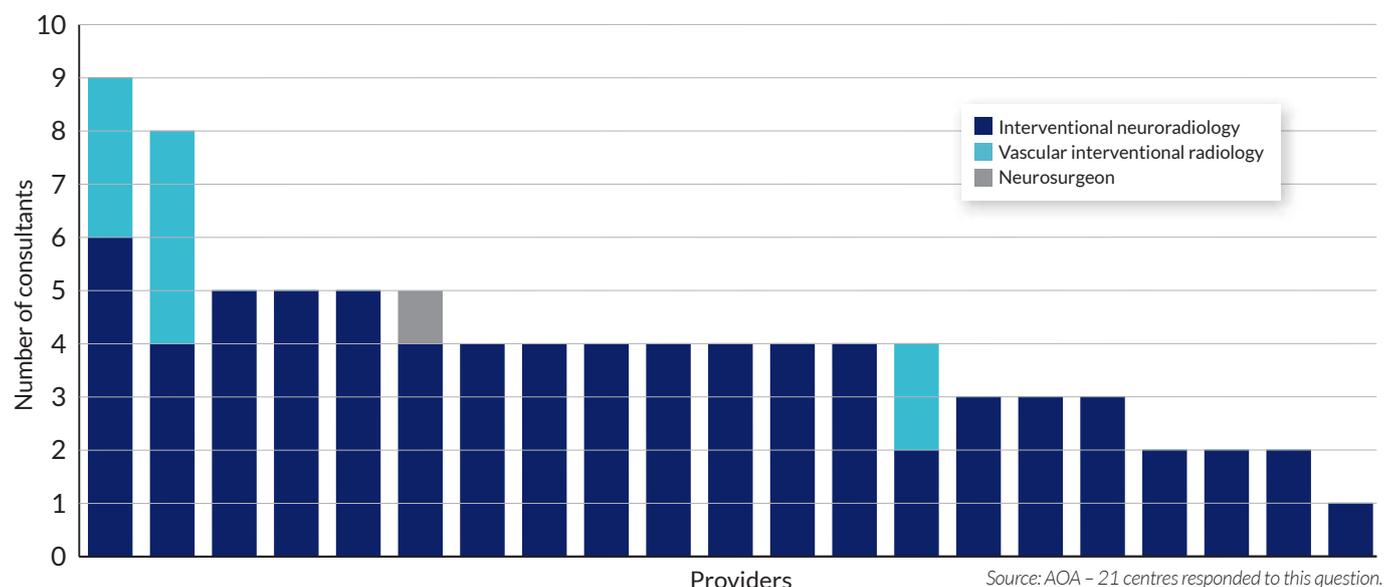
Thrombectomy is a complex intervention that draws on high levels of training and specialist, costly, equipment. Based on our visits and discussions with local teams, we found several barriers that will need to be overcome to deliver consistent and appropriate access to thrombectomy.

Workforce

One of the biggest challenges in increasing rates of thrombectomy in the NHS is workforce. A core constraint is the limited number of interventional neuro-radiologists in the NHS (85 as of 2021), who undertake the majority of thrombectomies.

Figure 41 shows the sub-specialty of consultants carrying out thrombectomy by neuroscience centre. Such low numbers of trained staff makes it very difficult to deliver sustainable rotas and provide a 24/7 service.

Figure 41: Number and specialty of consultants carrying out thrombectomy (England, 2019)



All units are planning to recruit and train more interventional neuro-radiologists.

Simulation training offers opportunities to train clinical teams in a safe and cost-effective way to develop the skills required to undertake thrombectomy. High-quality virtual reality simulation (VRS) training facilities, in a safe and realistic environment, including simulating the impact of complications and allowing teams to practice before dealing with emergencies in a real environment, has been used with success in some centres and with an evidence base.⁶³ It should not be considered a replacement for hands on fellowship training, but may reduce the time needed to develop competency.

⁶³ Liebig T, Holtmannspötter M, Crossley R, Lindkvist J, Henn P, Lönn L, Gallagher AG. Metric-Based Virtual Reality Simulation: A Paradigm Shift in Training for Mechanical Thrombectomy in Acute Stroke. *Stroke*. 2018 Jul;49(7):e239-e242. doi: 10.1161/STROKEAHA.118.021089. Epub 2018 Jun 4. PMID: 29866758.

Importantly, use of VRS allows training of interventionalists from a variety of specialties in the procedure early on in their fellowship, appreciating the complexity of the procedure. We envisage that the widespread use of VRS has the potential to reduce the time required to gain thrombectomy competence.

Recent correspondence in *Clinical Radiology*⁶⁴ notes that interventional neuroradiologist training:

“... has expanded rapidly since 2015 to a total of nearly 40 [trainees] currently at different stages of training. Even if all these trainees continue interventional practice within the NHS (and the trainers do not retire), they would not enable complete staffing of 24/7 rotas in all UK thrombectomy centres by 2022, never mind support development of new centres to provide care for remote populations.”

The authors support a new credentialing proposal by the Royal College of Radiologists, the British Society of Interventional Radiology (BSIR), the British Society of Neuroradiologists (BSNR) and UK Neurointerventional Group (UKNG). This proposal, which is currently being considered by the General Medical Council, could see clinicians from non-interventional radiology backgrounds trained to work alongside INRs and contribute to 24/7 services providing thrombectomy for acute stroke. If approved, this has the potential to increase workforce capacity (although it is still unknown how pragmatic an option this is for consultant colleagues, who are not radiologists, and their employing organisation if the training is time based rather than capability-based) We recommend an urgent review of the deliverability of fellowship training to non-radiologists, before GMC credentialing sign-off is complete, to appreciate the likely uptake of such programmes.

Balancing the need for rapid expansion of the thrombectomy capable workforce with the need for proficient and safe practice will be a challenge. Various groups have sought to articulate the level of training required by operators and the current credentialing proposals with the GMC for consideration may address this short fall. Attracting skilled non-INR interventionalists to become capable in thrombectomy requires careful consideration as to length of additional training required and the back fill of these individuals to undertake the training. However, evidence suggests this can be done safely.⁶⁵ Back filling diagnostic radiology work to enable training of the future generation of thrombectomy-capable practitioners requires investment; both were cited during our visits as barriers to thrombectomy access.

IN PRACTICE

Credentialing vascular radiologists to perform thrombectomy

Hull University Teaching Hospitals NHS Trust

Hull University Teaching Hospitals (HUTH) NHS Trust is the first UK neurosciences centre to credential a vascular radiologist (VR) in thrombectomy, with two others currently in training. The credentialed VR is now contributing to the provision of thrombectomy services 0800-1700 Monday-Friday. HUTH hopes to extend the thrombectomy service provision to 0800-2000 in 2021 and hopefully 24/7 once the required complement of INR/VRs are in place.

The decision to train a VR in thrombectomy was taken after discussion with INR colleagues at UKNG and discussion with HUTH management. BSNR guidance was followed and the thrombectomy/INR experience of the relevant VR was audited and found to be acceptable. This was discussed at the health group level/governance board and the VR was signed off to perform thrombectomy.

Apart from one-to-one training with an INR, the VRs in training have learned stroke imaging and interpretation at local training meetings like Hull Stroke School, Hull Interventional Neuroradiology Course, BSIR workshops for thrombectomy (all three courses providing hands on training on advanced vascular phantoms), and animal model thrombectomy training courses in Barcelona and Rotterdam.

HUTH has organised regional thrombectomy training and thrombectomy simulation days to bring together stroke teams from the DGH HASUs to improve their awareness of the referral pathways and to take part in simulation of a stroke patient's journey from arriving at HUTH to receiving thrombectomy. Regional thrombectomy pathway meetings also included a talk on rapid imaging (CTA & perfusion).

⁶⁴ Letter on behalf of members of the UK Neurointerventional Group (UKNG), the British Society of Neuroradiology (BSNR), the British Society of Interventional Radiology (BSIR) – *Clinical Radiology* 75 (2020) 868-875

⁶⁵ See, for example: Beharry J, Fink J, Colgan F et al, *Endovascular Therapy for Ischemic Stroke Can Be Successfully Performed by Peripheral Vascular Interventionalists, Endovascular Therapy for Ischemic Stroke Can Be Successfully Performed by Peripheral Vascular Interventionalists, Journal of Vascular and Interventional Radiology, Vol. 31, Issue 12, pp.1978-83, Dec 2020*

Pathway optimisation

There is evidence to suggest that many interventions have better outcomes the more frequently the team undertakes the intervention (e.g. IV thrombolysis, PCI to the heart, SAH coiling).⁶⁶ A recent study of over 900 patients undergoing endovascular thrombectomy demonstrated that for hospitals treating >150 patients per year, versus those treating 20-30 patients per year, there was a 10% improvement in independent outcome and 4% reduction in mortality.⁶⁷

Thrombectomy is typically undertaken by specialist neurosciences centres. There are 24 of these across England, 23 of which currently undertake routine thrombectomy, compared to 20 ISDNs. Centres are not evenly spread across the country and they often serve several networks. This complicates the process for agreeing treatment and management of patients that are eligible for thrombectomy, and we heard on our visits that this often leads to confusion, delay and inconsistent decision-making around which patients are transferred for thrombectomy and when. Many areas of England are not currently adequately served by a thrombectomy centre within reasonable road travel times (see **Figure 42** for a map showing national travel times to neuroscience centres).

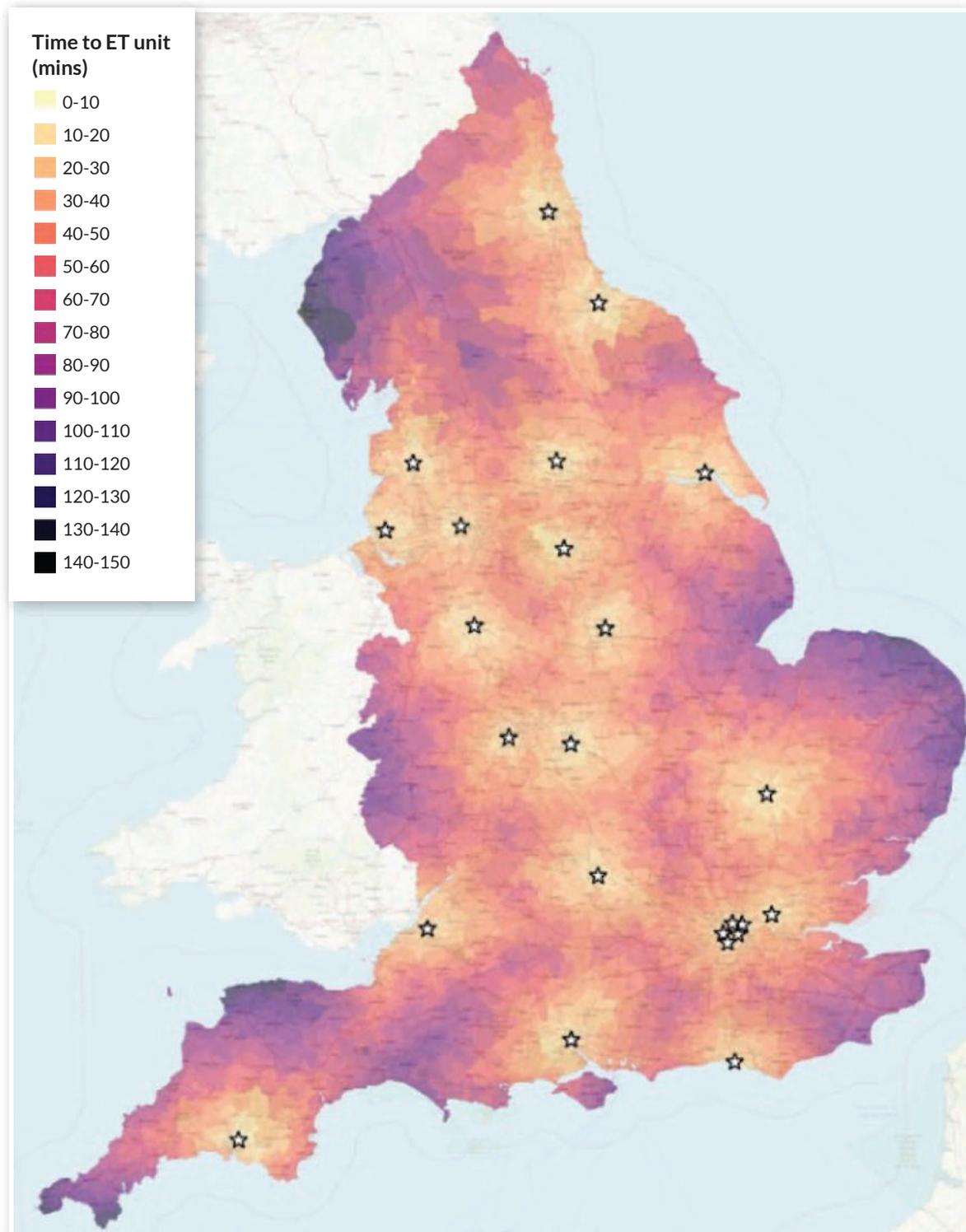
Insight from GIRFT's data

Only 26% of units report that their thrombectomy referrals are discussed at regional MDTs, in line with best-in-class practice.

⁶⁶ See for example: Prabhakaran S, Fonarow GC, Smith EE, et al. Hospital case volume is associated with mortality in patients hospitalized with subarachnoid hemorrhage. *Neurosurgery*. 2014;75:500-508. doi: 10.1227/NEU.0000000000000475 30; Saver JL, Fonarow GC, Smith EE, et al. Time to treatment with intravenous tissue plasminogen activator and outcome from acute ischemic stroke. *JAMA*. 2013;309:2480-2488. doi: 10.1001/jama.2013.6959; Hoh BL, Rabinov JD, Pryor JC, et al. In-hospital morbidity and mortality after endovascular treatment of unruptured intracranial aneurysms in the United States, 1996-2000: effect of hospital and physician volume. *AJNR Am J Neuroradiol*. 2003;24:1409-1420; Pandey AS, Gemmete JJ, Wilson TJ, et al. High subarachnoid hemorrhage patient volume associated with lower mortality and better outcomes. *Neurosurgery*. 2015;77:462-470; discussion 470. doi: 10.1227/NEU.0000000000000850; Jalbert JJ, Gerhard-Herman MD, Nguyel LL, et al. Relationship between physician and hospital procedure volume and mortality after carotid artery stenting among Medicare beneficiaries. *Cir Cardiovasc Qual Outcomes*. 2015;8:81-89; Badheka AO, Patel NJ, Grover P, et al. Impact of annual operator and institutional volume on percutaneous coronary intervention outcomes: a 5-year United States experience (2005-2009). *Circulation* 2014;130:1392-406.

⁶⁷ Kim BM, Baek JH, Heo JH, Kim DJ, Nam HS, Kim YD. Effect of Cumulative Case Volume on Procedural and Clinical Outcomes in Endovascular Thrombectomy. *Stroke*. 2019 May;50(5):1178-1183.

Figure 42: Current access to existing neuroscience centres as of 2019⁶⁸



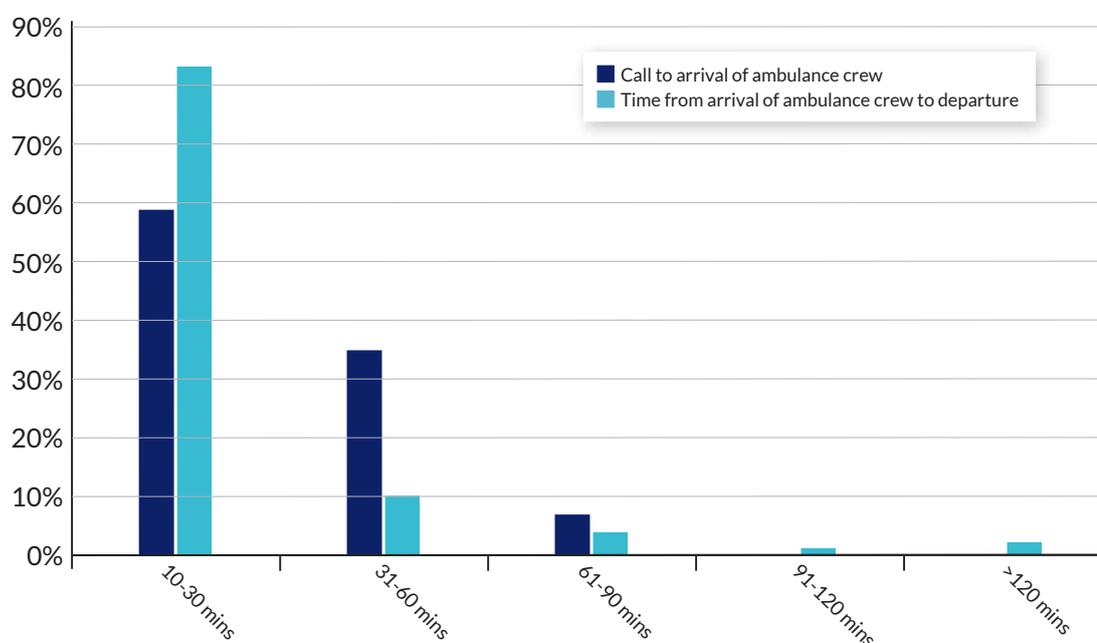
Source: Oxford Academic Health Science Network

⁶⁸ Allen M, Pearn K et al in Gary Ford, Martin James and Phil White (eds) Mechanical thrombectomy for acute ischaemic stroke: an implementation guide for the UK, Oxford Academic Health Science Network, April 2019

Thrombectomy also relies on rapid imaging to support a rapid diagnosis and a clear treatment plan. The decision to undertake thrombectomy is a joint decision by the admitting specialist stroke team (ASC) with the regional thrombectomy-capable centre (CSC), so images need to be shared with the interventionalist performing the procedure. As highlighted above, there are challenges both with completing imaging rapidly and there is often no reliable infrastructure for sharing images across the team members and with providers involved in delivering care quickly. This sharing becomes more complicated when receiving centres work with a variety of referral centres running different systems. AI decision-support tools may incorporate these imaging sharing capabilities and be an advantage to their primary decision support function (see **Figure 17**, introducing the NOSIP).

Journeys in and out of acute hospitals also add to delays in transferring patients for thrombectomy. **Figure 43** shows data reported by units on patients transferred for thrombectomy. It shows the average time from call to arrival at an acute hospital and the average time from arrival of the ambulance crew at the acute hospital to departure for onward transfer. The current average door-in door-out (DIDO) time in England is greater than two hours.

Figure 43: Transfer times in and out of hospital for patients transferred for thrombectomy



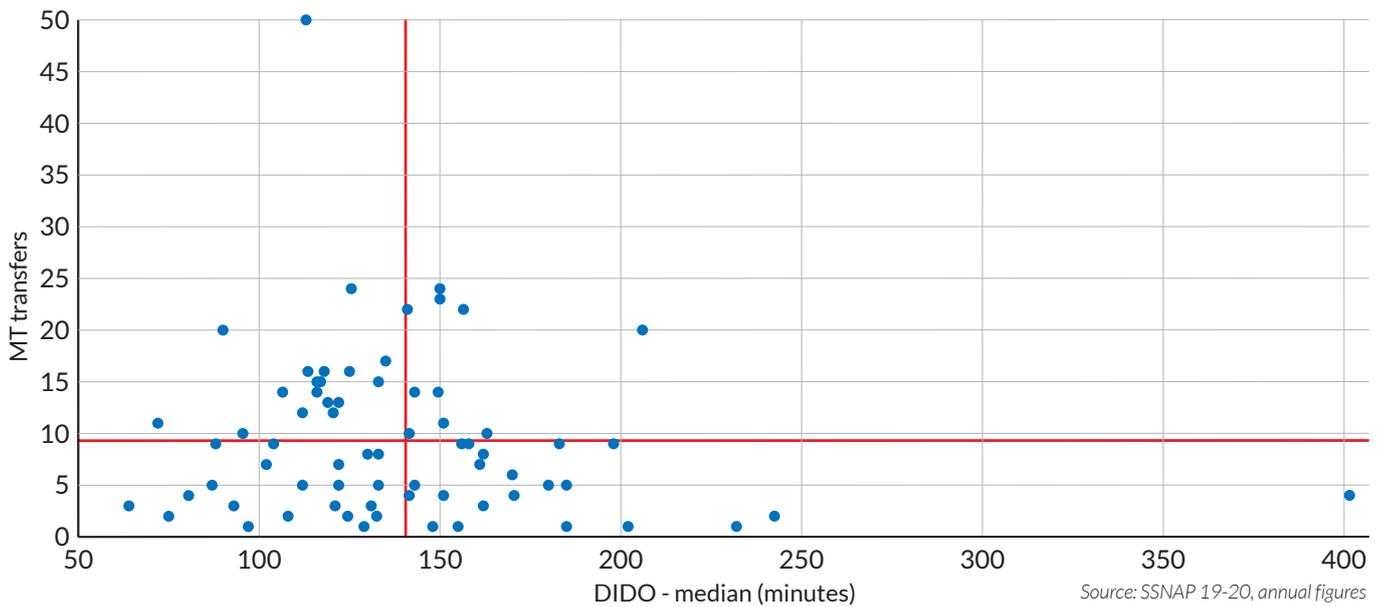
Note: data is reported by units and shows responses to the following questions:

- What is the average time between call to ambulance from acute hospital to arrival of ambulance crew at acute hospital for your last 5 cases / over last 12 months?
- What is the average time between arrival of the ambulance crew at the acute hospital to departure from acute hospital for your last 5 cases / over last 12?

Source: GIRFT question added to AOA 2019

We found significant variation in DIDO times, which did not demonstrate a significant correlation with volume of thrombectomy referrals from the spoke unit (ASC), see **Figure 44**. A granular understanding of the heterogeneity of the process is required, learning from those centres who appeared to have low DIDO both with and without high volumes of patients referred. It is important to incorporate secondary transfers from spoke to hub hospitals in this understanding of a networked approach to increasing thrombectomy rates.

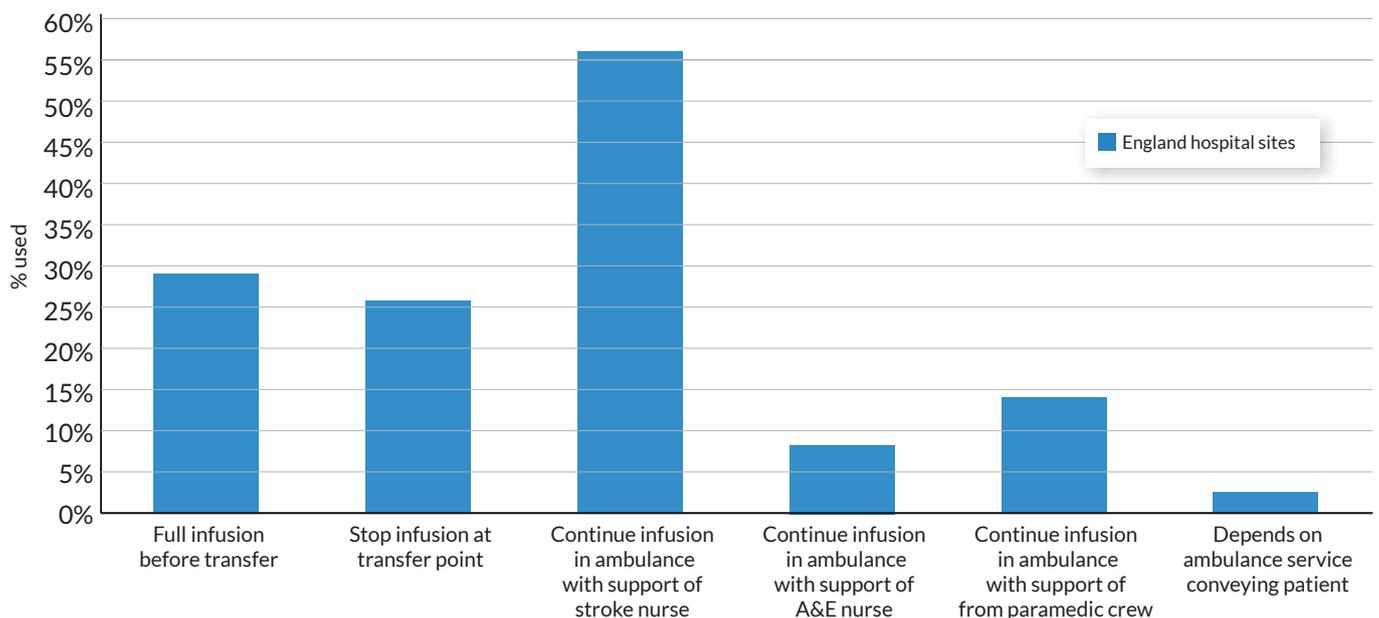
Figure 44: Relationship between DIDO times and volume of referrals (all referring units, England)



A key enabler to improving rapid access to thrombectomy services is addressing barriers to the sharing of images and ensuring that providers adhere to the new National Optimal Stroke Imaging Pathway (NOSIP).

We also found variation in the management of thrombolysis in patients prior to transfer for thrombectomy, which may lead to delays in transfers. **Figure 45** shows variations in the management of thrombolysis in patients who are being referred for thrombectomy.

Figure 45: Process for IV thrombolysis prior to transfer for thrombectomy

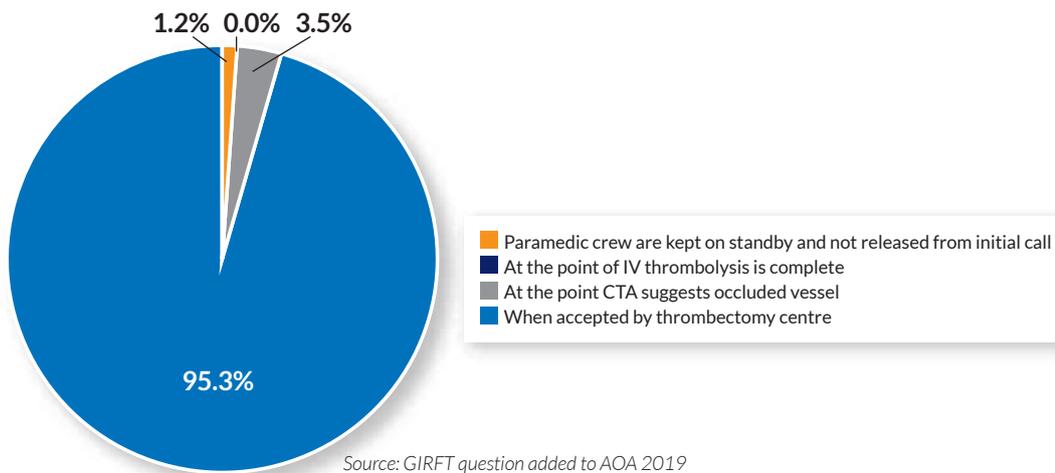


Note: Percentages do not sum to 100% as units were able to select more than one option to reflect common local practices. Question was asked of units that make referrals for thrombectomy.

Source: GIRFT question added to AOA 2019

In almost all units, the ambulance services are not asked to convey patients to a thrombectomy centre until the referral has been accepted by the thrombectomy centre. A minority of units try to speed up the conveyance process by keeping the original paramedic crew on standby whilst a decision is made or requesting conveyance earlier in the process (**Figure 46**). 15% of units report that their stroke team uses helicopter transfer for thrombectomy patients.

Figure 46: When a patient requires conveyance to the thrombectomy centre at what point do you call the first responder ambulance service?



Note: percentages do not sum to 100% as units were able to select more than one option to reflect common local practices

IN PRACTICE

Improving DIDO times for patients referred for thrombectomy

Buckinghamshire Healthcare NHS Trust

In ischaemic stroke, rapid reperfusion therapy – including endovascular thrombectomy – reduces disability and improves outcomes.

In the UK, the majority of thrombectomy cases are referred to Comprehensive Stroke Centres (CSCs) from local ASCs ('drip and ship'), with this arrangement being the most feasible in the NHS. It is therefore critical that door-in door-out (DIDO) times at referring centres are optimised, with one study showing a correlation between longer DIDO times and poorer outcomes after thrombectomy.⁶⁹

Despite a very good door-to-needle (DTN) time of 30 minutes, the trust completed an audit of their initial series of thrombectomy patients and found an unexpectedly long DIDO. Since then, a variety of quality improvement measures and a standard operating procedure (SOP) have been implemented, aiming for a target of one hour. As a consequence, median DIDO time fell from 1 hour 50 minutes to 1 hour. These reductions are attributed improvements in individual steps of the pathway, in-line with the new SOPs, including:

- CT to CT Angiogram (CTA): This showed the most marked improvement in time, stemming from automatic triggering of a CTA in thrombectomy candidates. To avoid delays in DTN time, cannulation takes place in CT room/waiting area, and tPA can be started in the scanner room after initial CT. (Median time=5 minutes.)
- CTA to referral: Most cases (70%) are now referred within 10 minutes – another significant improvement. This may reflect requirement for stroke consultant review of images in the CT room as per the SOP. (Median time=8 minutes.)
- Referral to acceptance by thrombectomy centre: Referral times have improved due to optimised image transfer, as well as the use of a baton phone for thrombectomy referrals by accepting centres. However, it remains the largest component time of the pathway. (Median time=23 minutes.)
- Acceptance to departure: The median time for this is 15 mins. It happens fastest when the original ambulance crew remain on-site (acceptance to door-out times are under 5 minutes) but this cannot be guaranteed due to service capacity.

An increase in the number of centres that can undertake thrombectomy (CSC) may also be required. We recognise this may take time given capital and workforce constraints, but it is likely essential to deliver meaningful improvements in access to thrombectomy. Recent modelling suggests a pragmatic approach is required, based upon large geographic areas and not singular ICS or ISDN footprints if the complex relationship between earlier access to thrombectomy is balanced with ASC sustainability, given the potential for ambulance bias when CSC and ASC are only 15 minutes apart in travel time from the scene.⁷⁰

Culture and behaviour, governance and leadership

As highlighted earlier, culture and leadership are critical enablers to motivating and sustaining change at a local level. Motivating systems to change how they plan and deliver thrombectomy services will require strong leadership and a supportive and collegiate approach to collaborate across wide geographic networks. This may be challenging given the barriers described above. Feedback from our visits is that professional silos and varied approaches to how systems work together may delay progress. It is vital trusts and systems prioritise leadership, and it is timely to do so now given the emphasis the ICS design framework places on clinical and professional leadership.⁷¹

⁶⁹ McTaggart RA, Moldovan K et al. Door-in-Door-Out Time at Primary Stroke Centers May Predict Outcome for Emergent Large Vessel Occlusion Patients *Stroke*. 2018 Dec;49(12):2969-2974. doi: 10.1161/STROKEAHA.118.021936.

⁷⁰ Gary Ford, Martin James and Phil White (eds) *Mechanical thrombectomy for acute ischaemic stroke: an implementation guide for the UK*, Oxford Academic Health Science Network, April 2019

⁷¹ NHS England and NHS Improvement, *Integrated Care Systems Design Framework, version 1, June 2021*

IN PRACTICE

Delivering 24/7 thrombectomy

Imperial College Healthcare NHS Trust

The Imperial Stroke Centre thrombectomy service has been in development since NHS England commissioned the service in 2018. Since that time, the service has grown from a five-day 9-5 service, to a seven-day extended day service, and finally to full 24/7 cover by August 2019. By early 2020, the Imperial thrombectomy service had grown into the largest volume thrombectomy service in the UK. The service provides for the local population of North West London, six centres beyond London and overnight cover for two further London centres—thereby providing an overnight thrombectomy service for most of the population of North London.

Thrombectomy for anterior circulation stroke has been shown to be a highly effective treatment with grade A, level 1 evidence. Despite this, access to this time-sensitive treatment for local patients was patchy at best, from 2015 to early 2018. Patients in North West London had access to a weekday only, 9-5 service, which was far from ideal.

A business case for 24/7 thrombectomy was successfully completed in 2017 and efforts to fulfil this commenced in early 2018, with the full support of the trust's executive board. The new 24/7 service was launched in August 2019. Several interventions were instrumental in establishing the new service, including:

- A weekly thrombectomy board that brought together a diverse inter-disciplinary collaboration within the trust to drive and sustain change.
- Regular (monthly) review of data to ensure quality of service is maintained and any deviation from internationally published results are discussed in detail.
- The highest degree of efficiency, effectiveness and patient safety when managing thrombectomy patients (e.g. new monthly thrombectomy simulation, which uses a real-time scenario to educate all staff and to iron out any problems, aiming to shave off every second along the pathway wherever safely possible).
- Strengthening communication between the eight regional centres being served, via a quarterly Regional Thrombectomy meeting where metrics, patient case presentations and new updates including AI technologies are discussed.

Capital and funding

Thrombectomy is currently carried out routinely at 23 of the 24 commissioned neurosciences centres across England. Catheter laboratory capacity was highlighted during our visits as a barrier to delivery. At the time of writing only four have access to more than one biplane CT angiography equipment. Meeting the targets to increase access to thrombectomy will require significant investment in imaging capabilities at both ASC and CSC and new capacity with the right equipment at CSCs to undertake the procedure. There are high fixed capital costs to setting up thrombectomy services. Whilst current tariffs cover the revenue costs of delivering thrombectomy, they do not adequately cover the significant up-front costs to setting up the infrastructure required to deliver thrombectomy. Investment will need to be prioritised to cover these high fixed costs to enable change, particularly at the two to six envisaged standalone thrombectomy centres required.

Accountability

Thrombectomy is a specialised service that is nationally commissioned. Delivery is overseen by regional specialised commissioning teams whose responsibilities include agreeing and monitoring the delivery of specialised services. As part of the annual contracting rounds, regions and their providers of thrombectomy agree contract plans that they deliver services against. Across all regions, actual thrombectomy activity levels are significantly below the levels set out in contract plans. This has been the case for a number of years and highlights the transformation that will be required to deliver on plans to grow access to thrombectomy.

We raise this as an accountability barrier because there needs to be clear ownership (and leadership) for driving the transformation needed to build momentum and deliver change.

Data

One reason why accountability may be unclear is that data around the provision of thrombectomy is limited. One of the findings from our visits is that with the data available, we were not able to undertake more than a cursory analysis of thrombectomy services and were certainly not able to get close to identifying the root cause of problems in a useful way that could support quality improvement. SSNAP collect process metrics along the thrombectomy pathway, although from our visits the lack of sufficient granularity to pinpoint underlying concern with referrals, patient flow, acceptance decisions and provision was frequently cited as a major barrier to improvement.

From the currently available data from SUS, there appears to be a significant variation in the use of critical care beds by thrombectomy centres post procedure. Some centres admit all of their patients there, whilst others admit less than 10% of post-thrombectomy patients. The current national average is 25% with a median length of stay of four days. 60 % of those patients admitted to HDU or ITU require more than two organ support. Therefore an appropriate figure is therefore likely to be 15% of all patients truly requiring critical care support post-thrombectomy.

GIRFT's action plan for improving access to thrombectomy

We are recommending that 8% of all ischaemic stroke patients should be accessing thrombectomy by 2025. This is achievable within the short to medium-term and is significant progress towards the Long Term Plan goal of 10%. We have identified a number of steps that local systems may take to optimise the pathway, train and mobilise staff to deliver thrombectomy, which together are likely to improve access to thrombectomy for patients with stroke across the country.

Workforce

We are recommending an urgent review of the deliverability of fellowship training to non-radiologists, alongside the current credentialing proposals for the GMC, making it possible for non-INTR interventionalists to be capable of performing thrombectomy rapidly and safely. Simulation training offers a cost-effective and safe route to increase the number of clinicians equipped to complement formal thrombectomy fellowship training.

Pathway optimisation

Based on our visits, we think there are steps localities can take to optimise local thrombectomy pathways. The first step is to strengthen pathways between thrombectomy hubs (CSCs) and referring ASCs, which is an urgent action for ISDNs to address. Access to thrombectomy services will also be improved if providers address barriers to the sharing of images and adhere to the new National Optimal Stroke Imaging Pathway.

GIRFT recommends the optimal pathway to reduce DIDO times would comprise:

1. Early and detailed notification of potential thrombectomy patient to ASC by ambulance clinicians attending the patient (may be enhanced through use of pre-hospital telemedicine).
2. ASC preparations (ordering imaging, pre-warning CT/emergency receivers, checking previous medical records, speaking to next of kin, CSC are pre-warned of likely impending referral etc.) are made whilst patient is in transit.
3. Patient is met by the waiting stroke team, as close to the imaging department at the ASC as feasibly possible, with a 'pit stop' to confirm likely diagnosis / safety for immediate imaging.
4. The ambulance crew are asked to wait whilst patient is imaged.
5. Adherence to the NOSIP, with all image acquisitions taken at the same sitting.
6. Immediate image interpretation by treating stroke physician with AI decision support tools available.
7. If IV thrombolysis is indicated this is commenced in the imaging department.
8. Immediate real time transmission of images to CSC and formal referral.
9. Patient is transferred from imaging department (if medically stable) to original ambulance for onward conveyance to CSC.

A best fit model for England is likely to require expansion of the current 24 neuroscience providers to deliver 24/7 cover with an additional four to six standalone thrombectomy centres supporting those regions of the country with poor access currently to a CSC. Southend University Hospitals NHS FT demonstrated that a non-neuroscience centre can deliver a thrombectomy service that is safe and effective (in this case the activity was delivered by an experienced INR).

Their audit data suggested that the service exceeds recommended audit standards and the improvement in outcomes for patients achieving less disability is similar to many of the international trials and established centres who participated in these. There is no reason to doubt that with correct pathways and training of operators, thrombectomy can be undertaken outside of a neurosurgical centre.

Culture and behaviour, governance and leadership

We recommend quality review visits, specifically focused on thrombectomy services. The goal should be to work with the seven NHSE regions and the ISDNs within each region, using the GIRFT methodology to evidence the specific barriers and constraints that may be impacting thrombectomy pathways. Our expectation is that these reviews will be an important step to support local teams in the development of compassionate leadership and culture necessary to improve patient centred pathways.

Capital funding

There is a need to financially support both established thrombectomy centres to operate 24/7 and any new standalone centres. The need for additional bi-plane capable catheter labs is real and the lack of funding is having a significant contributory impact on ability to deliver thrombectomy. We recommend the seven medical regions work with providers to navigate the financial demands upon the system, prioritising thrombectomy capital funding over other needs with less evidence of cost-efficiency and lives lived with less disability as a result.

Data

There is an urgent need to improve the data that is available to help plan, track and review patient flows through thrombectomy pathways. Specifically:

1. SSNAP data related to thrombectomy to be linked to SUS and HES data. Without this linking it is not possible to get a complete picture of referral pathways. As an example, HES records treatments undertaken by a provider, but there is a large group of patients who are referred for thrombectomy but not accepted. Without combining datasets, it is not possible to get a complete picture of decisions along pathways.
2. Reporting of SSNAP and HES needs to be accelerated so that the data is as current as possible. Delays in processing data make it less useful for quality improvement activities.
3. Networked thrombectomy performance should count towards final SSNAP scores.
4. Thrombectomy metrics in SSNAP should be expanded. At the time of our visits there were six elements of thrombectomy processes reported in SSNAP. When compiling our evidence base for GIRFT visits we found that these metrics were aggregated, making it difficult to understand the underlying drivers of differences between organisations. Examples of areas where we will be recommending data needs to be strengthened include:
 - More detail on the type of imaging performed to confirm (or not) appropriateness for thrombectomy.
 - Documenting the reasons for no procedure being undertaken.
 - Greater detail on post-intervention transfer and repatriation.

Accountability

During the GIRFT programme, we recommended establishing a new national Thrombectomy Implementation Group (TIG). The TIG, which is now in place, will oversee plans to roll out thrombectomy services in line with national policy, with the aim of ensuring the delivery of 24/7 thrombectomy services and increase capacity to meet the targets set out in the Long Term Plan. Amongst other responsibilities, this group should:

- Support the release of appropriate capital and revenue funding.
- Strengthen regional oversight, monitoring and ownership.
- Support regional pathway optimisation and quality improvement activities.
- Facilitate six regional thrombectomy quality review visits.
- Work with SSNAP to revise thrombectomy-relevant process metrics.
- Be a catalyst for enabling change (e.g. progressing credentialing proposals and overseeing implementation of the National Optimal Stroke Imaging Pathway).

Actions and progress made during GIRFT's stroke programme

- Establishment of a National Thrombectomy Implementation Group.
- SSNAP expansion of thrombectomy dataset to enable production of a networked thrombectomy score.
- GMC close to finalising thrombectomy-specific credential in partnership with the RCR.
- AI decision-support tools now operational in >50% of stroke centres in England with the appointment of a NHS England and NHS Improvement Stroke Digital Lead to facilitate and support national roll-out.

Recommendations to improve access to thrombectomy

Recommendation	Actions	Owners	Timescale
12. Improve access to and time to thrombectomy intervention. Aiming for 8% of all patients with stroke accessing thrombectomy by 2025.	a Develop the Thrombectomy Implementation Group (TIG) further to coordinate the national response, working closely with stakeholders.	NHSE&I National Stroke Programme and NHS Specialised Commissioning	Ongoing
	b Develop clear plans with implementation milestones and use data to monitor process and outcomes, reporting into the Thrombectomy Implementation Group (TIG) for oversight purposes.	ISDNs and regional medical directorates	Within six months of publication
	c Implement hub and spoke pathways within ISDNs to deliver thrombectomy, to deliver sustainable 24/7 access for the residents of each ISDN. This should involve specialised commissioning, the regional medical directors and all current referrers and providers.	ISDNs and communities of practice	Within 12 months of publication
	d Revise, pilot and implement new SSNAP metrics of process of care for thrombectomy, linking with specialised commissioning dashboards.	ISDNs	Within six months of publication
	e Implement imaging software (AI/decision-support tools) to rapidly identify patients that would benefit from thrombectomy.	ISDNs	Within 12 months of publication

Stroke prevention and Transient Ischaemic Attack (TIA) management

Primary prevention - promoting brain and heart vascular health

Over 80% of strokes are preventable or the onset of the first event may be delayed given the cause of the stroke is attributable to a modifiable risk factor.⁷² Stroke prevention is often managed alongside prevention of other vascular diseases because the risk factors are similar. The main factors that increase the risk an individual will suffer a stroke are well-evidenced and understood. They are also generally modifiable through behaviour and lifestyle change, and through management of medical conditions in primary care. The key risk factors for stroke include:

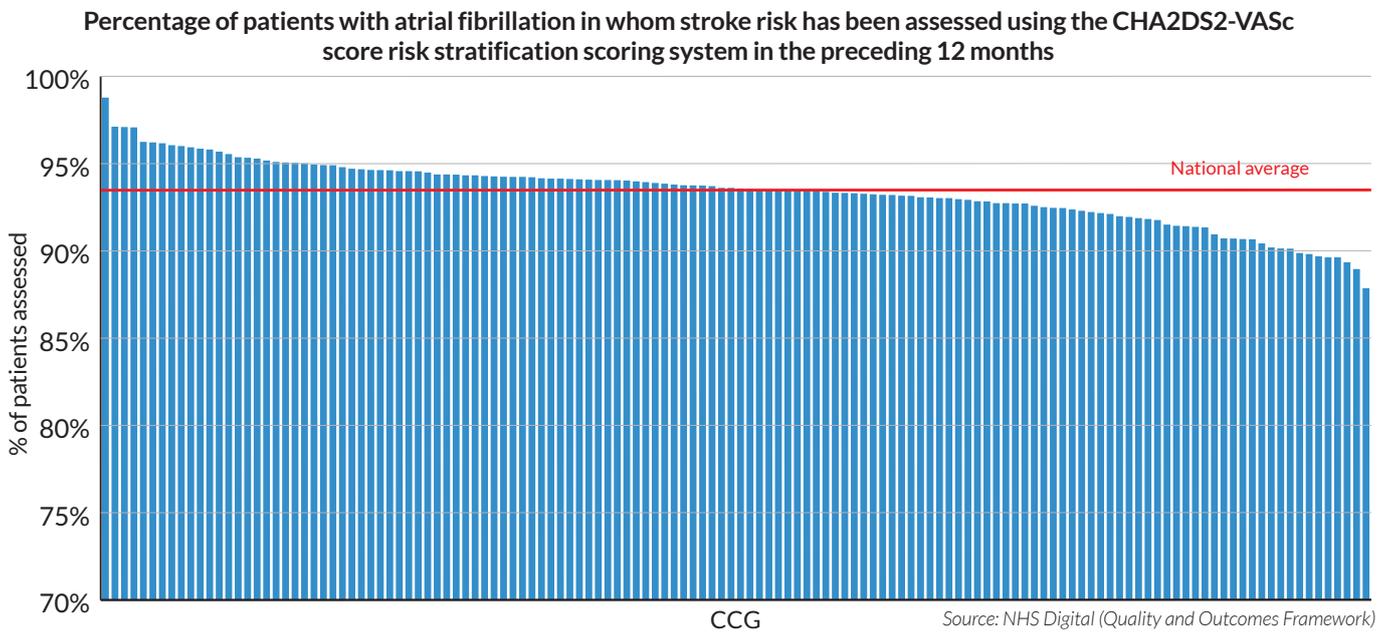
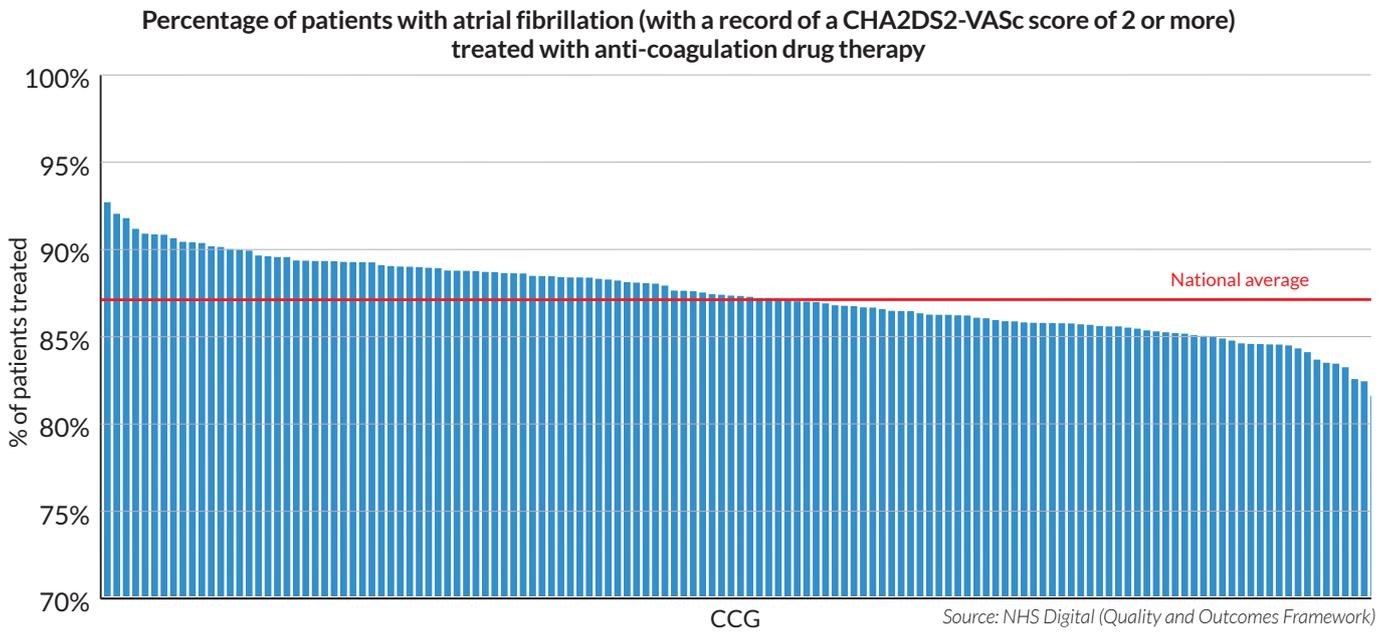
- age (over 55s at higher risk);
- medical conditions (e.g. high blood pressure, atrial fibrillation, high cholesterol, diabetes);
- lifestyle factors (smoking, alcohol, obesity, diet);
- family history; and
- ethnicity.

Prevention is at the heart of the NHS Long Term Plan. In addition to substantial commitments to tackle obesity, alcohol excess and smoking, the Plan includes a major ambition to prevent 150,000 strokes, heart attacks and vascular dementia by improving the treatment of the high-risk conditions – hypertension (high blood pressure), high cholesterol and atrial fibrillation. The concept of brain and heart vascular health should be promoted, with stroke and dementia prevention having parity of esteem within 'cardiac' disease prevention.

We know from national data that there is wide variation across CCGs in the prevalence of risk factors for stroke and in how those risk factors are managed. As an illustration, **Figure 47** shows the variation in practice by CCG at identifying risk and management of atrial fibrillation in primary care.

⁷² Risk factors for ischaemic and intracerebral haemorrhagic stroke in 22 countries (the INTERSTROKE study): *Lancet* 2010 Jul 10;376(9735):112-23

Figure 47: Variation in management of patients with atrial fibrillation, by CCG (2019-20)



We also know stroke incidence is linked to health inequalities. For example, a recent study funded by NHS England and the Welsh government found higher incidence of hospitalisation for both ischaemic stroke and intracerebral haemorrhage in lower socioeconomic groups. Patients from the lowest socioeconomic groups had their stroke seven years earlier than patients from the highest. Lower socioeconomic groups are more likely to have pre-stroke disability and diabetes, which in part explains why these groups have a higher risk of mortality one-year post-stroke.⁷³

Given the high variation across geographies in the risk factors for stroke, dementia and heart disease, and the good evidence that many of these risk factors are modifiable, localities need to look again at how they prioritise and target their risk prevention programmes. Effective primary prevention activities require close working across organisations and sectors. Patients typically have multiple CVD risk factors and addressing them, especially given the link to inequalities, requires a cross-sector approach with must be integrated across health and social care – in line with the vision set out in the DHSC’s recent White Paper, *Integration and Innovation: working together to improve health and social care*.

IN PRACTICE

A shared approach to hypertension detection and management

Cheshire and Merseyside Health and Care Partnership

Cheshire and Merseyside have developed and delivered a cross-sector approach to hypertension detection and management since 2015. The relationships and trust that had already been developed meant that they were able to respond quickly and as one system to adapt CVD prevention activities during COVID-19, and a cross-sector subgroup continued to support CVD prevention across C&M STP throughout COVID-19. ‘Happy Hearts’ (www.happy-hearts.co.uk) is an example of one of the group’s cross-cutting work streams, bringing together local and national websites, information, guidance and resources for patients, carers and health professionals, supporting CVD prevention during and beyond COVID-19. It includes translated, easy-read and video resources to improve inclusivity, and an upstream approach is supported practically by links to local council health and wellbeing and COVID-19 support service webpages.

See <https://www.happy-hearts.co.uk> for further information.

These shared approaches require clear governance and reporting structures alongside a shared understanding of the prevention challenge being addressed. There are plenty of resources available to help. Some, like the NHS Health Check programme, have been successful in realising a reduction of risk factors such as smoking and have identified underlying medical conditions, such as hypertension and diabetes, that may otherwise have been undetected or detected late.⁷⁴

There are also toolkits and resources that can be drawn on to support stroke prevention activities. Examples include:

- NCVIN - the National Cardiovascular Intelligence Network⁷⁵;
- the UCLPartners proactive care frameworks for the management of long-term conditions (discussed in more detail below);⁷⁶ and
- the National CVD Prevention Programme, which provides a range of support to primary care teams. This includes the Primary Care Cardiovascular Society’s CVD Academy, which offers accredited educational packages to primary health care and allied professionals in cardiovascular disease with the aim of improving patient care and reducing the burden of cardiovascular disease.⁷⁷

Similarly, recent work published by a collaboration of the GIRFT stroke team with Oxford Academic Health Science Network⁷⁸ describes pragmatic advice for primary care teams to deliver CVD prevention – the guidance is focused on supporting teams during COVID, but the advice is relevant more generally.

⁷³ Bray, BD, Paley, L, Hoffman, A, et al Socioeconomic disparities in first stroke incidence, quality of care, and survival: a nationwide registry-based cohort study of 44 million adults in England, *Lancet Public Health* 2018; 3: e185–93

⁷⁴ Alageel S, Gulliford MC (2019) Health checks and cardiovascular risk factor values over six years’ follow-up: Matched cohort study using electronic health records in England. *PLoS Med* 16(7): e1002863. <https://doi.org/10.1371/journal.pmed.1002863>

⁷⁵ <https://www.gov.uk/guidance/cardiovascular-disease-data-and-analysis-a-guide-for-health-professionals>

⁷⁶ <https://uclpartners.com/proactive-care/>

⁷⁷ <https://fingertips.phe.org.uk/profile/cardiovascular-disease-prevention>

⁷⁸ Oxford AHSN and GIRFT guidance: CVD prevention during the COVID-19 pandemic. https://evessio.s3.amazonaws.com/customer/8603be9c-b8c3-49ef-86d2-e4ccb958c5d1/event/f7f018f1-82a1-4349-ab30-346a2eff9bac/media/General_Content/69f8e6d9-node_CVD_during_the_COVID-19_pandemic_-_guidance_for_primary_care_-_interactive_pdf-October_2020.pdf

IN PRACTICE

CVDPREVENT

CVDPREVENT is a national primary care audit that will automatically extract routinely held GP data covering diagnosis and management of six high-risk conditions that cause stroke, heart attack and dementia: atrial fibrillation (AF), high blood pressure, high cholesterol, diabetes, non-diabetic hyperglycaemia and chronic kidney disease.

CVDPREVENT provides a foundation for professionally-led quality improvement in individual GP practices across Primary Care Networks (PCNs). It will support primary care in understanding how many patients with the high-risk conditions are potentially undiagnosed, under treated or over treated.

The audit will provide data to highlight gaps, identify inequalities and monitor improvement and impact on inequalities, as well as enabling and guiding opportunities for improvement. It will generate quarterly, anonymised data at national, regional, PCN and CCG practice level, across a broad range of metrics. Locally based QI audit tools based on the CVDPREVENT business rule set will enable practices and primary care networks to systematically identify individuals whose clinical risk factors are sub-optimally managed so that they can be offered treatment that will minimise their risk of life-changing heart attack or stroke.

As of February 2021, more than 75% of Primary Care Networks have signed up to CVDPREVENT. The programme is due to go live at the end of 2021.

IN PRACTICE

Pharmacist-led virtual clinics to optimise anticoagulation therapy in AF⁷⁹

Lambeth and Southwark clinical commissioning groups

Lambeth and Southwark clinical commissioning groups (CCGs) delivered pharmacist-led virtual clinics to ensure all atrial fibrillation (AF) patients at risk of stroke were offered anticoagulation, if appropriate.

Over a 12-month period, the programme reviewed over 1,500 patients with AF not receiving anticoagulation, which resulted in an additional 1,200 patients being anticoagulated. The two CCGs have since seen a 25% reduction in the rate of AF-related stroke. A Prescribing Improvement Scheme (PIS) was developed, which involved:

- A practice level audit of all AF patients not anticoagulated.
- Delivery of in-practice virtual clinics led by specialist anticoagulation pharmacists, during which treatment options were discussed with the practice prior to patient follow up. These options included warfarin or direct oral anticoagulants or, where anticoagulation was contraindicated, insertion of a left atrial appendage occlusion device in appropriate patients. An individualised management plan was agreed for each patient.
- Implementation of the patient management plans by the GP practice, for which the practice submitted outcomes to receive payment as defined by the prescribing improvement scheme.

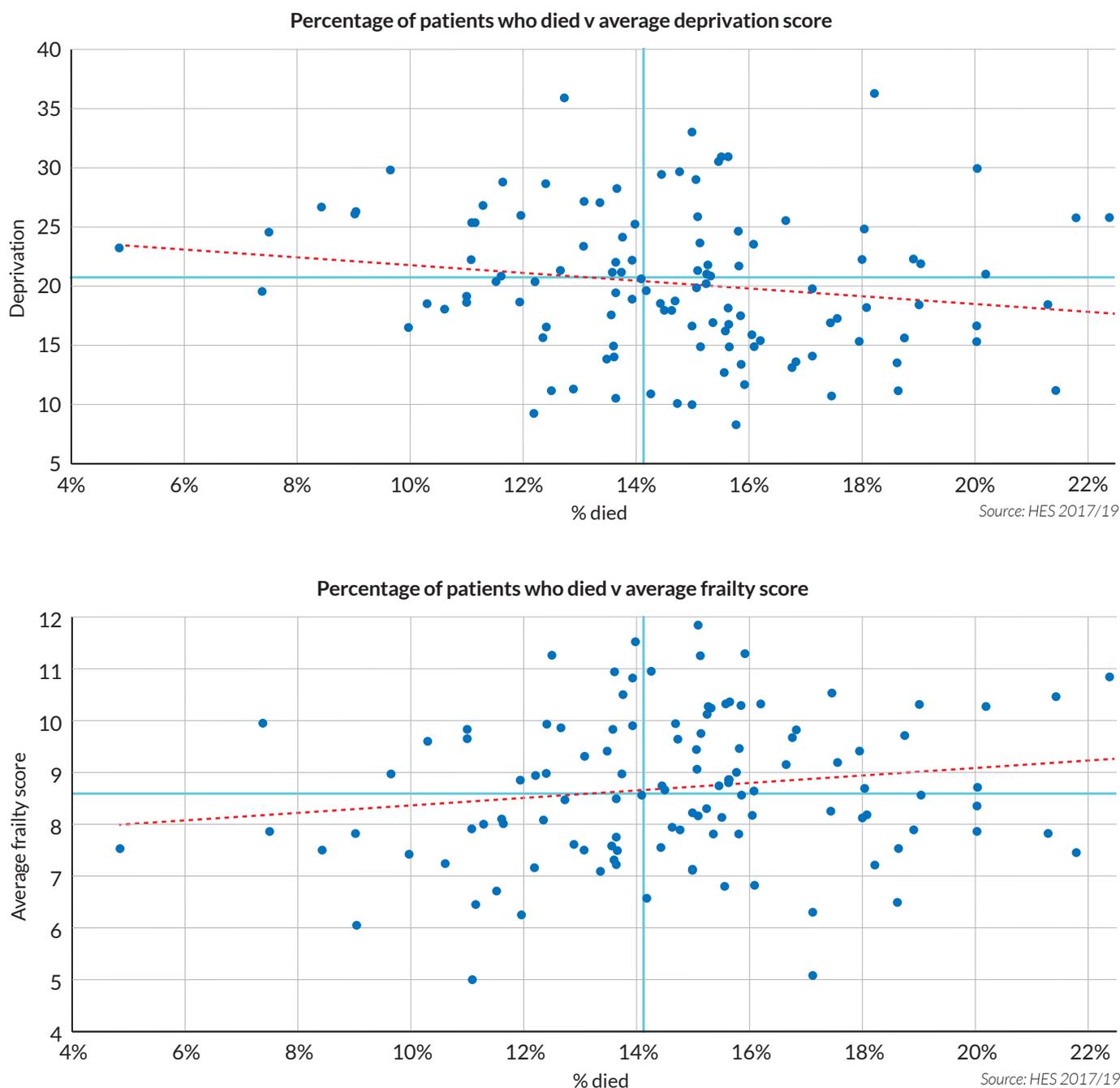
The virtual clinic discussions sought to address the myths and misconceptions associated with the use of anticoagulation in AF. The discussions focused on specific patient groups who are often not optimally treated. For example, patients who are housebound, frail, have fallen or bled in the past and those with cognitive impairment. The aim was to equip frontline GP practice staff to effectively assess and treat these patients in future to ensure the outcomes of the programme were sustained.

As a result of the programme, over a 12 month period, the management of over 1,500 people with AF not receiving anticoagulant therapy was reviewed across 91 GP practices in Lambeth and Southwark CCG. At the end of the programme, an additional 1,200 people with AF were anticoagulated and, over the three years since then, the rate of AF-related stroke across the 2 CCGs has fallen by 25% (compared to a 3% fall nationally).

⁷⁹ Based on full case study available at <https://www.gov.uk/government/case-studies/pharmacist-led-virtual-clinics-to-optimise-anticoagulation-in-af>, accessed March 2021

Interestingly, whilst risk factors for CVD vary by geography and socioeconomic characteristics, our own analysis suggests that overall mortality rates, at the hospital level, are not significantly associated with deprivation and frailty risk factors. **Figure 48** shows the correlation between the aggregate deprivation score of a hospital's patients with stroke, their aggregate frailty index and hospital stroke mortality. A more detailed analysis, at the patient level and controlling for other characteristics would give a more definitive insight, but it is observed that neither of the correlations appeared statistically significant.

Figure 48: Relationship between deprivation, frailty, and hospital stroke mortality (hospital-level correlation, 2017-18)



On our visits, we saw variation in the extent to which systems actively engaged stroke teams in supporting and promoting prevention activities, and in the effectiveness of local prevention strategies. Generally, we found little evidence of systems using consistent data to identify, target and track prevention activities – although there were some examples of good practice it is clear that an ISDN-based strategy, that links in to CVD-R regional boards, and other relevant prevention boards is essential.

IN PRACTICE

Management of long-term conditions

UCLPartners

UCLPartners has designed a suite of resources to help primary care teams identify and effectively manage patients with long-term conditions. These resources (support packages) include search and risk stratification tools that stratify patients into low, medium and high risk of deterioration. They are easy-to-deploy tools, developed by a clinical team, working with the Clinical Effectiveness Group based at Queen Mary University of London. The search criteria to identify patients from practice records draw on national guidance.

Practice teams have access to education and training resources that upskill teams to proactively manage patients, including new pathways and methods for conducting virtual assessments. Patients are provided with digital tools to support patient activation and self-management at home.

- Cardiovascular disease
 - Hypertension
 - Atrial fibrillation (in development)
 - Lipid management (in development)
- Type 2 diabetes
- Asthma
- Chronic obstructive pulmonary disease (COPD)

As well as using data to inform tracking and targeting at the individual level, systems must do more to measure progress on primary prevention activities against agreed priorities and goals. ISDNs are well-placed to support this in collaboration with cardiac networks, regional CVD-Respiratory Board and Public Health teams. They must take a lead role in using this data to develop a network-wide prevention strategy grounded in agreed metrics and tracked consistently.

Reducing health inequalities in stroke care

The unwarranted variation in stroke care we have observed may inversely impact different groups within society. The COVID-19 pandemic has exaggerated these differences and it is acknowledged that this variation is avoidable and a key priority of the NHSE in its recovery from the pandemic.⁸⁰

Throughout this report we have highlighted areas for improvement, focusing on prevention, access, experience and the quality of care received. GIRFT supports the concept that excellence in care should be available to all regardless of location, held beliefs, distinguishable characteristics, financial status, or educational attainment. Merely acknowledging there are health inequalities that exist is not enough, however, and it is the responsibility of us all to actively seek out inequalities in stroke care and put in processes that mitigate and diminish them.

This is not straightforward and will require coordination within and between system partners to ensure meaningful change. Central funding to ISDNs has been secured for local systems to implement programmes of work that specifically address the inequities in stroke care that exist today for those who are most vulnerable. GIRFT suggests locally assessing the impact of intervening in some of the 37 opportunities listed in the stroke-specific health inequalities framework, below, which can be used to prioritise funding and target those most in need. The framework identifies different areas of potential inequality and suggests metrics for identifying needs and tracking impact. An NHSE Health Inequality (HI) improvement programme (Core20PLUS5) has recently been launched which will see each ICS have a designated HI lead who GIRFT recommends each ISDN to coordinate their HI work with.

⁸⁰ <https://www.england.nhs.uk/wp-content/uploads/2021/03/B0468-nhs-operational-planning-and-contracting-guidance.pdf> (last accessed July 2021)

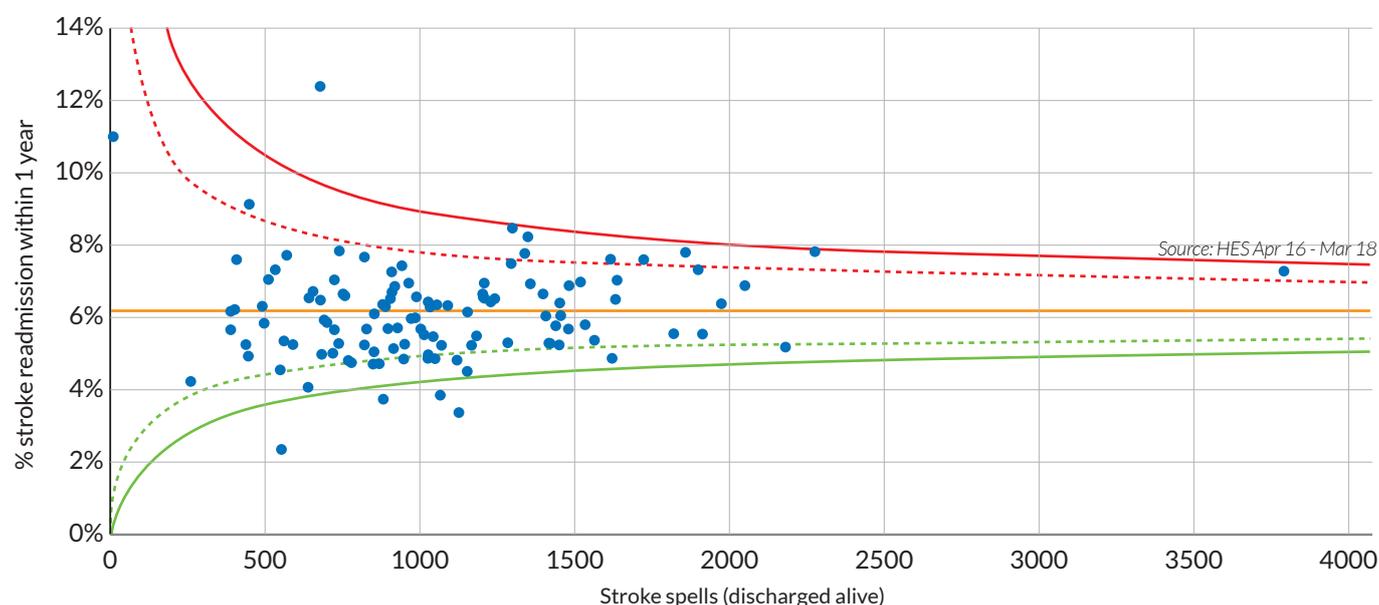
Table 4: Stroke-specific health inequalities framework

<p>Targeting variation in those groups with the highest prevalence of risk related behaviours:</p> <ol style="list-style-type: none"> 1) Smoking 2) Poor nutrition 3) Excess alcohol consumption 4) Recreational drug use 5) Limited exercise 6) Healthy living illiteracy 	<p>Targeting variation in those groups with the highest prevalence of conditions with aetiological association for stroke:</p> <ol style="list-style-type: none"> 1) Hypertension 2) Atrial fibrillation 3) Hypercholesterolaemia 4) Diabetes 5) Other vascular diseases 	<p>Targeting variation in those groups with the worst access to specific elements of the stroke care pathway:</p> <ol style="list-style-type: none"> 1) Prehospital: Recognition of stroke symptoms and calling for help, then delivery of Category 2 calls 2) Admission to CSC/ACS – and all the key milestones of good care 3) Personalised Information: e.g. Stroke passport 4) Psychology intervention 5) Admission to Integrated Community Stroke Service compliant service 6) 6/52 and 6/12 follow up 7) Life after stroke care 8) Vocational rehabilitation 9) Digital exclusion
<p>Targeting variation in those groups with the worst reported experience of care:</p> <ol style="list-style-type: none"> 1) Prehospital 2) HASU/ASU 3) Inpatient rehabilitation 4) Integrated Community Stroke Service 5) Life after stroke care including follow up 	<p>Targeting variation in those groups with the worst quality of care:</p> <ol style="list-style-type: none"> 1) Prevention (low anticoagulation rates , blood pressure targets not met, high HbA1C etc) 2) Prehospital 3) HASU/ASU 4) Inpatient rehab 5) Integrated Community Stroke Service 6) Psychology intervention 7) Life after stroke care including follow up 	<p>Targeting variation in those groups with the highest prevalence of the wider determinants of increased stroke prevalence or known worse stroke care/access/ experience:</p> <ol style="list-style-type: none"> 1) Geographic (e.g. urban vs rural) 2) High levels of pollution 3) Those groups specifically protected under law (e.g. age, sex, race and disability) 4) Social economic (e.g. housing, income) 5) Those groups socially excluded (e.g. through language, homelessness, societal pressures, mental health, lack of access to primary care)

Secondary prevention

The risk of a patient having recurrent stroke is greatest immediately after their first stroke. 2–3% of survivors of a first stroke have another stroke within the first 30 days, 7.1% have another stroke within a year, and 16% at five years. After the first year, the average annual risk of recurrent stroke for the next four years falls to about 5%. We know from data compiled by GIRFT that the rates of recurrence of stroke vary significantly across the country. **Figure 49** shows the variation in readmission due to recurrent stroke, by provider.

Figure 49: Patients readmitted with stroke within one year of stroke discharge (where discharged alive from stroke spell) – April 2016 to March 2018

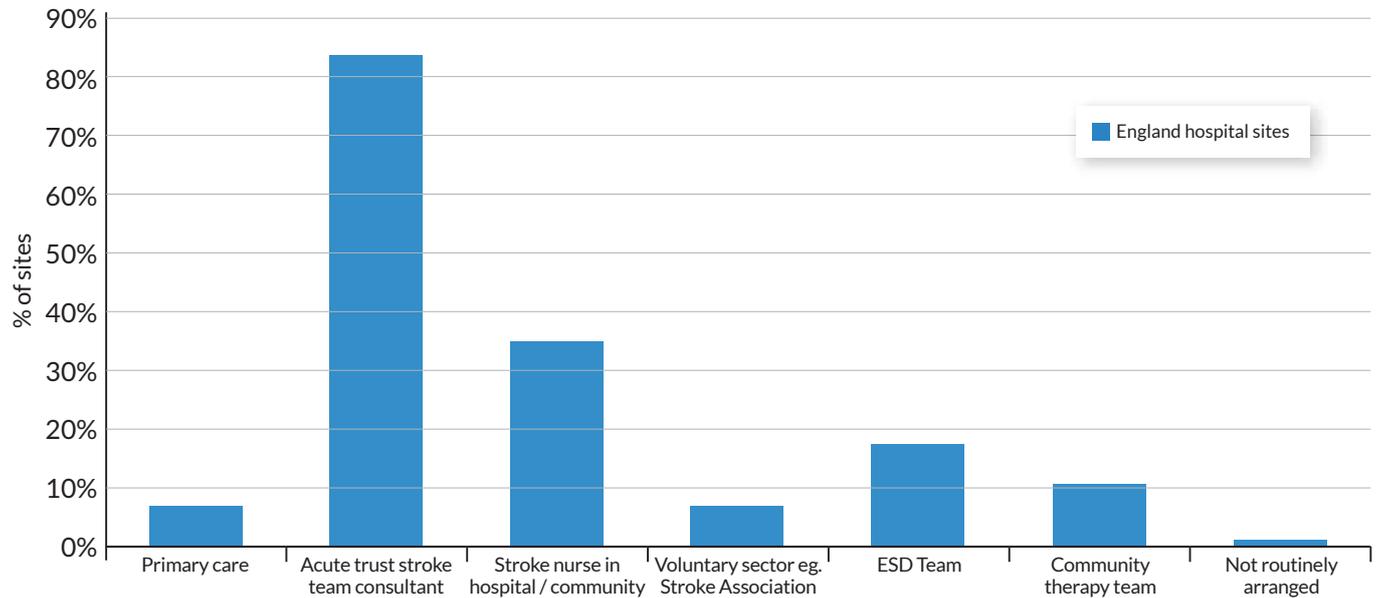


Although this data is not casemix adjusted, the underlying risk factors for recurrence of stroke are universal and systems should make a concerted effort to both correctly diagnose the aetiology of stroke and ensure patients are involved from the outset in being encouraged to own the choice of and compliance with treatment and investigations. Lifestyle and behavioural changes, alongside management of existing medical conditions, are important parts of a secondary prevention strategies.

Six-week follow-ups

Post-discharge reviews with patients soon after a stroke are an important component of secondary prevention. Six-week reviews are an opportunity for stroke teams to review initial diagnoses, identify additional investigations and review treatment received to date. Over 90% of units report routinely undertaking reviews of patients six weeks post-discharge. Generally, these reviews are undertaken by a member of the stroke team, although in a significant minority of cases they are conducted by community or voluntary sector teams (**Figure 50**). These six-week reviews are undertaken in many units across the country by specifically trained stroke specialist nurses with oversight from the medical stroke consultant.

Figure 50: Who completes 6-week reviews post-discharge from hospital?



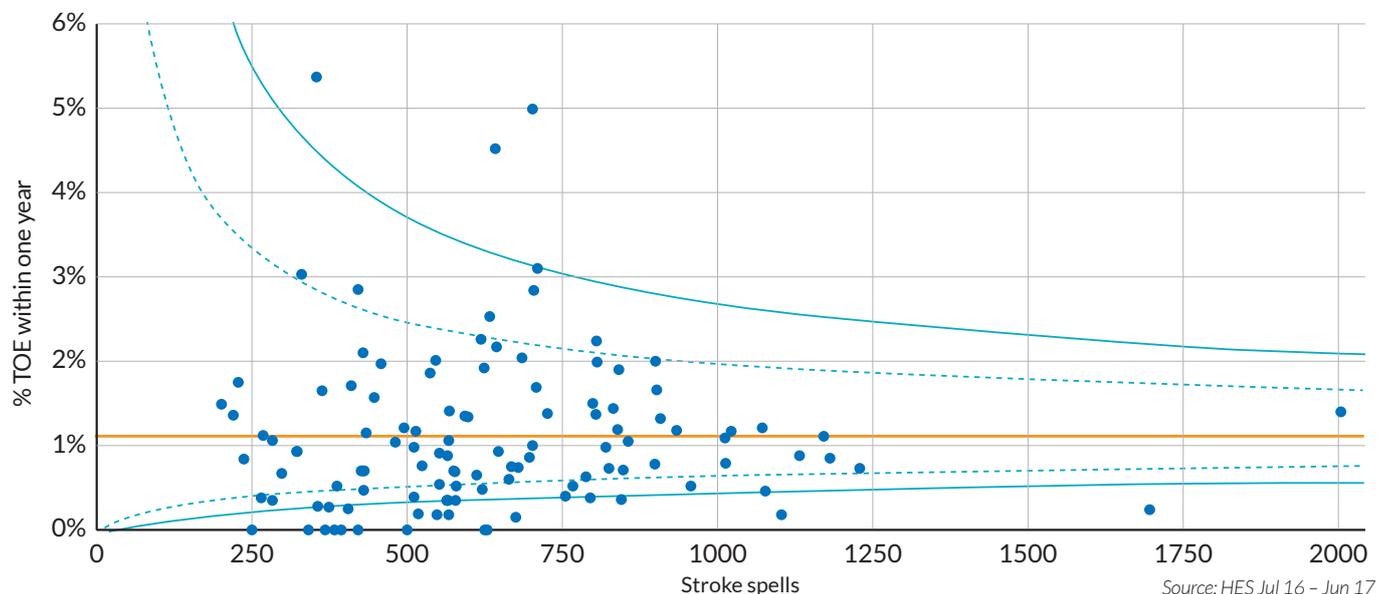
Note: percentages do not sum to 100% as units were able to select more than one option to reflect common local practices. Question is based on the 90.4% of units that report routinely completing 6-week reviews

Source: GIRFT question added to AOA 2019

Additional screening, diagnostics and monitoring

There are additional secondary interventions to monitor and screen patients after a stroke that reduce the risk of a recurrence. These include ambulatory blood pressure monitoring to confirm a diagnosis of hypertension⁸¹ (where blood pressure is monitored regularly over a 24-hour period), prolonged cardiac monitoring (to identify paroxysmal atrial fibrillation) and echocardiography (to exclude thrombus formation and prothrombotic valvular disorders). On our visits, clinical teams reported difficulties accessing these basic tests which is evident in the data. As an example, **Figure 51** looks at the proportion of patients receiving transoesophageal echocardiography (TOE) during their stroke admission or within one year of discharge when compared to the number of stroke admissions.

Figure 51: Patients with transoesophageal echocardiography in stroke spell or within one year of discharge (by site, all stroke spells) (July 16-June 17)



Source: HES Jul 16 - Jun 17

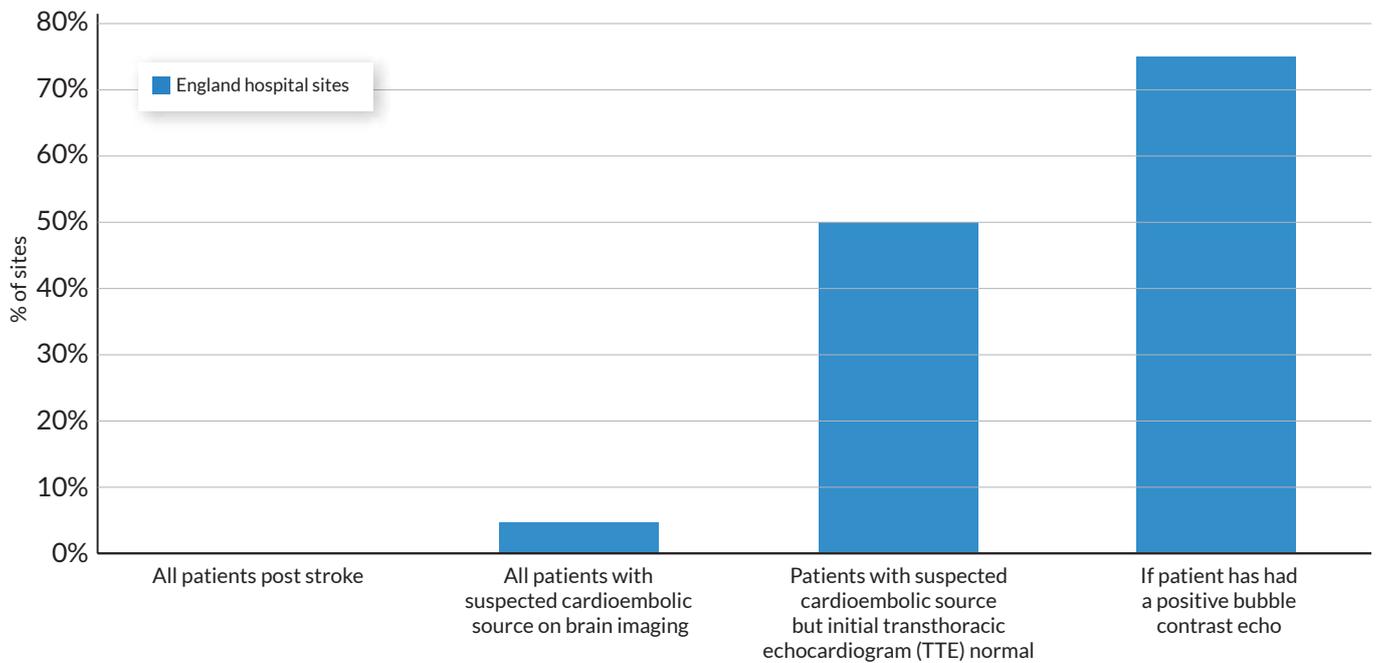
⁸¹ NICE Hypertension in adults: diagnosis and management NICE guideline NG136, 28 August 2019

Whilst coding differences may account for some of this variation, data collected by GIRFT shows wide differences in the indications used by units to determine which patients are offered transoesophageal echocardiography. There appears to be a lack of clinical consensus as to who should have a TOE and this highlighted a need to standardise the investigative pathway for cryptogenic stroke (**Figure 52**).

Insight from GIRFT's data

Over 80% units request a bubble contrast echo for patients with suspected cardioembolic source where the initial transthoracic echocardiogram is normal.

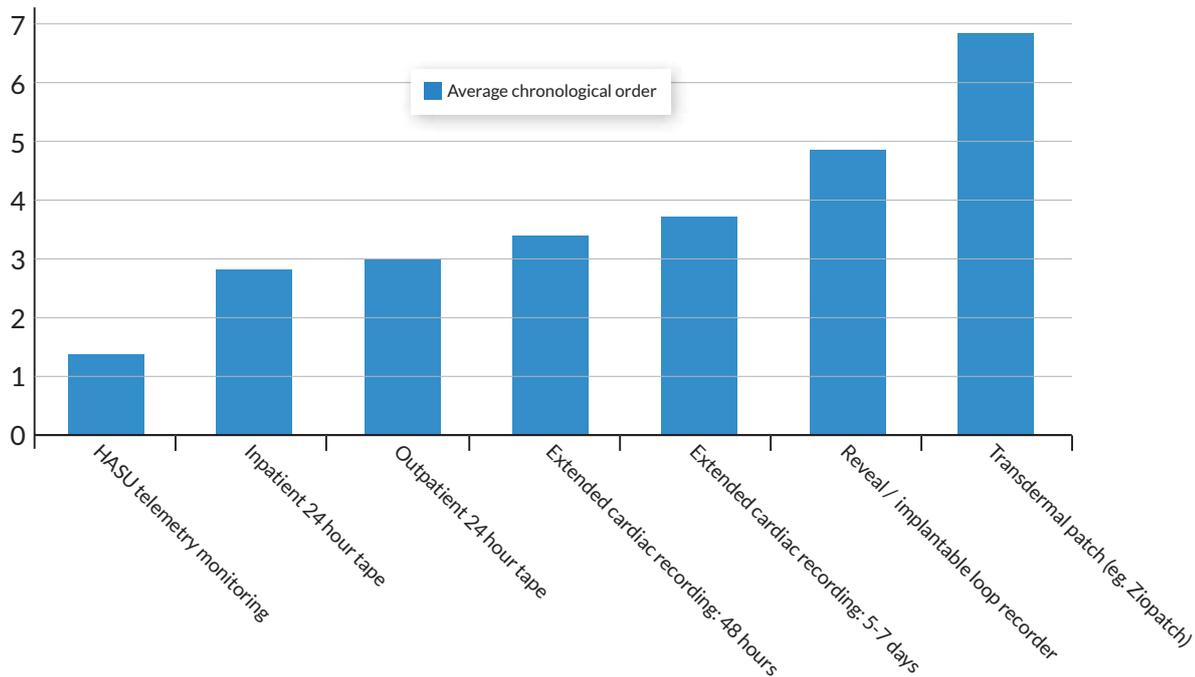
Figure 52: For which patients is a TOE (transoesophageal echocardiography) requested?



Source: GIRFT question added to AOA 2019

Figure 53 shows an aggregation of local unit's pathways for detecting paroxysmal atrial fibrillation (interventions on the left with the lowest rank are typically used first, whilst the right-hand interventions are typically used last). It was clear speaking to teams that access to prolonged cardiac monitoring was variable and there was often duplicate tests ordered with long waits for investigations.

Figure 53: Usual pathway for detecting paroxysmal atrial fibrillation



Note: Units were asked to rank the interventions in the order they were used in the pathway. The data in the graph is the aggregated response across all units. A ranking of 1 implies the intervention is used first in the pathway. Higher rankings mean units reported using these interventions later in the pathway.

Source: GIRFT question added to AOA 2019

Last year NICE supported patent foramen ovale (PFO) closure and the insertion of left atrial appendage occlusion in specific groups of patients post-stroke.⁸² This was very encouraging but the delay in these decisions have led to diversification of services across the country over several years. Many, but not all, regions have either trust based or regional cryptogenic stroke MDTs comprising stroke physicians, neurologists and cardiology colleagues where complex cases are discussed.

Insight from GIRFT's data

58% of units offer patent foramen ovale closure regionally. 88% of these units discuss cases at a specialist cryptogenic stroke/cardiology MDT before PFO closure is offered.

⁸² NHS England Clinical Commissioning Policy: Percutaneous patent foramen ovale closure for the prevention of recurrent cerebral embolic stroke in adults (around age 60 years and under), First published: July 2019

IN PRACTICE

Optimisation of investigations for embolic stroke of unknown source

Cambridge University Hospitals NHS Foundation Trust and Royal Papworth Hospital NHS Foundation Trust

Cambridge University Hospitals set up a new pathway with the Royal Papworth Hospital to streamline investigations for stroke survivors with embolic stroke of unknown source (ESUS). This involved more streamlined access to extended monitoring for atrial fibrillation (PAF/AF) using implantable loop recorders (ILR devices), plus bubble echo and transoesophageal echo techniques. Cardiac nurses run the ILR service. All suitable patients have an ILR device for up to six months before any decision is made for cardiac intervention such as PFO (patent foramen ovale closure).

A specific cardiac/stroke MDT was set up to discuss cases and decide on treatment plans. This meets once per month. Two AF nurses working within the stroke team support stroke survivors in the community to optimise secondary prevention, in particular providing advice on direct oral anticoagulant (DOAC) usage and helping to maintain compliance, which is valued by primary care colleagues.

As a consequence of the new pathway, the trust reports:

- Improved pick up rate of PAF in stroke survivors (by up to 30%), translating into more DOAC prescriptions and strokes prevented.
- Improved case selection for interventional procedures such as PFO closure (as a consequence of MDT working).
- Improved cross institutional boundary working.
- Waiting times for cardiac investigations have decreased; and non-attendances have fallen.
- Improved engagement of stroke survivors and carers in their own medicines' management due to improved information and support from the AF nurses.
- Excellent feedback on the service from primary care colleagues.

For further information, see: Cotter PE, Martin PJ, Ring L, Warburton EA, Belham M, and Pugh PJ. Incidence of Atrial Fibrillation detected by Implantable Loop Recorders in Unexplained Stroke. *Neurology*: 2013 Apr 23;80(17):1546-50. (Epub 2013 Mar 27)

Carotid endarterectomy

Carotid endarterectomy is surgery undertaken to remove atherosclerotic plaque build-up in the carotid arteries, which carry blood to the brain. This procedure is typically carried out in patients who have had a minor stroke or TIA with the aim of reducing the risk of further strokes.

GIRFT's review of vascular surgery examined delivery of carotid endarterectomy procedures in detail. It notes that to deliver the maximum chance of avoiding a major stroke, these procedures should be undertaken urgently following a minor stroke or TIA. The target set by NICE is that diagnosis to referral should be no more than seven days, and then a further seven days from referral to surgery. GIRFT's review found wide variation nationally in the median wait time from diagnosis to carotid endarterectomy surgery. It made recommendations for improving access, including that all vascular units should operate within a hub and spoke network model, as defined by a national service specification. This will deliver improved early decision-making capability and access to diagnostics, allowing early treatment, prioritised by degree of urgency.⁸³

What we found

During our visits, we found differences in local pathways to support primary and secondary prevention for stroke. Many teams reported significant delays in accessing cardiac investigations.

In some areas, patients are actively followed up by stroke teams to get an understanding of the aetiology of their stroke, with targeted support offered. More common is that patients are discharged with an expectation that primary care teams will pick up these activities but primary care teams are often unaware of this expectation and so clinical accountability for patient care may be lost.

⁸³ *Vascular Surgery, GIRFT Programme National Specialty Report, March 2018*

Insight from GIRFT's data

73% of units use an age cut-off for determining access to thrombophilia screening.

21% of units offer it only to patients with a history of DVT, pulmonary embolism or miscarriage.

Our recommendation is that there must be a clinical consensus pathway for investigating the risk factors for stroke, with clear ownership and responsibility sitting with acute stroke teams for ensuring appropriate investigations and treatments are started post-stroke. This should be monitored at the six-week and six-month reviews. Alongside this, there must be better access to the resources that enable secondary prevention, such as longer-term cardiac monitoring, and support from community pharmacists and other trained individuals to support brain and heart vascular health and prevention management in the community.

The European Stroke Organisation sets out a range of goals that it encourages members to work towards by 2030. In the absence of nationally agreed guidance, adaptation and adoption by each ISDN would seem appropriate. These goals support prevention activities as well as active rehabilitation and follow-up and include:⁸⁴

- Including secondary prevention in national stroke plans with follow-up in primary/community care.
- Ensuring that at least 90% of the stroke population is seen by a stroke specialist and have access to secondary prevention management (investigation and treatment). The European Society of Cardiology has developed guidance for the management of atrial fibrillation, which is an important component of secondary prevention activities and should be followed: <https://academic.oup.com/europace/article/18/11/1609/2437601>
- Ensuring access to key investigational modalities: CT (or MR) scanning, carotid duplex, ECG, 24-hour ECG, echocardiography (transthoracic and transoesophageal), blood tests (lipids, glucose, HbA1c, coagulation, erythrocyte sedimentation rate, C-reactive protein and autoantibodies).
- Ensuring access to key preventative strategies: lifestyle advice, antihypertensives, lipid-lowering agents, antiplatelets, anticoagulants, oral hypoglycaemic agents and insulin, carotid endarterectomy and PFO closure.
- Offering physical fitness programmes to all stroke survivors living in the community.
- Providing a documented plan for community rehabilitation and self-management support for all patients with stroke with residual difficulties on discharge from hospital.
- Ensuring that all patients with stroke and carers have a review of the rehabilitation and other needs at three to six months after stroke and annually thereafter.

IN PRACTICE

Cardiac monitoring after stroke

University Hospital Southampton NHS Foundation Trust

Atrial fibrillation is present in as many as 30% of cases of ischaemic stroke. Its detection is vital in ensuring timely anticoagulation and future risk reduction. The coronavirus pandemic presents new challenges in arranging outpatient cardiac monitoring, with the need to reduce hospital attendances and lower the risk of infection transmission. COVID-19 funding has enabled University Hospital Southampton to access Zio patches (a cardiac monitoring service), and review current practice and how it might change with the use of wearable devices.

In a study, the trust collected data from the first 100 patients admitted in 2020 before the pandemic struck. A diagnosis of atrial fibrillation, whether cardiac monitoring was needed, and the type and duration were recorded. The trust analysed the time taken from monitoring request being made to date of the test performed and subsequent report being issued.

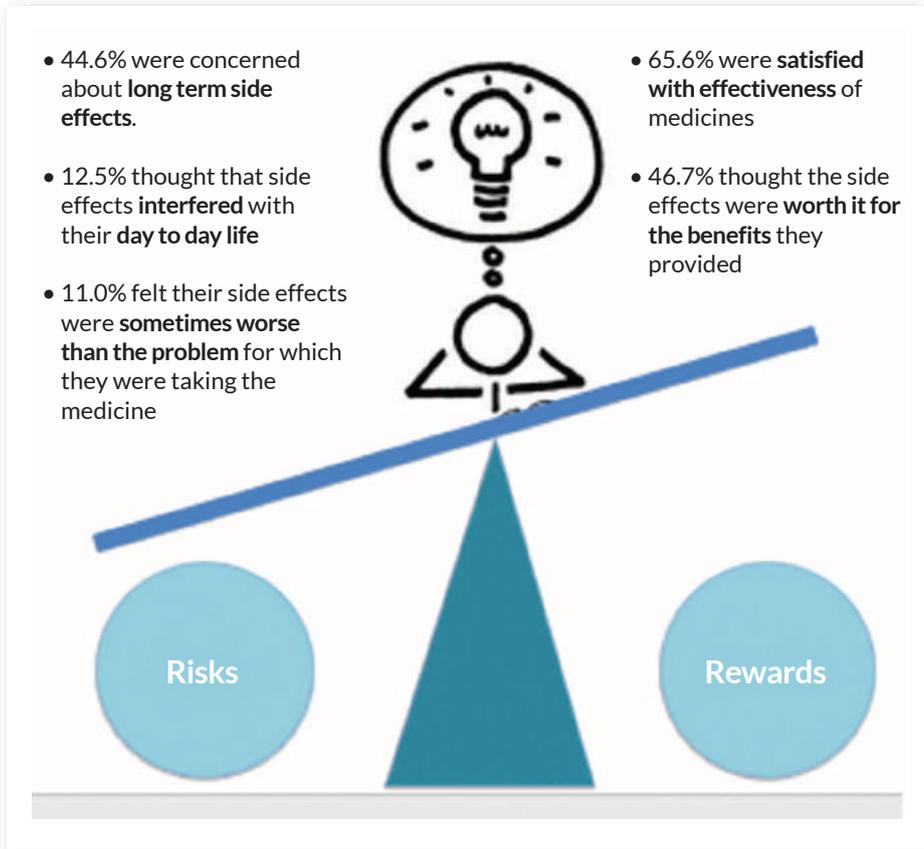
The study found that 31/100 patients were diagnosed with atrial fibrillation, 28 on admission and 3 following cardiac monitoring. Four patients had 72-hour tapes, two had 24-hour tapes, two had seven-day tapes, three had 48-hour tapes and 12 had R-test (a small recorder that can be worn for up to four weeks). The average time from test to request being performed was 24 days, time from test to analysis 17 days and request to report 41 days. The trust's first patient with a Zio patch had it put on for two weeks before discharge, posted it back and a PDF of the report was available within 21 days.

The study concluded that wearable technologies such as the Zio patch show considerable promise in early detection of atrial fibrillation after stroke. Time taken for monitoring to occur is significantly reduced with a likely higher diagnostic yield as monitoring starts closer to the index stroke event. The patches can be applied in hospital prior to discharge, are sent back to the monitoring team avoiding the need for further hospital attendances and reduced time for analysis. The next step is a cost-effectiveness assessment followed by a comprehensive business case to support the expansion of future device use.

Most stroke and TIA survivors are prescribed medicines to help reduce the risk of further stroke. Evidence suggests that some stroke survivors find complying with medication regimes difficult, which likely has an impact on the effectiveness of their medication. This is despite clear evidence that taking prescribed medicines and following lifestyle advice can reduce the risk of another stroke by 80%. The KeMiST study funded by the Stroke Association⁸⁵ surveyed over 300 patients with stroke and found that over 25% of stroke survivors do not continue medicines, even for the first year after their stroke. Another 20% take less than is needed for the medicines to work. **Figure 54** summarises findings from the study, suggesting that nearly half of patients had concerns about the long-term side effects of medicines, with some patients reporting that medicines interfered with their day-to-day life or that the side effects were not worth the perceived benefits. It is important that during inpatient stays and on transfer of care, hospital pharmacy teams are involved in medication reviews and optimisation, with a link to community pharmacy and GP practices to ensure adherence to prescribed medication.

⁸⁵ Sarah Corlett, Rebecca Cassidy, Julie Hedayioglu et al, *Stroke survivors' experiences of using regular medicines: What is their medication-related burden?* UKSF 2019

Figure 54: Themes from the KeMiST study of stroke survivors' experience with using medicines



Source: KeMiST Study

Systems should ensure that a robust and consistent process is in place to ensure that once patient-owned treatment decisions have been made, regular reviews explore compliance and intervene where it is poor with an educational framework and consideration of alternative interventions if adherence remains low.

We recognise that behavioural factors will impact the effectiveness of any primary or secondary prevention. Whilst the KeMiST study highlights this in relation to medicines, ISDNs will need to work with local partners across all parts of the primary and secondary prevention pathways and adapt approaches to address challenges within the local population.

Transient Ischemic Attack

A transient ischemic attack (TIA) is a temporary period where blood flow to the brain is disrupted. Patients with TIAs usually have symptoms that last only a few minutes but are similar to those of a stroke—they are sometimes referred to as mini strokes. Whilst TIAs do not cause lasting brain damage, they are frequently a warning sign of a future stroke and hence are an opportunity to prevent future strokes. Although by definition there will not be permanent physical damage from a TIA, many patients report significant psychological sequelae, such as anxiety, following a TIA.

Triaging is an important part of the TIA pathway in an efficient service, given the high number of patients referred with histories suggestive of other non-neurological diagnoses. GIRFT AOA data suggests that review of referrals is usually undertaken by a member of the stroke team, but there is often variation in who does this — especially within and outside core hours.

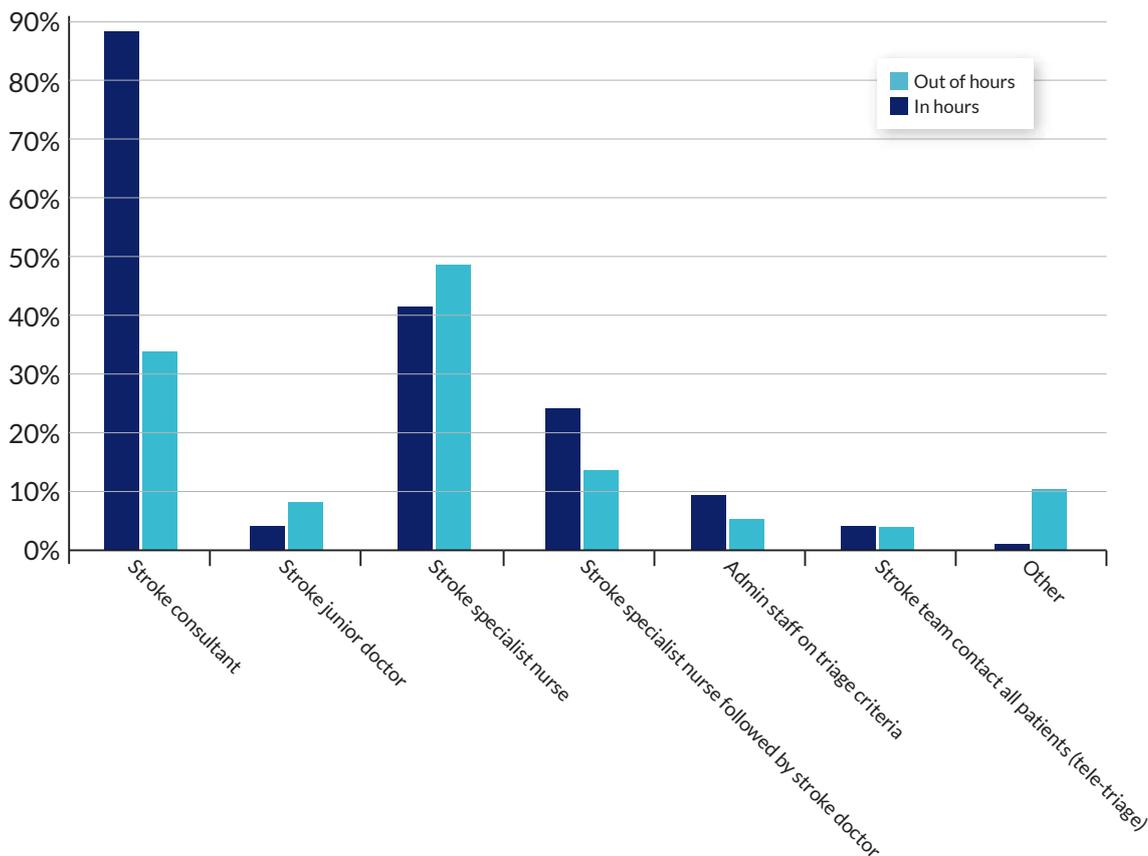
Figure 55 shows that generally stroke consultants are involved in triaging TIA referrals in core hours whilst outside core hours it is likely completed by another member of the stroke team. We do not think initial triage of TIA referrals is a good use of stroke consultant time. Many centres have trained and supported their stroke specialist nurses to take an initial history from the patient and then discuss with the stroke consultant prior to booking an appointment/investigation making onward referral to another more appropriate clinic or providing simple reassurance back to the patient.

Insight from GIRFT's data

In over 85% of units, the stroke team triages referrals to TIA/neurovascular service.

54% of units classify TIA referrals as high or low risk using ABCD(2) score – despite NICE guidance saying this is of limited value.

Figure 55: Who triages referrals to the TIA/neurovascular service?



Note: percentages do not sum to 100% as units were able to select more than one option to reflect common local practices Source: GIRFT question added to AOA 2019

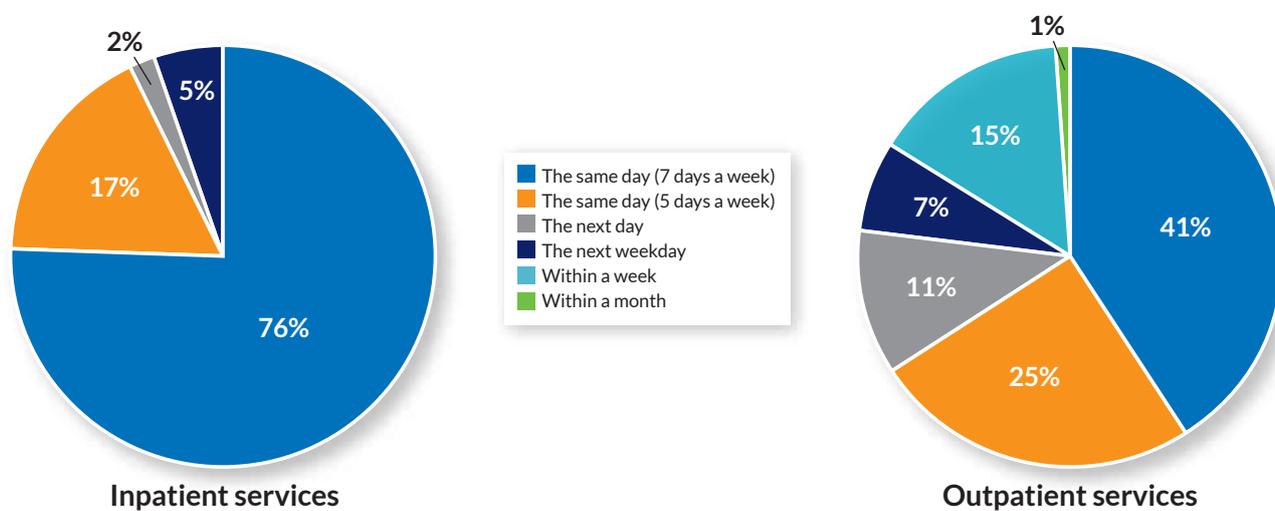
From our visits it became apparent that data on the number of patients who suffer a TIA is poorly recorded because patients are usually treated in an outpatient setting, where diagnosis codes are not collected. Data from the OXVASC study suggests there are around 60,000 new TIA diagnoses per year in England. Within three months, 17% of these patients will experience a stroke.⁸⁶ Many individual stroke services collect their own TIA data and are aware of the number of referrals into their service, the number seen and resource required to deliver a responsive service. Although a TIA 'tab' exists within SSNAP, this data is not reported and as a result appears to be infrequently used.

NICE has provided guidance to the NHS on the management of patients with suspected TIA. They recommend referral to a specialist for assessment within 24 hours of symptom onset.⁸⁷ Data suggests speed of access is very variable across the country (Figure 56). Although many services have seven-day TIA services, capacity to ensure all patients with suspected TIA are seen within 24 hours was not consistent. Some services still admit TIA patients to facilitate rapid access to investigations, especially at weekends.

⁸⁶ Johnston SC, Gress DR, Browner WS, Sidney S. Short-term prognosis after emergency department diagnosis of TIA. JAMA. 2000;284(22):2901-2906.

⁸⁷ National Institute for Health and Care Excellence. Stroke and transient ischaemic attack in over 16s: Diagnosis and initial management (ng128). Pharmacological treatments and thrombectomy for people with acute stroke. 2019

Figure 56: Time to see, investigate and initiate treatment for TIA (by unit, England, 2019/20)



Source: SSNAP Acute Organisational Audit, 2019

Current TIA service provision

Our findings from meeting every stroke service in England is that there are both important differences in services' ability to offer rapid access to assessment for patients with TIA and first line access to MRI (as per NICE 129 guidance), and variation in the clinical models they follow.

Some services make good use of triage to manage referrals appropriately. Some TIA clinics are delivered by consultants, whereas many trusts have trained stroke nurse specialists to run these services. We also see differences in physical organisation – some TIA clinics are co-located with access to imaging at the same site, whilst others are separated.

View from our visits:

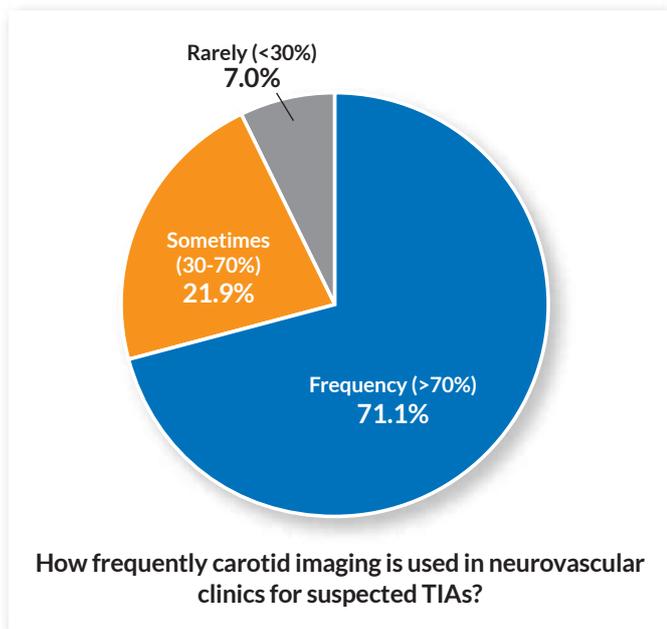
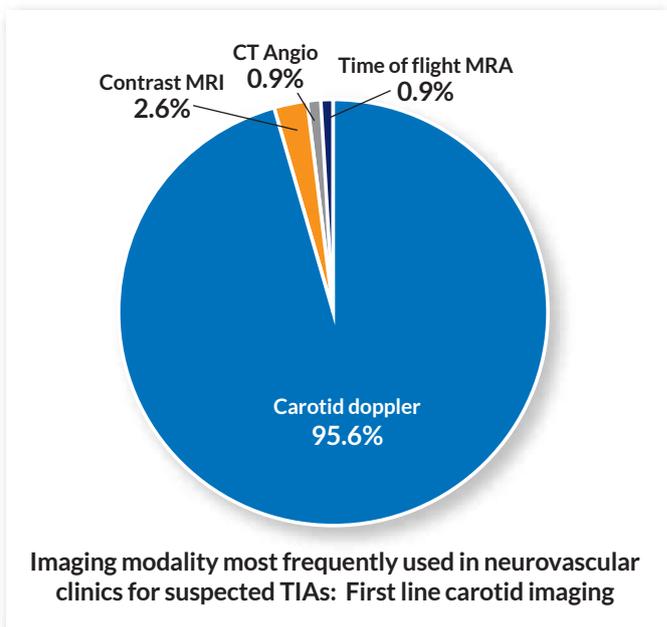
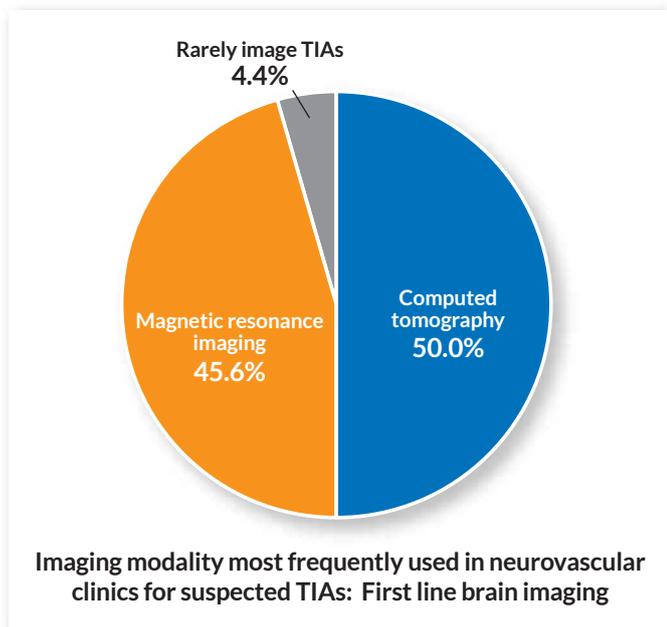
74 % of units reported that they had seven-day access to TIA imaging services, many with reduced weekend access however. 38% reported difficulties accessing imaging at the weekend.

Data also shows that the diagnostic investigations offered to suspected TIA patients is variable and inconsistent with established guidance. For example, **Figure 57** shows data on first-line imaging for patients suspected of having a TIA. NICE guidance is that MRI should be used, but the evidence is that half of services routinely use CT imaging as first line investigation of suspected TIA.

Insight from GIRFT's data

50% of services use CT first line for TIA brain imaging and quarter of patients do not receive carotid imaging on the same day as their TIA clinic appointment.

Figure 57: First-line imaging for patients with suspected TIA

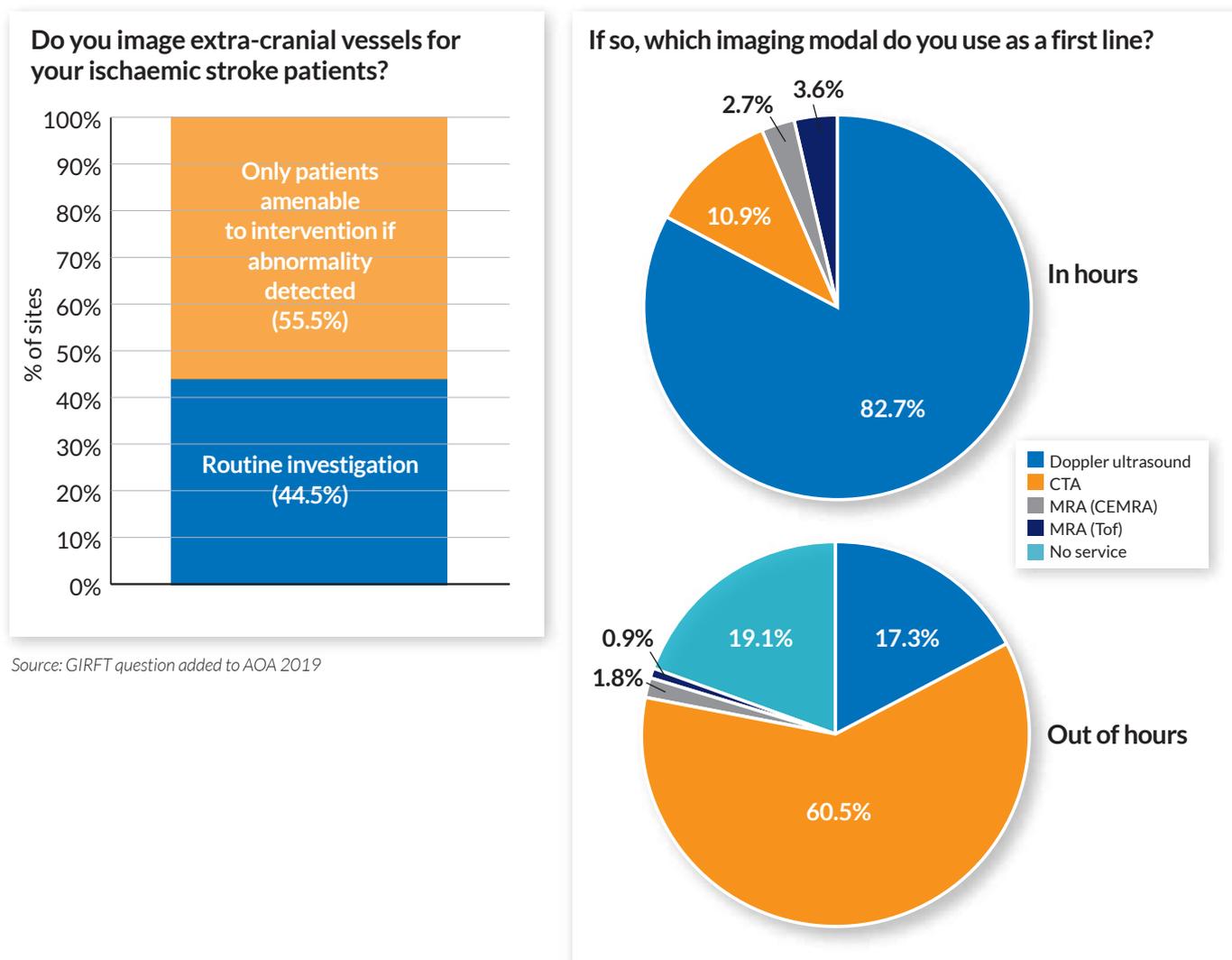


Source: GIRFT questions added to SSNAP AOA

In addition, we observed unwarranted variation in access to appropriate MRI in those services that were not co-located with an Acute Stroke Centre. This does not mean that geographically remote TIA clinics should not exist, but it is often more difficult to get access to appropriate imaging. Our Imaging section discussed the importance of rapid imaging in diagnosing and understanding the aetiology of stroke. It also highlighted the difficulties local services have in accessing the right imaging at the right time, which are both relevant when investigating suspected TIAs. The recommendations outlined by Professor Sir Mike Richards in his diagnostics review (detailing the creation of diagnostic imaging hubs), as well as our own GIRFT recommendations around standardised imaging pathways should take into account imaging services for suspected TIA and the possibility these may be undertaken away from an acute hospital and in a Community Diagnostic Hub.

From our visits, we found that the usual imaging for symptomatic carotid artery stenosis is predominantly carotid duplex ultrasound. In hours 11% of services use CT angiography (CTA) first line to image the carotids, whereas 61% use this modality out of hours due to lack of out of hours access to vascular duplex ultrasound (**Figure 58**).

Figure 58: Imaging of extra-cranial vessels

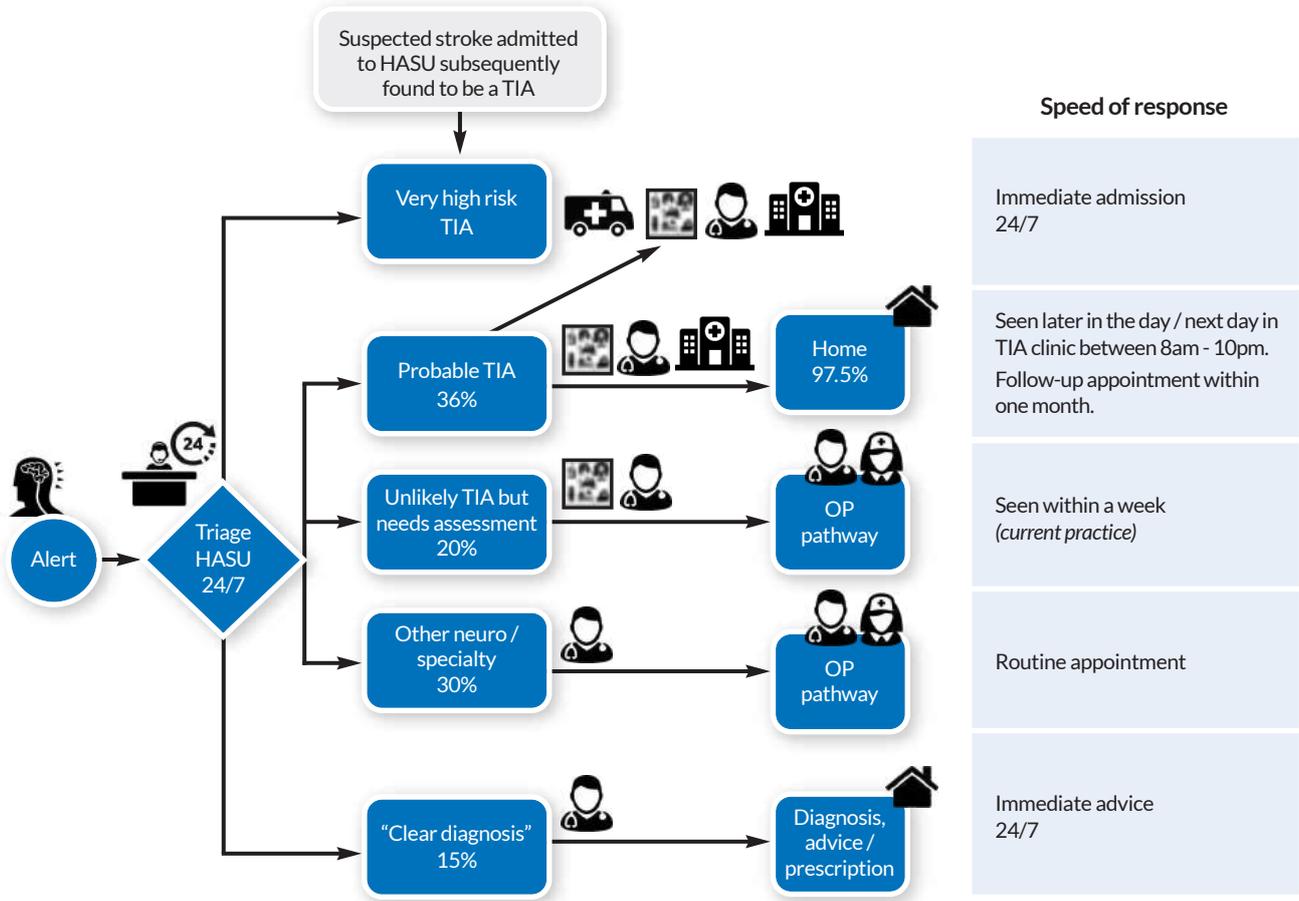


Implementing a standardised TIA pathway

We witnessed many examples of excellent pathways of care and as a first step to reducing variation in how patients with suspected TIA are managed, we are recommending that ISDNs adopt a standardised TIA pathway, such as set out in **Figure 59**. The appropriate triaging of patients into one of the five arms will correctly identify the urgency of review for patients and systems and help reduce the current burden upon stroke teams to see and investigate the many patients that are referred with non-neurovascular acute neurological conditions. Key markers of a high-quality service include:

- Initial stroke nurse triage with subsequent stroke consultant review.
- Majority of suspected TIAs managed on the outpatient pathway and seen/investigated within 24 hours, 7 days a week.
- Access to other appropriate rapid access clinics if TIA not suspected.
- Immediate initiation of secondary prevention and rapid access to secondary investigations to identify risk factors.
- One month follow-up often delivered by a stroke nurse specialist.

Figure 59: TIA pathway



Source: agreed by the South East Coast Stroke Clinical Reference Group based on NICE guidance

TIA services during a pandemic

A growing number of services adopted a structured approach to triaging suspected TIA patients and new models of working. TIA services across the country moved to a virtual model. Whilst this shift is a response to a unique set of circumstances, it illustrates what can be achieved when local systems must adapt. Our recommendation is that this shift should be continued during the restoration and recovery period, but acknowledging that a proportion of patients will need a face-to-face review, especially patients in whom there is diagnostic uncertainty after an initial telephone triage. Stroke teams should now critically review their TIA services to see which areas need to be remodelled to better facilitate rapid access. This should include reviewing clinic time allocation, recognising that it takes longer to deliver virtual reviews. Please refer to guidance on delivering virtual TIA clinics that has been developed by the collaboration of GIRFT with Oxford AHSN.⁸⁸

⁸⁸ <https://basp.ac.uk/wp-content/uploads/2020/05/Adapting-stroke-services-in-the-COVID-19-pandemic-May-2020-Virtual-TIA-clinic.pdf>

IN PRACTICE

TIA referral system

Oxford University Hospitals NHS Foundation Trust

The TIA and minor stroke referral pathway at Oxford University Hospitals was reconfigured in 2019 when the TIA service switched to one delivered by the duty stroke consultant every day rather than via discrete outpatient clinics. The system has been further reconfigured to meet the challenges of the COVID-19 pandemic to minimise the amount of direct patient contact with the healthcare system.

To optimise the standard of triage, the TIA service referrals are reviewed directly by the duty stroke consultant throughout each day (at least twice per day) to ensure a prompt triage and clinic review service. The review process is supported in real-time by a dedicated TIA and stroke secretary. No referrals are made by telephone, unless the patient is already in the hospital and there is an opportunity to avoid a future visit to hospital from direct review by a member of the stroke team.

One of the enabling factors has been the creation of a clear process that the team follows, which provides and ensures consistency in how referrals are managed and clarity on roles and organisation, including:

- Referrals from both the ED and GPs are completed using a referral pro forma PDF sent to a dedicated nhs.net email address. Access to this TIA inbox is available to all of the stroke consultants and the TIA secretary.
- The referral pro forma contains a structured template, check boxes to prompt appropriate referral, and information about alternative referral pathways for non-specialists. It also contains prompts to administer aspirin and give driving advice.
- The TIA inbox is reviewed by the duty stroke consultant at regular intervals throughout the working day to triage referrals for review or arrange alternative clinic arrangements. This permits opportunistic triaging around unpredictable acute care commitments.
- The TIA secretary also screens the TIA inbox to create virtual hospital encounters for each referral at the earliest opportunity. This ensures that a telephone review can be documented in the electronic health record at the time of triage and investigations requested against the correct patient encounter.
- Once an outcome for the referral is decided, the original referral email is forwarded to the same TIA inbox with 'Triaged:' prefixed in the email subject line and with instructions for the TIA secretary in the email body.
- A redirect rule has been created so the 'Triaged:' prefix ensures this forwarded email is automatically sent straight to a subfolder for actions and archive by the TIA secretary.
- The duty consultant can then delete the original referral email from the TIA inbox once all consultant actions are taken, ensuring it is clear to the next duty consultant which referrals have been reviewed and actioned.

Recommendations to strengthen primary and secondary prevention of stroke

Recommendation	Actions	Owners	Timescale
13. Conduct clear assessment of the health inequalities specific to geographical regions and groups.	a Undertake comprehensive review of the reversible risk factors of stroke in specific ISDNs appreciating underserved groups and social economic factors. Including but not exclusive to smoking, diet, alcohol and drug consumption, exercise levels, educational attainment, housing, employment, language barriers, hypertension, hypercholesterolaemia and atrial fibrillation.	ISDNs, CVD-R Boards and Local Authorities	Within 12 months of publication
14. ISDNs, working with ICSs and PCNs, to engage in a coordinated approach to CVD prevention.	a NHSE&I to coordinate the design and content of a CVD prevention data dashboard to support ISDNs with local prevention strategies.	NHSE&I National CVD Prevention Programme in partnership with Office for Health of Improvement and Disparities	Within 12 months of publication
	b ISDNs to engage with all stakeholders (local authorities, public health, patient groups) to agree an overall strategy for CVD prevention. The strategy should be linked to Regional CVD-R board priorities and the Long Term Plan CVD prevention priorities, using agreed data extracts from Public Health England's National Cardiovascular Intelligence Network and the new CVDPREVENT audit to understand performance, identify opportunities and track progress.	ISDNs, CVD-R Boards, ICSs and Local Authorities	Within 12 months of publication
	c Ensure every ISDN has access to the CVDPrevent audit and to RightCare tools for improving stroke prevention.	NHSE&I National CVD Prevention Programme and regional medical directorates	Within 12 months of publication
	d Publicise the 'every contact counts' message for improved brain and heart vascular health.	All health care and third sector providers that come into contact with patients	Within six months of publication
15. ISDNs to oversee and support the implementation of pathways for secondary prevention including cryptogenic stroke and TIA management.	a Ensure each ISDN has clear protocols in place for blood pressure lowering, lipid management and anticoagulation therapy for at risk populations.	ISDNs, PCNs and provider organisations, and Regional CVD-R Boards	Within six months of publication
	b Develop a clinical consensus pathway for secondary stroke prevention and investigation of cryptogenic stroke (including review of European Society of Cardiology recommendations) and recommend how best to embed in provider organisations. This must include rapid access to carotid endarterectomy.	GIRFT, ICSWP, NHSE&I	Within six months of publication
	c ISDNs to adopt and adapt ESO recommendations, with support from the ICSWP.	ISDNs and provider organisations	Within six months of publication
	d Each ISDN to ensure that all acute stroke providers have formal cryptogenic stroke regional MDT meetings where individual patients are discussed and referred for complex interventions, including but not exclusive to carotid endarterectomy, PFO closure and left atrial appendage occlusion. These meetings should have all relevant experts in attendance, including those who undertake the procedures.	ISDNs and acute stroke providers	Within six months of publication
	e Commission and deliver 6-week, 6-month and 12-month post-discharge reviews. Providers to coordinate data collection to monitor delivery of post-discharge follow-up and include adherence to secondary prevention.	Commissioners and providers of 6-week, 6-month and 12-month reviews	Within 12 months of publication
	f Partnership working with the CVD prevention programme to assess and evaluate remote, wearable devices and access to implantable devices and understand feasibility of national procurement framework.	NHSE&I National CVD Prevention and Stroke Programme	Within 18 months of publication

Recommendations to strengthen primary and secondary prevention of stroke (continued)

Recommendation	Actions	Owners	Timescale
<p>16. ISDNs to work with their local systems and ensure adherence to NICE guidance for TIA. Patients with suspected TIA must be assessed seven days a week with remote triage to prioritise assessment within 24 hours. Assessment must include appropriate investigations including brain imaging, carotid vessel imaging (where appropriate) and rhythm check to exclude atrial fibrillation.</p>	<p>a Review stroke services and ensure access to 7-day TIA assessment. This should begin with a gap analysis covering pathway elements including senior clinical triage, same day imaging and initiation of appropriate secondary prevention within 24 hours.</p>	ISDNs and provider organisations	Within six months of publication
	<p>b Provide access to alternative specialist rapid-access clinics e.g. acute neurology, transient loss of consciousness clinics, falls and first fit clinics.</p>	Acute providers	Within 18 months of publication
	<p>c Each ISDN to have an agreed a pathway of care to support provider delivery.</p>	ISDNs working with Imaging Networks	Within six months of publication
	<p>d Work towards 7-day MRI access and discontinue inappropriate CT scanning for TIA.</p>	Provider organisations	Within 18 months of publication
	<p>e Establish capacity to review TIA patients at recommended intervals (current RCP guidance is at four weeks).</p>	Provider organisations	Within six months of publication

Workforce

Background

The delivery of an end-to-end stroke care pathway presents a highly complex workforce challenge for health and social care providers. How we identify, train and develop our workforce within the NHS is critical and we need to be radical and brave in our endeavour to enable a capability-based workforce.

The workforce engaged in providing care for patients with stroke must provide a comprehensive and integrated service wherever possible that encompasses prevention, recognition of stroke and its mimics, early management during hyperacute and acute phases, post-acute stroke management, early inpatient rehabilitation and community-based services, including life after stroke support, secondary prevention and end of life care..

The care pathway must also address the challenge of long-term rehabilitation, re-enablement and helping stroke survivors manage the impacts of their stroke, whilst maximising their quality of life and participation in normal activities. These latter phases present an ongoing and often poorly realised workforce challenge, which stretches beyond the normal confines of trained and registered health and social care professionals and includes relatives, carers and third sector groups in providing interventions. This informal workforce, which rarely has professional registration or qualification, would nevertheless benefit from a shared set of skills and understanding to meet the needs of stroke survivors.

Stroke medicine has in some part been a victim of its own success. In many hospitals it was one of the first to deliver seven-day consultant ward rounds, extended nursing and therapy roles, in-reach into busy A&E departments and early supported discharge (ESD) teams to drive more rapid assessment and transfer of care. This resulted in a reduction in the length of stay (49% reduction between 2001-2014, based on data from SSNAP) but not a parallel increase in staffing or a decrease in bed base. Many appropriately staffed stroke units are still seen by hospital managers as over-staffed older people's care wards and are often the first port of call when staffing is short elsewhere. There is a perception that stroke nursing is disproportionately labour intensive and medical trainees see stroke as a very rota-intense specialty.

Stroke services face significant staffing challenges – both in attracting enough professionals and ensuring that they have the right skills. The shortage of stroke physicians is well reported in SSNAP Organisational Audits (e.g. in 2019, 48% of sites report having at least one unfilled funded stroke consultant post). This shortfall had increased since 2014, when 26% of such posts were unfilled.⁸⁹ In addition 58% of trusts achieve adequate senior nurse staffing on stroke units and many of the units we visited reported high vacancy rates in their nurse workforce.

Delivery of neuropsychology is particularly challenged and in the last AOA only 7% of services stated they had access to sufficient psychologists. There are too few interventional neuroradiologists (INRs) to enable delivery of thrombectomy to all those eligible, and a third of all INRs work across six neuroscience centres in Greater London, leaving the remaining 16 centres across England with insufficient INRs to deliver this evidence-based, disability-saving intervention. There are also shortages in the radiology and radiography workforce, as identified in the GIRFT radiology report.⁹⁰

There has been a long-standing shortage of speech and language therapists (SLT) within the NHS to support stroke services, and more recently there has been a growing national shortage of occupational therapists. Despite strong evidence of the benefit of swallowing assessment and interventions from SLT and a reduction in stroke-associated pneumonia,⁹¹ we found from our visits that SLTs were less likely to be able to offer a 7/7 service to patients when compared to other therapies. We also noted that many weekday therapy teams are stretched across seven days and many community ESD teams strive to deliver a needs-based model, when they are only staffed for a time limited pathway.

We found limited evidence of an appreciation of the value of pharmacists during our visits, with many units reporting that they did not have consistent stroke unit-based pharmacy specialists. This was particularly apparent at weekends. Some units reported that where paper based prescribing still existed, drug charts would leave the stroke unit for hours at a time. This is inefficient and potentially unsafe. We recommend this practice be avoided, which is feasible with the appropriate allocation of pharmacists to stroke units.

⁸⁹ *Sentinel Stroke National Audit Programme, Acute organisational audit report December 2019, National Report, England, Wales and Northern Ireland. Prepared by Royal College of Physicians, Care Quality Improvement Department (CQID) on behalf of the Intercollegiate Stroke Working Party*

⁹⁰ *Radiology, GIRFT Programme National Specialty Report, November 2020*

⁹¹ *Eltringham, S.A., Kilner, K., Gee, M. et al. Factors Associated with Risk of Stroke-Associated Pneumonia in Patients with Dysphagia: A Systematic Review. Dysphagia (2019). <https://doi.org/10.1007/s00455-019-10061-6>*

The staffing issues described above leave stroke services vulnerable and unable to keep pace with advances in stroke care. A recent joint report by the GIRFT authors of this report and the British Association of Stroke Physicians⁹² notes that despite many key advances in stroke medicine, there has not been adequate improvements in the consultant workforce to address the rapidly increasing demand of a consultant delivered pathway.

Many of the issues highlighted in the preceding sections of this report are, at their heart, related to workforce. Based on the many views we heard during our visits, there are practical steps we can take that will strengthen the way we train, retain and deploy colleagues working across disciplines within the stroke pathway.

The NHS People Plan

It is vital that we care for our stroke workforce. The People Plan⁹³ from NHS England and NHS Improvement and Health Education England (HEE) was published in July 2020 and sets out what staff working in the NHS can expect from their leaders and each other. Central themes of the People Plan build on the Interim People Plan in June 2019.⁹⁴ It focuses on how we must look after each other and foster a culture of inclusion and belonging, as well as actions to grow and train our workforce, and work together differently to deliver patient care.

From our visits it was clear that stroke care is being delivered by exceptional, dedicated and driven multidisciplinary teams. We met inspirational leaders from nursing, therapy and medical backgrounds, as well as passionate trust executives, managers and commissioners that had a clear shared vision and expectations of their services and workforce.

Within stroke care, we have already started to address many of the ambitions of the People Plan, but there is a real opportunity for the stroke community to come together to accelerate the delivery of local 'Stroke People Plans' within individual ISDNs.

The People Plan also includes 'Our NHS People Promise,' which sets out ambitions for what people working within the NHS will say by 2024. It will set out a clear framework for collective action on workforce priorities over the next five years and a fuller range of specific targeted actions to address our biggest challenges. The Plan will:

- Explain how we **put people issues at the heart of all we do** – in local employer organisations, in health and care systems, and in national bodies.
- Illustrate what **engagement and collaboration** has taken place.
- Show how feedback has been **listened to**.
- Describe the **benefits for staff and service users** and the difference they will see on the ground.
- Embody and promote **collaboration** across the **NHS, local government and the wider care sector**.
- Create **movement and momentum** – The Plan is not an end point, but a beginning.

The People Plan will set out action to:

- **Make the NHS the best place to work**, improving staff experience and retention.
- **Improve the leadership culture**, with an emphasis on compassionate, inclusive and collaborative leadership behaviours.
- **Transform and grow the workforce** with more staff, working differently in support of Long Term Plan priorities by:
 - **Releasing more time for care**, supported by systematic use of digital technology.
 - **Supporting and enabling workforce redesign** through better use of clinical and non-clinical roles to support registered professions, extended and advanced roles, and using current professionals across different settings including primary care.
 - **Growing the future workforce** and reforming education and training to ensure the right number and mix of staff – with the right skills – able to contribute to our workforce immediately, and in the medium to long term (5-10 years).
 - **Implement a new operating model for workforce issues**, with a much stronger role for integrated care systems.

Although these recommendations may appear straightforward to deliver, many of the basic principles were not evident upon our visits. All employers are strongly encouraged to adhere, both in spirit and demonstrable actions, to the NHS People Plan.

⁹² British Association of Stroke Physicians & Getting It Right First Time Meeting the Future Consultant Workforce Challenges: Stroke Medicine Stroke Medicine Consultant Workforce Requirements 2019 – 2022, July 2019

⁹³ NHS England and NHS Improvement and Health Education England, WE ARE THE NHS: People Plan 2020/21 - action for us all

⁹⁴ Available at: <https://www.longtermplan.nhs.uk/publication/interim-nhs-people-plan/> (accessed 3rd December 2020)

Training and career progression

The 2007 NHS England National Stroke Strategy⁹⁵ recognised the specialist skills required to deliver high quality stroke care and with clear recommendations about the need for transferable training and clear career pathways:

“Existing staffing numbers and skill mix profiles are insufficient to deliver the required input in stroke care pathways. Workforce review is therefore needed, along with a workforce plan that defines the care pathway, lists the functions at each stage and the competencies required to perform the functions, and then ensures training is put in place to support staff to acquire the competencies.”

“Staff working with stroke have variable levels of knowledge and skills. Specialist knowledge has developed ad hoc in practice and there is no nationally recognised stroke-specific training. Nationally recognised, quality-assured and transferable training and education programmes for stroke linked to professional roles and career pathways are needed.”

Sadly, we have not delivered the ambitions of the National Stroke Strategy (NSS), in part due to lack of resource, mandate and policy directive. There is now a renewed focus following the inclusion of stroke medicine as one of the NHS Long Term Plan priorities and a specific workforce work stream within the National Stroke Programme (NSP) led by Health Education England (HEE). The GIRFT stroke programme has worked closely with HEE over the last 18 months to provide granular detail about staffing levels and many of the workforce challenges our stroke services face. A major focus of this workstream is the ongoing development of the Stroke Specific Educational Framework (SSEF) and the HEE STAR framework.

Up-skilling the stroke workforce: the Stroke Specific Educational Framework

The Stroke Specific Educational Framework (SSEF) was established partly in response to the needs identified in the 2007 NSS. It aims to establish nationally recognised, quality-assured and transferable education programmes in stroke. The SSEF consists of 16 Elements of Care (EoC) and is related to the stroke strategies in all four UK countries. Within each EoC there are key competencies that reflect the ‘knowledge and understanding’ and ‘skills and abilities’ a member of staff should possess if they work in that area of stroke care delivery.

It was acknowledged that the SSEF was a good starting point and should be developed further to become a helpful resource for staff across the multidisciplinary team (MDT). It is clear from our visits, and subsequent stakeholder engagement, that the SSEF needed to be refreshed and updated to address the end-to-end pathway. It needed to support other key members of the MDT, including a more developed section for the exciting role of Advanced Clinical Practitioners (ACPs) and a description of practical competencies for extended and advanced practice roles.

The updated SSEF may be used by staff to self-assess their knowledge, understanding, skills and abilities in relation to stroke care and benchmark themselves against the SSEF profile for their job role and grade. Using this information, the SSEF highlights areas for professional development and suggests accredited courses to meet continuing professional development needs.

⁹⁵ Department of Health National Stroke Strategy

IN PRACTICE

The Stroke-Specific Education Framework

In response to the National Stroke Strategy (2007) the Department of Health funded the development of the Stroke-Specific Education Framework (SSEF), a nationally recognised tool to ensure consistent and measurable education and training for those working in stroke care.

The SSEF, and the accompanying online toolkit, launched in 2014, enables healthcare professionals (HCPs) to reflect upon their stroke-specific knowledge and skills, self-assess against nationally agreed standardised role profiles, identifying relevant education and training. Over 3500 HCPs have already undergone this process, with SSEF registration being a prerequisite for all stroke-specialist staff in several NHS Trusts.

The cross-sector national workforce working group, currently developing a workforce implementation strategy for the NHS Long Term Plan, identified the SSEF as a mechanism to facilitate workforce development and modernisation.

Health Education England adopted the SSEF in 2020 to support this aim by increasing workforce engagement with SSEF and standardising approaches to education and practice across NHS organisations. This collaboration has facilitated a programme of work including:

- A UK-wide stakeholder engagement exercise to inform developments of the existing resource.
- An in-depth review of the framework to ensure its utility in meeting current, and future, workforce needs.
- Dissemination and supported implementation of the resource for NHS organisations.

The Skills and Capabilities workstream of the workforce working group continue to support the NHS and HEE in the development of resources to inform and support the implementation of the Integrated Stroke Delivery Networks in 2021.

For more information about the SSEF visit: <https://stroke-education.org.uk/>

To get in touch with the SSEF project team email: SSEFEnquiries@uclan.ac.uk

Alongside the SSEF, other resources and curricula are in place to develop and support career progression. For instance, stroke specialist nurses are an important part of stroke teams and the GIRFT authors of this report worked with the Royal College of Nursing (RCN) to outline the range of career pathways within stroke nursing and minimum recommended education requirements, in addition to knowledge and skills. It provides a guide for stroke services and employers to develop local career development frameworks for the nursing workforce.⁹⁶ The relatively new role of physician associates should be supported and developed within stroke medicine. Their skill set should be utilised within the specialty. They support and complement the nursing medical and specialist teams.

Getting the most from our skilled workforce

A very clear message from meeting stroke services is that when individuals are given the skills and then the freedom to use those skills, it will deliver tangible benefits in terms of quality of care and efficiency. We should foster collaborative rather than competitive behaviours between disciplines.

Clinical teams' routine activities should utilise the full extent of their education, training, and experience, their time should not be spent doing things that could be effectively done by someone else with a different set of skills, or in fact tasks that could be delivered using digital technology more effectively. The COVID-19 pandemic has accelerated the use of remote and digital pathways. Whilst most of this innovation has been positive, it is imperative that the workforce has the correct equipment, remote access, and adequate training to ensure that digital exclusion is not exacerbated for staff and services users.

The development of extended and advanced roles for nurses and therapists is clearly one of the key solutions we must focus on if we are to address the workforce gap, service delivery and clinical leadership. It has been most encouraging to see an increasing number of nurse consultants take up ISDN and trust-based leadership across the country since our visits.

⁹⁶ <https://www.rcn.org.uk/clinical-topics/neuroscience-nursing/stroke/uk-career-framework-for-stroke-nurses>, accessed February 2021

Insight from GIRFT's data

14% of stroke teams have physician associates. These teams have on average two WTE physician associates.

IN PRACTICE

Developing a multidisciplinary team of advanced clinical practitioners

Salford Royal Hospital NHS Foundation Trust

The stroke leadership team at Salford Royal Hospital has, over a number of years, established a multidisciplinary team of stroke advanced clinical practitioners (ACPs). These clinicians work as part of a multidisciplinary medical team across the stroke service within the largest stroke service in the UK at the Comprehensive Stroke Centre in Salford. The motivation for this was the need for a more consistent workforce. A model was devised to mitigate the risk of lack of recruitment of medical junior doctors and increase patient safety by having a stable workforce with different background skill sets to be able to contribute to meeting patient need across the stroke pathway.

The initiative was led and initially established with experienced nurses and now has clinicians from four professional backgrounds including occupational therapy, physiotherapy, nursing and paramedic. Each ACP has an MSc in Advanced Practice and completed stroke competencies. The team are managed by a Stroke Nurse Consultant and each has a medical supervisor to support their on-going development. The ACPs work to job plans with 80% direct clinical contact and 20% non-clinical time (for personal and service development). The team support all aspects of the stroke MDT dependent on their personal competency framework – including ED assessment, TIA assessment, ward-based treatment/care, discharge planning and follow-up.

Whilst advanced clinical practitioners (ACPs) are not a like for like replacement for junior medical staff, they can offer support to integrated junior medical and ACP rotas in their direct clinical contact time whilst also bringing additional benefits to supporting service development (leading audit and quality improvement) alongside consultant colleagues. ACPs offer a wealth of stroke knowledge and experience coupled with leadership skills from their previous senior posts within their home professions. They provide continuity within the service as a team of senior experienced clinicians in their own right. This stability supports safe, consistent and effective patient care, enables service development projects and supports the development and supervision of other staff within the stroke team. It also provides a structured opportunity for career progression within stroke care to senior staff seeking to enhance and expand their clinical roles.

IN PRACTICE

Stroke Nurse Consultants

East Lancashire Hospitals NHS Trust

In 2016 the East Lancashire Hospitals NHS Trust was consistently scoring a D in the Sentinel Stroke National Audit Programme (SSNAP). The hyperacute/acute stroke care was led by the emergency department, with input from the stroke nursing and medical team who were based on the stroke unit.

A team was developed to understand the stroke pathway and the roles and responsibilities within the team with a goal of improving the stroke service. This was achieved by staff engagement workshops and teams were identified to improve stroke care with shared vision to be the best stroke unit they could be. It was recognised that there was a shortage of stroke physicians, specialist stroke nursing staff and difficulties in recruiting a senior medical post. Specialist stroke clinical leadership to develop and cascade updated guidelines within the team was also a challenge. The trust decided to recruit two stroke nurse consultants (SNC) with a background and qualification in advanced clinical practice to:

- improve SSNAP scores;
- improve bed utilisation with less stroke outliers;
- provide strong leadership;
- improve retention of staff, staffing levels and staff morale;
- provide specialist training to all staff working in stroke care; and
- take part in stroke research developing a research portfolio.

The SNCs are also providing the training, pathway development and leadership to meet new local network goals. These include having a stroke ambulatory service in each hospital in the network by March 2021, improving thrombolysis and thrombectomy rates, as well as introducing artificial intelligence to support acute stroke scanning.

Since recruitment of the SNCs, the service consistently scores an A on SSNAP and is continuing with service development. The SNCs help to ensure the service provides a specialist stroke review to all new acute stroke patients attending the emergency department, ambulatory care or inpatient referrals, from 8am-6pm five days per week. The median consultant review time has fallen from over 17 hours to under 5 hours. The trust has contributed to the improvement of pathways and protocols across the network and played an active role in audits, research and mortality reviews.

Stroke consultant training

Medical consultant workforce is a real concern. As mentioned earlier, just under 50% of stroke services currently have a consultant vacancy based on the last SSNAP AOA report in 2019.

The stroke medicine curriculum was first approved in 2006 with several centres approved for training, but without significant funding. Workforce modelling for the National Stroke Strategy found a need to fund and train 60 trainees per annum for five years, followed by 30 per annum thereafter. But recent data shows that the number of trainees has steadily declined from 31 (2014/15) to 25 (2018/19). On this basis, the current medical trainee numbers are not enough to support the present stroke consultant workforce deficit, which is complicated by attrition rates estimated at 3-5% per annum.

In the current curriculum, training to become a stroke specialist means undertaking an indicative two-year training pathway. Trainees from a finite number of parent specialty backgrounds (acute internal medicine, cardiology, clinical pharmacology, geriatric medicine, neurology, and rehabilitation medicine) undertake the first year within the parent specialty followed by an additional specialist training year in stroke medicine as a sub-specialty. This leads to varying lengths of training in the parent specialties: from no additional training (neurology), extension by six months (acute internal medicine) to an additional year (other specialties including geriatric medicine).

Following the Shape of Training review (2014) and the GMC review of the curricula and assessment standards (2017), all UK curricula needed to incorporate the GMC Generic Professional Capabilities by 2020. This created an opportunity to allow more flexibility and opportunity for doctors to train in stroke medicine.

The first year has now been embedded into internal medicine (principally stage 1) and the new curriculum for higher training is as follows:

- Neurology (indicative five-year programme starting in 2022): the entire stroke medicine curriculum is proposed to be embedded into neurology training with internal medicine so all neurologists will be trained in the management of stroke). It will be vital that stroke and neurology services work much more closely together to ensure attractive and exciting job planning to enable integration of acute neurology and acute stroke services.
- Geriatric medicine (indicative four-year programme): all trainees will undertake core stroke medicine with an opportunity to elect to train in more detail under the 'Theme For Service' special interest model. Trainees who wish to train fully in stroke would be expected to undertake an Out of Programme (OOP) period of six months to complete.
- Acute internal medicine (indicative four years): all trainees will undertake core stroke medicine with an opportunity to elect to train in more detail under the 'Specialist Skill' and extend training by an indicative six months.
- Internal medicine (standalone): a novel shortened training pathway with internal medicine (stage 1) followed by internal medicine (stage 2) plus stroke over an indicative three years has been proposed and aligns with the *Medical Education Reform Programme and the Future Doctor*.

The purpose of the new curriculum is to ensure that trainees from a wide number of clinical backgrounds develop a full range of capabilities across all of stroke medicine to maximise the number of doctors capable of managing complex patients with stroke on day one as a consultant. There needs to be an ability to work flexibly as a consultant, and also have the ability to move across sub-specialty interests e.g. a 35 year old consultant may want to do hyperacute care for the first 15 years of their career, and latterly focus more on leadership, training and education or perhaps rehabilitation. The revised rehabilitation medicine curriculum—JRCPTB 2021⁹⁷—offers further opportunity for those with a shared skillset to contribute to the stroke pathway. The COVID-19 pandemic has highlighted the benefit and advantages of more flexible working patterns, such as remote working, and this should be supported.

An additional challenge is good job planning within the consultant workforce. Data presented above on access to stroke consultants shows significant problems nationally with timely access to specialist expertise. Our view is that these problems are only partly about staff numbers, which requires longer-term solutions as listed above. More immediate benefits come from protecting staff time, so specialists are available to deliver stroke care, but also in ensuring that senior decision makers are available to support the hyper-acute pathway. Job planning and intelligent use of rotas may facilitate this. Regional telemedicine rotas and regional pre-hospital triage hotlines should also be explored and encouraged.

Hyper-acute stroke and neurological assessment – HASA/HANA model

A key to success in the future will be ensuring that the consultants of tomorrow with stroke expertise, work within stroke medicine – which by definition, in most hospitals across the country, also includes the delivery of acute neurology assessment. One way to ensure this is addressed is further exploration of the HASA/HANA (hyper-acute stroke assessment and hyper-acute neurology assessment) model. In hospitals that have delivered acute 'front door' neurology services, neurology 'hot clinics' and close working between stroke teams and neurology teams, can lead to more sustainable rotas. It can reduce duplication of effort and streamline referral pathways, and reduce unnecessary admissions. The shared learning that comes from closer working between stroke and neurology services also offers an opportunity to explore shared overnight on-call rotas.

As part of the GIRFT stroke programme, we have met with several stroke and neurology leads at some of the country's larger stroke services to explore options for delivery of the 'HASA/HANA' model. As mentioned in GIRFT's neurology report, both programmes are keen to support these efficient and collaborative models and we recommend trusts and systems actively explore joint stroke and neurology rotas.

This model has been successfully implemented at St George's University Hospitals NHS Foundation Trust (see the case study summarised on page 80).⁹⁸

⁹⁷ <https://www.jrcptb.org.uk/specialties/stroke-medicine-sub-specialty>, accessed April 2021

⁹⁸ Kuven M, Valerie J, Mahinda Y, et al 291 St George's hyperacute neurology: right person, right time, *Journal of Neurology, Neurosurgery & Psychiatry* 2018;89:A45.

Delivering local workforce requirements

Across England, each region has its own, individual challenges around both shortages of staff and upskilling their local NHS workforce – the nurses, therapists, pharmacists, doctors, healthcare scientists, and many other healthcare professionals that provide care and support to those who access stroke services. Mapping current workforce and understanding levels of skill and expertise along the pathway will be an important step in understanding future staffing requirements and training gaps. Additional priorities from the National Stroke Delivery Board’s workforce workstream will enable ISDNs to have recommended staffing numbers to ensure stroke service needs are met at a local level. This is complex because the stroke workforce is rarely located in a single place but often dispersed across a wide range of health and social care settings from hyperacute stroke units through to rehabilitation units and large, often segregated, community teams. This presents challenges in quantifying existing workforce resources and then to identify the skills they possess and gaps in knowledge and training.

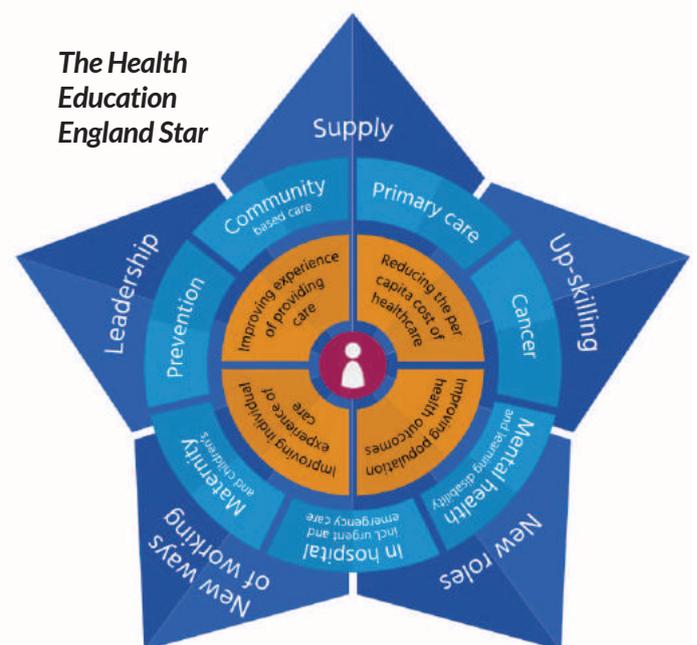
The delivery of a skills and capabilities model rather than solely a model based on professional qualifications across different aspects of the workforce is essential. Whilst this approach sounds complicated to map, it allows greater flexibility in the range of workforce solutions available for an existing workforce adapting to the advent of new technologies or service models. It also allows flexibility in planning any future workforce and allows non-registered staff and the voluntary sector to get a range of skills that are additive to stroke survivors’ care delivery.

There needs to be a standardised process to map capacity and demand for the stroke workforce. Work to look at the numbers of different professionals likely to be required in a fixed locality, based on stroke incidence and bed base, is currently underway. The National Stroke Delivery Board’s workforce workstream has spent time working through these estimates at national level and is now looking to support ISDN workforce planning. How these ambitions are delivered across individual networks, taking into account existing staffing structures, will form the basis of workforce development plans and workforce transformation projects. This should help ISDNs as they develop workforce investment plans.

With the many competing priorities, and the ever present need to demonstrate value for money within public services, finding solutions to workforce challenges may be difficult. The STAR framework from Health Education England may help. It has resources based around five themes that support local systems to plan, lead and sustain workforce change. It includes a range of workforce transformation solutions to help address the workforce requirements identified and maximise the impact of workforce changes.⁹⁹

Understanding the bed base requirement of stroke as a specialty is vital, but has rarely been calculated. We saw huge variation in the number of beds that stroke teams had responsibility for against the annual number of stroke admissions. A capacity and demand review to understand optimal bed requirements is an integral part of each ISDN’s workforce planning. A prototype bed calculator tool has been developed by the GIRFT stroke programme in collaboration with the CSU at NHS Arden and GEM, with subsequent support from ECIST. This allows individual trusts or regions to review (based on average length of stay, stroke mimic rates, TIA admissions, accessibility into ESD services and mortality rates) the number of beds they will require to ensure they have adequate capacity within their stroke service.

We encourage services to use a range of other calculators that are available to help estimate workforce and capacity requirements. The Royal College of Radiologists have developed guidance to support service planning and workforce requirements.¹⁰⁰ In collaboration with the British Association of Stroke Physicians, GIRFT has developed similar guidance to support stroke consultant workforce planning.¹⁰¹



⁹⁹ <https://www.hee.nhs.uk/our-work/hee-star> (accessed 3rd December 2020)

¹⁰⁰ Royal College of Radiologists, *Radiology business intelligence for service planning and workforce modelling*, October 2020

¹⁰¹ British Association of Stroke Physicians & Getting It Right First Time Meeting the Future Consultant Workforce Challenges: *Stroke Medicine Stroke Medicine Consultant Workforce Requirements 2019 – 2022*, July 2019

Supporting new ways of working

Having healthy and content staff relies upon resilient staff working in empathetic organisations. Excessive workload and workplace burnout were highlighted as critical workforce issues in many of our visits. In addition to investing in and retaining a skilled stroke workforce, there are ways teams may work differently.

We saw many examples on our visits. Some of these focus on using new technologies to enable better access to specialist expertise. Data from the SSNAP's AOA suggests there are significant opportunities for units to make greater use of technologies. For example:

- nearly 35% of stroke units do not use telemedicine to allow remote access for management of stroke care;
- 48% of units do not share an out-of-hours telemedicine rota with other hospitals;
- there is a lack of rotation and integration between hospital and community therapy teams with silo working; and
- there is duplication of documentation of key patient information, with skilled staff spending a significant proportion of their day undertaking administration tasks.

IN PRACTICE

Regional stroke telemedicine service

East of England

The out-of-hours East of England regional stroke telemedicine service was introduced in 2010 to address the inequitable access to stroke thrombolysis across the region.

A videoconferencing telemedicine software solution allows the stroke consultants to rapidly link with the referring hospital, providing real-time, rapid access to stroke expertise when and where it was required. Prior to telemedicine, many patients with stroke were transferred between hospitals to access thrombolysis, only to be outside the timeframe for treatment on arrival at the treating hospital.

The stroke telemedicine consultants are also able to securely access the patient's CT scan via the image exchange portal (IEP) system. The IEP allows each hospital to transmit the patient's CT scans through to our dedicated 'blue-light' institution. The CT scanners at the referring hospital are linked with the IEP system, enabling automatic routing of the relevant CT scans out of hours. The stroke telemedicine consultants are then able to access the internet-based web browser and review the patient's CT scan via a three-factor authentication process. If the patient's CT scan is not available via IEP, the Visionable software has a desktop-sharing feature, enabling the local stroke team to access their local PACS on the stroke telemedicine cart and share this view with the stroke telemedicine consultant.

Each hospital has two telemedicine carts: one based in the ED; and one based on the hyperacute stroke unit (HASU). Each cart is a mobile, wireless-enabled trolley, housing a hospital-specific PC that runs the telemedicine software and is easily moved to the end of the patient's bed, as needed. The on-call stroke telemedicine consultant is based at home, with a standard laptop, using the Visionable software, enabling them to clearly see and hear the patient, their relatives and the local clinical team in a 'virtual' consulting room.

The COVID-19 pandemic has led to significant changes in how NHS services are delivered and used. It has seen an acceleration of polices, an explosion of innovation that has never been seen before, challenged held assumptions and provided a new lens to review care delivery. Changes have affected the whole care pathway from health promotion, support for vulnerable communities, remote consultations, emergency care, mental health services, and seen new networks and collaborations demonstrate improvements at great pace. These innovations also have potential to improve collaboration across teams and different stages of the stroke pathway, with the right training and support offered for their implementation.

Stroke medicine is a great place to use learning from the COVID 19 pandemic as a springboard for quality improvement in stroke care, supporting local systems and the workforce. The pandemic has however also tested individuals, teams and systems to their limits. It has reminded us all that we are stronger working within cohesive teams and networks than in isolation.

IN PRACTICE

Virtual ward rounds in stroke care

Western Sussex Hospitals NHS Foundation Trust

The COVID-19 outbreak brought innovative new ways of working at Worthing Hospital, using IT in the hospital setting to protect not only patients but also staff.

Worthing Hospital is a district general hospital with an acute stroke unit providing 24/7 thrombolysis, acute stroke care, ongoing stroke rehabilitation and daily TIA clinics. This work is covered by three WTE consultants to ensure that the risk of coronavirus infection is minimised for patients and staff. The consultants adopted virtual ward rounds, utilising and building on their experience with telemedicine, which was already being used for hyperacute stroke calls. IT systems within the trust already allowed patient observations, blood results, patient notes, imaging and prescription charts to be viewed electronically.

By using FaceTime on a ward iPad, the junior doctors who are physically present with the patients and wearing PPE, could connect to the stroke consultants' iPad for a virtual ward round review. The stroke consultant had sight of all of the patient information, allowing them to make decisions akin to them being physically present on a ward round, despite them being in a remote location. The consultant could also make an entry in the medical notes by scribing on a history sheet, which was later filed in the patients' medical notes.

The process has enabled effective stroke consultant input to patients with stroke, with or without coronavirus. Patients were not fazed by having to speak to a consultant on an iPad screen rather than in person. This system also allowed the stroke consultants to provide rapid reviews in other areas such as the ED, not only for acute stroke calls but also to prevent unnecessary admission to hospital for a stroke review or inappropriate referral to the TIA clinic.

IN PRACTICE

Flexible working and supporting access to physiotherapy

Nottingham University Hospitals NHS Trust

During the COVID-19 pandemic teams across the stroke inpatient pathway experienced a reduction in physiotherapy staffing numbers either due to shielding of staff or childcare issues. For the latter, flexible working was implemented; this mostly involved members of the team working some of their contracted hours at the weekend rather than during the week. As a result, this increased the workforce at the weekend, allowing the weekend focus not only to be on hyperacute admissions and discharges but also on increasing rehabilitation across the pathway.

Following discussions with management and therapy leads, flexible working was implemented, increasing rather than replacing the workforce at the weekend, which allowed efficient use of staff resources. The physiotherapists on the weekend rota were allocated either hyperacute or rehabilitation to help formalise the role, with close communication at handover to determine if redeployment was required was ensured throughout the day.

This led to greatly increased rehabilitation across the weekend, not only with numbers of patients seen but also due to increased therapy presence prompting nursing staff to transfer patients out of bed more readily. This coupled with lower admissions meant that a higher percentage of patients received a seven-day physiotherapy service, as well as reducing the pressure on Mondays. Equally, patients requiring two therapists could receive more effective treatment sessions rather than requiring adapted treatment due to lone working. A secondary outcome was the beneficial effect of peer support, especially for complex stroke respiratory patients or when hyperacute services were particularly busy.

Actions and progress made during GIRFT's stroke programme

During GIRFT's stroke programme, the following actions have been completed or are in progress:

- Work continues to expand the SSEF in partnership with HEE.
- A bed calculator tool has been developed so that ISDNs and providers can plan capacity in a consistent and evidence-based way.
- Work is in progress to expand the thrombectomy workforce, including establishing a Thrombectomy Implementing Group to lead change and work with the GMC and Royal College of Radiologists to deliver credentialing for thrombectomy.
- GIRFT/BASP 'Meeting the Future Consultant Workforce Challenges' 2019-2022 published in July 2019.

Recommendations to support the stroke workforce

Recommendation	Actions	Owners	Timescale
17. Increase awareness of and delivery of the NHS People Plan – Our NHS People Promise. Use ISDN leadership and governance structures and the Stroke Specific Educational Framework (SSEF) to support the delivery a regional 'Stroke People Plan' to meet the needs of the stroke workforce and improve staff experience and retention.	a ISDNs to work with local services to identify the key actions required to deliver the NHS People Plan, specifically within stroke services.	ISDNs and provider organisations	Within six months of publication
	b Develop a plan in each ISDN to deliver a compassionate, inclusive, and collaborative leadership culture within and across ISDN networks.	ISDNs, supported by NHSE&I regional medical directorate teams	Within 18 months of publication
	c Further develop the Stroke Specific Educational Framework (SSEF) with support from HEE, and working with relevant specialist societies, to ensure it is fit for purpose as a tool to support capability assessment, role development and structured training and career development for both the registered and non-registered workforce.	HEE	Within 12 months of publication
	d Support and enable workforce redesign through better use of clinical and non-clinical roles, including extended and advanced roles e.g. Advanced Clinical Practice (ACP) roles, and encouraging usage of the SSEF.	BASP, GIRFT/NHSE&I, HEE, GMC, RCN and relevant professional bodies (including societies and royal colleges)	Within 18 months of publication
	e Ensure delivery of updated curriculum for medical specialty training in stroke medicine and its integration into the new shape of training for neurology.	HEE	Within six months of publication
	f Promote the BASP <i>Meeting the Future Consultant Workforce Challenges</i> paper and support the consultant job planning calculator.	ISDNs	Within six months of publication
18. Transform delivery of care and efficiency of workforce by incorporation of digital technology.	a Review the impact of virtual working, rapid adoption of technology and digital exclusion on the workforce to establish good practice. Formally evaluate and support local adoption.	HEE supported by NHSE&I NHSX and AHSNs	Within 18 months of publication
	b Implement digital technology at local level, based on formal evaluation.	ISDNs	Within two years of publication

Recommendations to support the stroke workforce (continued)

Recommendation	Actions	Owners	Timescale
19. ISDNs and local providers to use NHS England and NHS Improvement's stroke bed calculator to plan bed capacity requirements in a consistent and evidence-based way.	a Calculate stroke service bed requirements, reflecting both patients in hospital and those requiring community rehabilitation support at home, to inform workforce planning and funding models.	ISDNs and providers	Within 12 months of publication
20. Deliver a sustainable workforce for thrombectomy.	a Thrombectomy Implementation Group (TIG) to develop options to inform an overall thrombectomy workforce strategy, in partnership with the relevant professional bodies.	NHSE&I National Stroke Programme and HEE	Within 9-12 months of publication
	b Support for GMC credentialing for non-interventional neuro-radiologists to deliver thrombectomy.	GMC with support from NHSEI Thrombectomy Implementation Group	Within 12 months of publication
	c Develop national thrombectomy training academies and community of practice reporting into the Thrombectomy Implementation Group (TIG) for oversight purposes.	HEE	Within 12 months of publication
	d Ensure adequate availability of staff across the thrombectomy pathway.	ISDNs	Within 12 months of publication
21. Further develop the SSEF with a focus on the post-acute pathway, including life after stroke, psychological models of care, voluntary sector workforce and end of life care.	a Develop a consensus on the principles of a Life After Stroke care pathway.	NHSE&I National Stroke Programme and the Stroke Association, working with other voluntary sector groups	Within 12 months of publication
	b Review training requirements for current and anticipated future workforce including non-registered workers.	ISDNs and provider organisations	Within 12 months of publication
	c Review workforce requirements across post-acute stroke pathway.	ISDNs	Within 12 months of publication
	d Deliver a continuous learning framework to support extended and advanced roles.	HEE with relevant professional bodies	Ongoing

Rehabilitation and life after stroke

The evidence base

Stroke rehabilitation is an often complex, multi-professional process designed to facilitate restoration of, or adaptation to, the loss of physical, psychological, cognitive, and social function when brain ischaemia is persistent and damage permanent. There is strong evidence that a coordinated multidisciplinary team approach to delivery of rehabilitation results in a reduction in death, institutionalisation, and dependency.¹⁰² Rehabilitation will draw on range of skilled specialists, including physiotherapy, occupational therapy, speech and language therapy, dieticians, orthoptists, psychologists and many others. Comprehensive stroke rehabilitation delivered by specialists in this field has been shown to be the most effective form of rehabilitation for stroke survivors, with trials and observational studies demonstrating that this increases survivors' independence and reduces admissions to institutional care and length of hospital stays.^{103, 104, 105}

There is also evidence for a dose response to rehabilitation.¹⁰⁶ Current guidelines recommend 45 minutes of each relevant therapy for at least five days a week as a pragmatic choice.^{107, 108} However, it is likely that the ideal amount is higher than this and will vary in intensity and delivery from patient to patient. This is supported by the NHS England Long Term Plan whereby all services should be working towards (or already delivering) a fully commissioned seven day pathway to ensure optimal patient outcomes.

Guidelines issued by the Royal College of Physicians and The National Institute for Health and Care Excellence (NICE) make clear the importance of both inpatient and community stroke rehabilitation services. This includes recommendations about specialist stroke rehabilitation, encompassing in-hospital and following transfer home, including access for those going into residential, nursing homes or prolonged inpatient neurorehabilitation. Rehabilitation should continue for as long as a patient is willing and capable of participating and showing measurable benefit from the intervention both in hospital and in the community.¹⁰⁹ Careful consideration should also be given to how and when stroke survivors 'leave' rehabilitation, and transition into their life after stroke.

Current challenges

Across England, there is inequity in provision of stroke rehabilitation services. Although there are examples of high-quality services meeting evidence-based standards, there are many stroke survivors who do not get the standard of rehabilitation they need and deserve. Research by the Stroke Association highlights that many patients and their carers are excluded by existing stroke rehabilitation pathways. They refer to a sense of abandonment—their research suggests that 45% of stroke survivors feel abandoned when they leave hospital.¹¹⁰ This reflects what we observed on our visits and pilot PROMS and PREMS survey (see *Patient reported outcomes*, page 168).

¹⁰² Turner-Stokes L, Pick A, Nair A, Disler PB, Wade DT. Multi-disciplinary rehabilitation for acquired brain injury in adults of working age. *Cochrane Database of Systematic Reviews* 2015, Issue 12. Art. No.: CD004170. DOI: 10.1002/14651858.CD004170.pub3

¹⁰³ Stroke Unit Trialists' Collaboration. Organised inpatient (stroke unit) care for stroke. *Cochrane Database System Review*. 2013. 9. P. CD000197

¹⁰⁴ Langhorne P et al. Early Supported discharge services for people with acute stroke. *Cochrane Systematic Review*. 2017

¹⁰⁵ Fisher RJ, Gaynor C, Kerr M, Langhorne P, Anderson C, Bautz-Holter E, Indredavik B, Mayo N, Power M, Rodgers H, Morten Rønning O, Widén Holmqvist L, Wolfe C, Walker M. A Consensus on Stroke Early Supported Discharge. *Stroke*. 2011; 42:1392-1397.

¹⁰⁶ Lohse KR, Lang CE, Boyd LA. Is more better? Using metadata to explore dose-response relationships in stroke rehabilitation. *Stroke*. 2014;45(7):2053-2058. doi:10.1161/STROKEAHA.114.004695

¹⁰⁷ Royal College of Physicians, National Clinical Guideline for Stroke, 2016. Intercollegiate Stroke Working Party. [https://www.strokeaudit.org/SupportFiles/Documents/Guidelines/2016-National-Clinical-Guideline-for-Stroke-5t-\(1\).aspx](https://www.strokeaudit.org/SupportFiles/Documents/Guidelines/2016-National-Clinical-Guideline-for-Stroke-5t-(1).aspx)

¹⁰⁸ NICE Guideline, Stroke Rehabilitation in the Adult. 2013 <https://www.nice.org.uk/guidance/cg162>

¹⁰⁹ Fisher RJ, Walker MF, Golton I, Jenkinson D. The implementation of evidence based rehabilitation services for stroke survivors living in the community. The results of a Delphi consensus process. *Clinical Rehabilitation* 2013. 27(8): 741-749

¹¹⁰ Stroke Association (2016) A new era for stroke report; available at https://www.stroke.org.uk/sites/default/files/anefts_report_web.pdf (accessed November 2020)

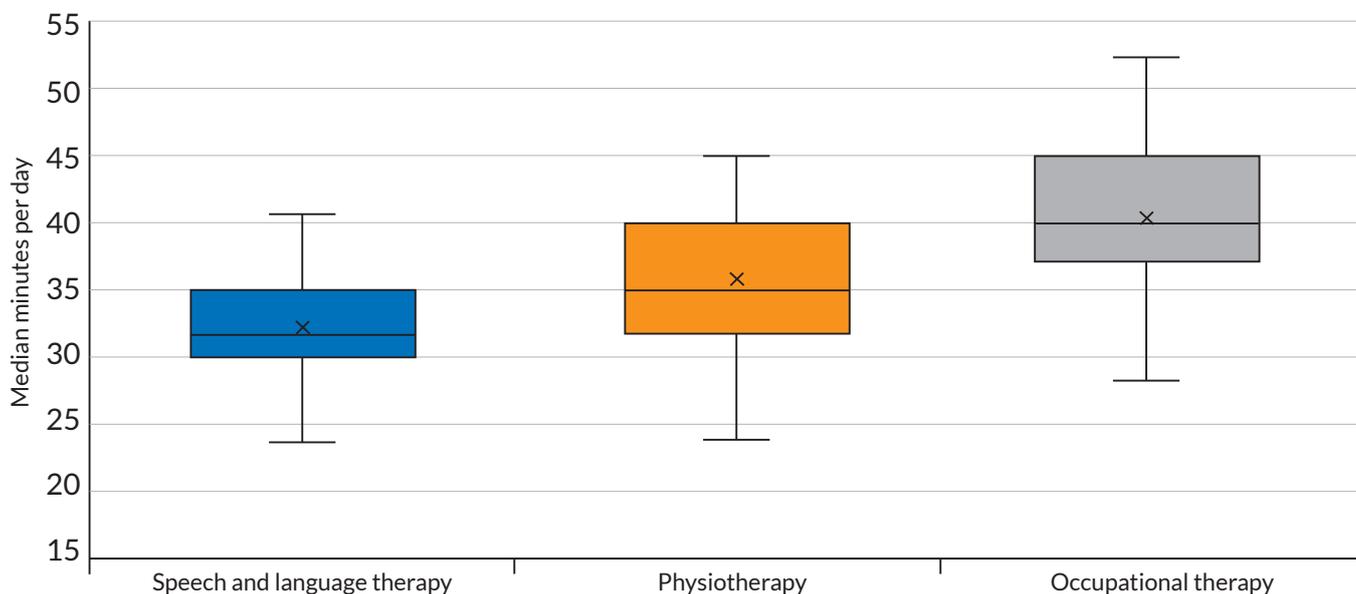
Hospital-based rehabilitation

There are significant proportions of patients who do not receive the amount of rehabilitation in hospital that is recommended.¹¹¹ A research study of four hospital sites in England showed that patients spent on average 37% of their time inactive and 60% alone.¹¹² It has also been reported that stroke survivors who are younger, those with lower pre-morbid disability, less severe stroke, those who have had a cerebral infarction (as opposed to haemorrhage), and those with few medical complications receive more intensive intervention in hospital- the inverse care law in action.¹¹³

Research conducted across eight stroke units in England reported that the most significant factor influencing the amount and frequency of therapy provided was the time therapists routinely spent, individually and collectively, in information exchange. Whilst handovers, board rounds and multidisciplinary meetings are vital, it was recommended that therapists use of time could be planned more efficiently to maximise therapy frequency and intensity.¹¹⁴ It is also important to try to reduce the administration burden for specialist staff and maximise 'hands on' therapy time. Data shows significant unwarranted variation in the amount of therapy time that patients with stroke are receiving. **Figure 60** shows the distribution of median therapy minutes that patients are receiving per day by site for physiotherapy, occupational therapy and speech and language therapy.

One of the consistent findings over our visits were the number of services that were delivering six or seven-day cover by stretching their teams that were commissioned to deliver five days. Whilst this is often the way teams evolve to demonstrate benefit of weekend therapy, this is not sustainable as a workforce model and formal commissioning of a weekend service is required to deliver high quality care and support work-life balance for therapy teams.

Figure 60: Access to therapies- physiotherapy, occupational therapy and speech and language therapy, median minutes per day (stroke spells, distribution across sites, England, April 2019-2020)



Note: each bar shows the distribution of median minutes, by site. The solid blocks are the interquartile range.

Source: SSNAP April 2019 - March 2020

¹¹¹ Sentinel Stroke National Audit Programme. *Moving the Dial of Stroke Care: The Sixth SSNAP Annual Report*. Kings College London. 2019. <https://www.strokeaudit.org/Documents/National/Clinical/Apr2018Mar2019/Apr2018Mar2019-AnnualReport.aspx>

¹¹² Chouliara N, Fisher R, Crosbie B, Guo B, Sprigg N, Walker M. *How do patients spend their time in stroke rehabilitation units in England? The REVIHR study*. *Disability and Rehabilitation*. 2019. <https://doi.org/10.1080/09638288.2019.1697764>

¹¹³ McGlinchey MP, Paley L, Hoffman A, Douiri A, Rudd AG. *Physiotherapy provision to hospitalised stroke patients: Analysis from the UK Sentinel Stroke National Audit Programme*. *Eur Stroke J*. 2019 Mar;4(1):75-84.

¹¹⁴ Clarke DJ, Burton LJ, Tyson SF, Rodgers H, Drummond A, Palmer R et al. *Why do stroke survivors not receive recommended amounts of active therapy? Findings from the ReAcT study, a mixed-methods case-study evaluation in eight stroke units*. *Clinical Rehabilitation* 2018. 32(8): 1119-1132.

IN PRACTICE

Moving rehabilitation into the community

Dorset Stroke and Neuro Rehab Service

Across Dorset, a local collaboration was established to trial a pilot exercise to move stroke and neuro rehabilitation away from the acute district general site to a community hospital site in August 2020. A ten-bedded stroke and neuro rehabilitation unit was established with the aim of improving hyperacute care and ensuring rehabilitation had focused attention and facilities, with an overall aim of improving patient outcomes.

The rehab unit seeks to comply with inpatient stroke standards, with two ward rounds a week (one medical, one rehab), a weekly MDT meeting, intensive therapy with an appropriate therapy establishment, stroke education and participation in SSNAP. The unit has a dedicated social worker and orthotic hours in the team. It currently provides a 6-day therapy service (which is an increase from the 5 ½ day service previously provided which prioritised new patient assessments). The unit is overseen by a responsible/admitting consultant therapist. Medically the ward is supported by a 0.5 WTE ward doctor (GP level) and a 0.5 WTE advanced nurse practitioner (B7), Monday to Friday. The team have access to advice and support of a consultant stroke physician, stroke consultant nurse and rehabilitation medicine consultant on the acute site via telephone as required, and are able to organise transfer back to acute care easily and promptly if required.

The pilot will undergo a full evaluation after one year. Examples of benefits to-date include:

- Achieving/maintained SSNAP A scores across the inpatient pathway.
- Aligning with the discharge to assess models, allowing ongoing assessment and rehabilitation to take place in the community, once inpatient care is medically no longer required.
- Creating acute bed capacity ahead of winter and to assist in COVID-19 surges.
- Therapy intensity being delivered above national average for minutes and days given.
- Reduced social care packages on discharge and at one month post-discharge.
- Lower rate of new institutionalised care on discharge.
- Positive staff and patient feedback.
- Low rates of transfer to acute, readmission and mortality.

Discharge-to-assess (D2A) models are becoming increasingly common in stroke care, where patients are funded and supported to leave hospital, when safe and appropriate to do so, continuing their care and assessment out of hospital. This approach is often positive because it reinforces the principle that the default pathway for patients is discharge home, accepting this will not be appropriate for all stroke survivors. It also helps units manage patient flow and acute bed capacity. There are concerns that current criteria for determining when patients are fit for transfer of care, these are not sensitive to identifying patients where recovery is dependent on specialist and coordinated inpatient stroke unit care. D2A is not a rehabilitation pathway and should not be seen as substitute for community rehabilitation and Early Supported Discharge programmes. Patients who would continue to benefit from stroke unit care and who cannot safely or effectively receive equivalent rehabilitation in the community, should not follow a D2A pathway. NHS England and NHS Improvement have recently issued guidance to clarify the circumstances under which D2A is appropriate for patients with stroke.¹¹⁵

Psychological support

The importance of addressing the less well recognised psychological effects of stroke cannot be under-estimated, and we know stroke survivors are often discharged home with these 'hidden' or rather poorly recognised effects of stroke. Nine out of ten stroke survivors experience at least one cognitive effect, and fatigue is the most common sequela of stroke. There is an ever-growing body of evidence highlighting the importance of psychological provision for stroke survivors.¹¹⁶

¹¹⁵ Discharge to Assess and Stroke Care Position Statement February 2021; Position statement developed in collaboration with: SE Region Community and Rehab Peer Network, Clinical Policy Unit, Medical Directorate and Discharge to Assess Programme, Strategy Directorate, NHS England and NHS Improvement

¹¹⁶ Watkins CL, Wathan JV, Leathley MJ, Auton MF, Deans CF, Dickinson HA, Jack CI, Sutton CJ, van den Broek MD, Lightbody CE. The 12-month effects of early motivational interviewing after acute stroke: a randomized controlled trial. *Stroke*. 2011 Jul;42(7):1956-61. doi: 10.1161/STROKEAHA.110.602227. Epub 2011 Jun 23. PMID: 21700946

Cognitive impairment has been highlighted as an important target for rehabilitation. A Cochrane review in 2013¹¹⁷ found limited evidence that different interventions resulted in statistically significant improvements in executive functioning, but the DRESS trial demonstrated some potential benefits of systematic neuropsychological approaches, particularly for those patients with right hemispheric strokes.¹¹⁸ For emotional problems after stroke, a stepped psychological care approach has been recommended.¹¹⁹

Clinical guidelines recommend that all hospitals providing stroke rehabilitation should have access to a clinical psychologist as a member of the multidisciplinary rehabilitation team. Only 5% of patients with stroke in hospital are deemed to require a review by a psychologist, likely to be a direct result of limited service provision. During the pandemic, the effect on stroke survivors' mental health, exacerbating any significant or pre-existing unmet need, has been significant. Seven in ten (69%) stroke survivors have felt more anxious and depressed.¹²⁰ A lack of psychological support for stroke survivors needs to be urgently addressed. The major effect a stroke has on close family member is often overlooked and carers and carer strain needs delicate consideration and support also; some of this carer support could be delivered by trained voluntary sector staff, peer to peer support groups and improved information giving, signposting support for self-care and management.

Home-based rehabilitation to all stroke survivors who need it

Many stroke survivors do not get access to home-based stroke rehabilitation quickly enough, particularly those not requiring hospital admission e.g. managed via stroke outpatient clinics. This includes both after transfer of care from hospital but also transitioning between services in the community, with some teams describing a 16-week wait for ongoing rehabilitation following transfer of care from time-limited ESD pathways. Stroke survivors can also miss out on getting the intensity of post-acute support they need. In 2018, a Stroke Association report stated that half of stroke survivors felt they needed support more frequently or for longer.¹²¹ Whilst most stroke units can offer access to specialist community rehabilitation support, this is variable across the country (**Figure 61**), with 17 units reporting that none of their patients have access to specialist community rehabilitation support.

Figure 61: Percentage of patients with access to specialist community rehabilitation (by unit, England, 2019/20)



¹¹⁷ Chung CSY, Pollock A, Campbell T, Durward BR, Hagen S. Cognitive rehabilitation for executive dysfunction in adults with stroke or other adult non-progressive acquired brain damage. *Cochrane Database of Systematic Reviews* 2013, Issue 4. Art. No.: CD008391. DOI: 10.1002/14651858.CD008391.pub2. Accessed 23 March 2021.

¹¹⁸ Walker MF, Sunderland A, Fletcher-Smith J, Drummond A, Logan P, Edmans JA, Garvey K, Dineen RA, Ince P, Horne J, Fisher RJ, Taylor JL. The DRESS trial: a feasibility randomized controlled trial of a neuropsychological approach to dressing therapy for stroke inpatients. *Clin Rehabil.* 2012 Aug;26(8):675-85. doi: 10.1177/0269215511431089. Epub 2011 Dec 16. PMID: 22180445; PMCID: PMC3479683.

¹¹⁹ NICE Common mental health problems: identification and pathways to care, *Clinical guideline CG123*, published date: 25 May 2011

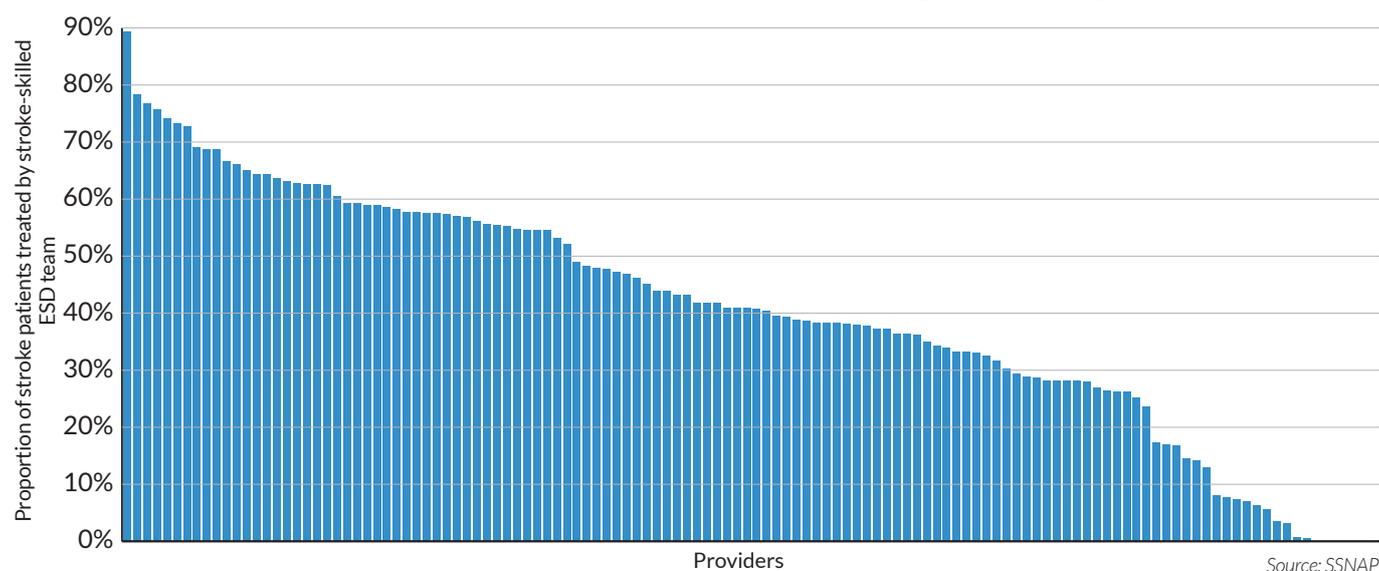
¹²⁰ Stroke Association Stroke recoveries at risk: How the COVID-19 pandemic has affected stroke survivors' lives and recoveries, September 2020. Available at: <https://www.stroke.org.uk/stroke-recoveries-at-risk-report>

¹²¹ Stroke Association Lived experience of stroke report, 2018. Available at: <https://www.stroke.org.uk/lived-experience-of-stroke-report>

Patients are being discharged from hospital quicker than ever before, with SSNAP data showing length of hospital stay reducing considerably since 2001. That are multiple possible reasons for this although increased access to Early Supported Discharge (ESD) programmes are likely to be important. ESD is a specialist essential service, which enables stroke survivors to continue their rehabilitation at home, and this should be with the same intensity and expertise as in hospital. The evidence for ESD is positive. A Cochrane review in 2017 notes that ‘appropriately resourced ESD services with co-ordinated multidisciplinary team input provided for a selected group of stroke patients can reduce long-term dependency and admission to institutional care as well as reducing the length of hospital stay’.¹²² An international ESD consensus defined the core components of an ESD service to facilitate implementation; a stroke specialist multidisciplinary team with appropriate staff/ patient ratios and coordinated MDT working.¹²³ Adoption of core components has been associated with a more responsive and intensive ESD service.¹²⁴ Consensus has also been reached on the core components of evidence-based community stroke services and how these would complement delivery of ESD.¹²⁵

NICE recommends that adults who have had a stroke are offered ESD if the core multidisciplinary stroke team assess that it is suitable for them. ESD is not suitable for all adults that have had a stroke or in all circumstances.¹²⁶ ESD is thought to be appropriate for around 40% of the stroke population but data shows wide variation in patients being able to access ESD (Figure 62).

Figure 62: Share of patients with stroke treated by an Early Supported Discharge Team (%) (England, July-Sept 2019)



The evidence suggests that ESD is only beneficial if it is properly planned and coordinated. The Cochrane review finds that the benefits of ESD are ‘inconclusive for services without coordinated multidisciplinary team input. We observed no adverse impact on the mood or subjective health status of patients or carers, nor on readmission to hospital’.

¹²² Langhorne P, Baylan S. Early supported discharge services for people with acute stroke. *Cochrane Database of Systematic Reviews* 2017, Issue 7. Art. No.: CD000443. DOI: 10.1002/14651858.CD000443.pub4.

¹²³ Fisher RJ, Gaynor C, Kerr M, Langhorne P, Anderson C, Bautz-Holter E, Indredavik B, Mayo N, Power M, Rodgers H, Morten Rønning O, Widén Holmqvist L, Wolfe C, Walker M. A Consensus on Stroke Early Supported Discharge. *Stroke*. 2011; 42:1392-1397

¹²⁴ Fisher R, Byrne A, Chouliara N, Lewis S, Paley L, Hoffman A, Rudd A, Robinson T, Langhorne P, Walker M. Effectiveness of Stroke Early Supported Discharge: Analysis from a National Stroke Registry. *Circulation: Cardiovascular Quality and Outcomes*. 2020;13:e006395. DOI: 10.1161/CIRCOUTCOMES.119.00639

¹²⁵ Fisher RJ, Walker MF, Golton I, Jenkinson D. The implementation of evidence based rehabilitation services for stroke survivors living in the community. *The results of a Delphi consensus process. Clinical Rehabilitation* 2013. 27(8): 741-749

¹²⁶ NICE Stroke in Adults Quality standard [QS2] Published date: 29 June 2010 Last updated: 12 April 2016

A Stroke Association report highlights that whilst over a third of stroke survivors are discharged to an ESD or community rehabilitation team:¹²⁷

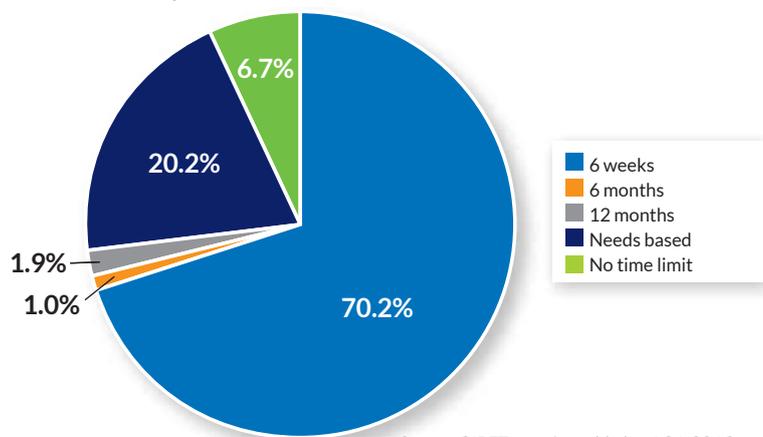
- 2 out of 10 hospitals in England, Wales and Northern Ireland do not offer ESD services.
- Only approximately half of the stroke survivors in England, Wales, and Northern Ireland are discharged from hospital having been assessed for all appropriate therapies and with agreed goals for their rehabilitation.

Many ESD teams also have a six-week limit in service – our data suggests that over 70% of stroke survivors receiving ESD have a time limit on service provision (**Figure 63**). This means stroke survivors who need additional rehabilitation must wait to access further community rehabilitation services when ESD provision ends. Also, many ESD teams do not have seven-day provision for therapy, which is essential if transfers of care are to be delivered appropriately throughout the week from the acute bed-based setting.

View from our visits:

Only 27% of units reported providing a seven-day Early Supported Discharge service.

Figure 63: For the ESD service that the majority of your patients access, what duration of time are the team commissioned for?



Source: GIRFT question added to AOA 2019

Note: question was asked of units that said they had access to an ESD team

Insight from GIRFT's data

Our data suggests that 70% of ESD services are time limited to weeks. AOA suggests suggests 20% of ESD services describe themselves as 'needs based'. Interestingly, 41% of services on our visits described their service as needs-based.

Many stroke teams that we met commented that the commissioning framework for rehabilitation services were inconsistent and difficult to negotiate and adapt. Rehabilitation relies on multidisciplinary teams from a range of organisations (including third sector) coming together. Standard NHS models of commissioning (such as individual contracts, negotiated on an annual basis, often late in the contracting cycle) do not support the planning and coordination required to provide an effective and stable rehabilitation pathway. In addition, it was often difficult for teams to quantify their community-based workforce involved in the delivery of stroke care, as this was often across several organisations. Many services had carried out gap analyses to understand current staffing against what would be required to deliver needs-based models of care, but this was often not a straightforward process. We observed from our visits that other models, such as lead provider models and integration with community neurorehabilitation teams, may be more effective in delivery of integrated pathways.

Our overall assessment is that whilst ESD programmes show some benefit to a subset of patients with stroke with a specific set of needs, more generally the services available to stroke survivors are inadequate and variable in quality and coverage. ESD often meets a need for support immediately after discharge, but over time needs change and rehabilitation support falls away. Our recommendation, explored in more depth below, is that there must be a great focus on flexible, needs-based pathways that are tailored to individual circumstances and needs to support stroke recovery and are not time-limited. Stroke rehabilitation should be accessible to all who may benefit, including nursing home residents and those with severe disabling stroke cared for in their own homes.

Moving from hospital to home based

In order to make the transfer between hospital and the community, whether this is home or to a temporary or permanent 24-hour care facility, smooth and successful for the stroke survivor and their carers, thorough communication between teams and professionals is vital. Teams that reported close working with their social care colleagues, often with a specific named stroke social worker who worked as part of the MDT team, had the smoothest transfer of care pathways with reductions in delayed discharges. The development of 'Trusted Assessor' roles to reduce duplication of needs assessments and documentation were also highly commended. Several ESD teams had domiciliary care capacity within their ESD teams, so that at the point a stroke survivor was ready for transfer of care, but was still requiring one to two carers, there was no delay in getting transfer.

A description of the rehabilitation needs (rehabilitation prescription) may be beneficial in this instance, to include a full assessment of needs, a comprehensive record of the patients' clinical condition, ongoing symptoms, psychosocial background, risks and treatments to date – the gold standard of which will have been contributed to by a holistic multidisciplinary team. It will also include a statement of their ongoing needs and recommendation for rehabilitation, with enough detail to be useful and inform planning and delivery of care. The evidence of improved success in transfer from a hospital to community setting using a rehabilitation prescription is strong, particularly highlighted by the British Society of Rehabilitation Medicine (BSRM) in their acute care pathway standards for specialist rehabilitation.¹²⁸

Ideal service model

The National Stroke Service Model (NSSM) for ISDNs sets out clear proposals for an Integrated Community Stroke Service (ICSS) to support rehabilitation. The model calls for ESD to coordinate early transfer of care and intensive stroke rehabilitation as part of an ICSS model integrated with community stroke/neuro rehabilitation and life after stroke support. This is, in fact, already being delivered in some parts of the country.

The intention is the ICSS will ensure patients with stroke are seamlessly seen in a timely way by a single multidisciplinary team, regardless of their disability or destination, and will ensure parity of provision for physical and psychological rehabilitation and goals.¹²⁹

Figure 64 provides an overview of the ICSS model. There is a particular emphasis on shaping rehabilitation to meet personalised goals for at least six months—with support thereafter as required in line with clinical judgement. There are three pathways to support rehabilitation:

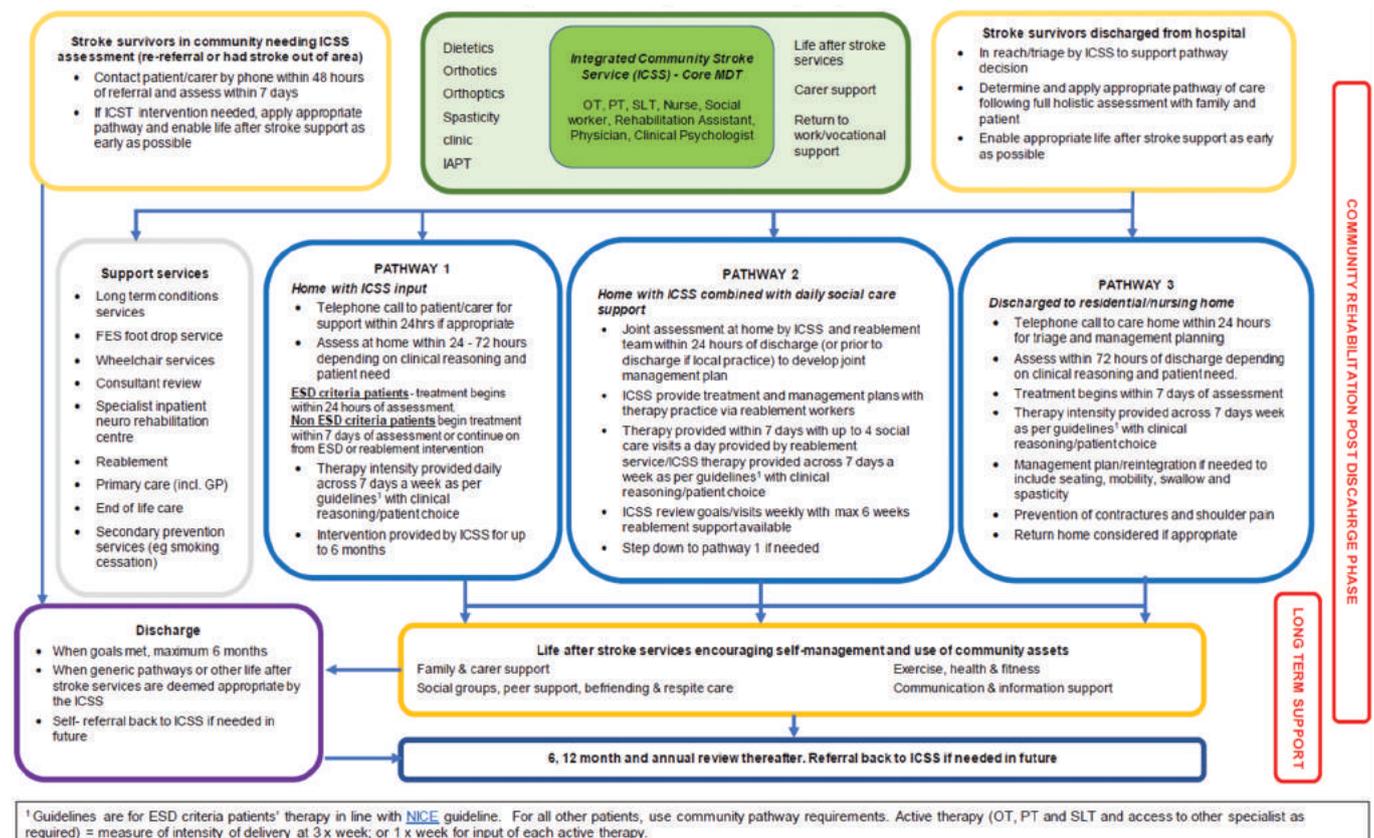
- **Pathway 1:** Home with ICSS input. These are patients able to manage activities of daily living, independently or with a carer, and includes both ESD and non-ESD patients.
- **Pathway 2:** Home with ICSS combined with daily social care support. Patients discharged home with social care support (such as a re-enablement service) combined with ICSS to enable safe management and rehabilitation at home. A joint rehabilitation management plan with social care should be put in place following the initial assessment at home within 24 hours of discharge.

¹²⁸ See <https://www.bsrn.org.uk/publications/publications> for further detail

¹²⁹ Latest draft is available on the Stroke Community Network on the FutureNHS collaboration platform (<https://future.nhs.uk/strokecommunity/group/home>) and is due for final publication in September 2021

- **Pathway 3:** Discharged to a residential/nursing home. All people with stroke discharged to a care home should receive an assessment and treatment from stroke rehabilitation services in the same way as patients living in their own home. Care home staff should have training on the physical, psychological and social effects of stroke and optimum management of common impairments/disabilities.

Figure 64: The Integrated Community Stroke Service model



There may be a small number of patients who are transferred to other care facilities (such as intermediate or transitional care) with support from the ICSS. Some patients will need access to specialist neurorehabilitation units, e.g. patients with long term tracheostomies, locked in syndrome, and Prolonged Disorders of Consciousness (PDOC) secondary to stroke.¹³⁰ The BSRM guidance supports models of specialist rehabilitation, defined as:

“...the total active care of patients with complex disabilities by a multi-professional team who have undergone recognised specialist training in rehabilitation, led /supported by a consultant trained and accredited in rehabilitation medicine.”

The evidence suggests that despite their longer length of stay, the cost of providing early specialist rehabilitation for patients with complex needs is rapidly offset by longer-term savings in the cost of community care, making this a highly cost-efficient intervention.¹³¹ It was clear from discussions with clinical teams across the country that access to these types of beds was variable, almost always delayed and lacking in clear quality assurance as most units do not enter into the SSNAP data set, but instead into UK Rehabilitation Outcomes Collaborative (UKROC). This is a collaborative set up by the National Institute for Health Research to develop a national database for collating case episodes for complex inpatient rehabilitation.

Closer working between the commissioned pathways of stroke rehabilitation and ‘specialist neurorehabilitation’ would be highly beneficial to stroke survivors, their families and rehabilitation teams.

¹³⁰ In line with existing guidance, e.g. Royal College of Physicians Prolonged disorders of consciousness following sudden onset brain injury: national clinical guidelines, March 2020; Royal College of Physicians and British Medical Association, Clinically-assisted nutrition and hydration (CANH) and adults who lack the capacity to consent: Guidance for decision-making in England and Wales, September 2020

¹³¹ British Society of Rehabilitation Medicine. Rehabilitation for patients in the acute care pathway following severe disabling illness or injury: BSRM core standard for specialist rehabilitation. October 2014 [online] [https://www.bsrm.org.uk/downloads/specialist-rehabilitation-prescription-for-acute-care-28-11-2014-ja--\(ap1-redrawn\).pdf](https://www.bsrm.org.uk/downloads/specialist-rehabilitation-prescription-for-acute-care-28-11-2014-ja--(ap1-redrawn).pdf)

IN PRACTICE

Transforming community neuro rehabilitation services in Greater Manchester

Greater Manchester Integrated Stroke Delivery Network

Over the past four years, the Greater Manchester Integrated Stroke Delivery Network has led the transformation of community stroke rehabilitation across its 11 localities to eliminate the 'postcode lottery' of post-acute care. This work has been conducted in conjunction with its sister network in neuro rehabilitation as many community teams also treat other neurological conditions.

Together, the networks scoped existing services and collaboratively developed models and service specifications for their respective pathways that aimed to be as similar as possible, and so could be run within a single service if desired, but also reflected the differing requirements of the patient cohorts. The integrated model is now the basis for the national model for community stroke as it ensures all patients discharged from a stroke unit, regardless of their level of need, are treated by a specialist, multidisciplinary team for up to six months, with community and re-referral also possible.

Once the stroke and neuro rehabilitation specifications were agreed at a system level, the networks worked with commissioners, providers and the voluntary sector in each locality to develop business cases and/or plans for implementation. The level of transformation required varied across the 11 areas, with two localities having to fully fund and establish new teams, with others merging/disaggregating existing teams or making minor changes to existing pathways of care. In most cases, additional investment was secured, mostly to recruit additional staff into the NHS community and voluntary sector teams for the area.

The network felt that the Sentinel Stroke National Audit Programme does not collect sufficient data to demonstrate the impact of community stroke care. The network collaboratively instigated additional data collection to better understand their performance and to allow measurement of the impacts of transformation. This information was presented in a dashboard and detailed report that was shared with the teams themselves, commissioners and at a system level to help drive change. Enhanced data collection was also piloted and rolled out in most teams undertaking six-month reviews in the region to better understand the longer-term impacts of stroke care and residual unmet need.

Some key lessons are:

- Win hearts and minds – use patient stories and examples as well as data and heavily involve the voluntary sector planning.
- Strong and credible local clinical leadership is needed to drive the process – it needs to be an AHP and someone with experience of transformation operationally.
- Data drives change.
- Make stroke a priority.
- Work with neuro rehabilitation to offer commissioners share-efficiencies and cost-neutral improvements to pathways.

The National Stroke Service Model is explicit about the breadth of multidisciplinary professionals and services required to support comprehensive rehabilitation – whichever pathway a stroke survivor follows. This includes e.g. dietetics, orthoptists, orthotics and spasticity services, and the NSSM emphasises other services that support stroke survivors' recovery. For example, the model requires that vocational rehabilitation (supporting survivors to return to activity, work and employment) is routinely available and offered as a tiered service around three levels of care:

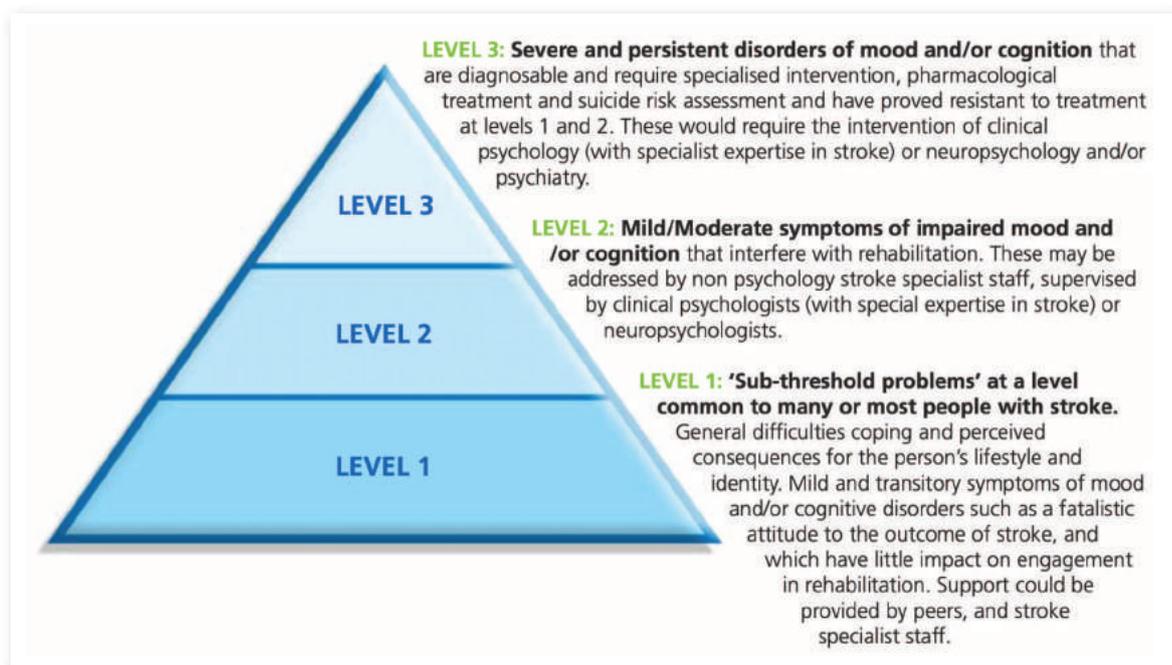
- Level 3 – advice and signposting on return to work (available to all)
- Level 2 – return to work service (for all stroke survivors that had a job prior to their stroke and wish to return to work)
- Level 1 – specialist vocational rehabilitation (for any stroke survivor with a disability that is preventing return to work or has a return-to-work plan that will take longer than six months to implement)

The NSSM also notes that psychological and neuropsychological rehabilitation must be routinely available as part of core service provision throughout the patient journey. Key principles include:¹³²

- Seeking and acting on the views of patients with stroke and their families about their psychological care.
- Giving psychological care the same emphasis as physical care and rehabilitation.
- Ensuring that the whole multidisciplinary team can identify psychological issues and know how to manage these issues (even if their role is to recognise problems and refer on to others).
- Making addressing psychological needs an essential part of the culture of stroke services.
- Giving regular training to multidisciplinary stroke staff so that there is a better understanding of psychological issues and needs.

The full multidisciplinary team must be trained and regularly address the burden of psychological, emotional, cognitive and neuropsychological effects commonly experienced by stroke survivors. These can greatly impact rehabilitation engagement, function, return to work and ultimately quality of life. A stepped approach to psychological care is recommended, endorsed by NICE, for people suffering from depression and anxiety disorders. This offers patients a hierarchical approach to intervention for psychological conditions, starting with simpler interventions initially and moving more complex interventions as required (**Figure 65**).

Figure 65: Stepped care model for psychological care after stroke



Source: NHS Improvement - Stroke Psychological care after stroke Improving stroke services for people with cognitive and mood disorders

Stroke survivors often suffer with spasticity during their recovery, which occurs when a stroke has damaged the nerve cells controlling muscle activity in the brain and spinal cord.

Insight from GIRFT's data

Over 75% of units report having access to spasticity services.

¹³² NHS Improvement - Stroke Psychological care after stroke Improving stroke services for people with cognitive and mood disorders

This can lead to involuntary muscle contraction, restrict range of movement and mobility and over the long-term result in abnormal posture. Evidence suggests interventions to manage spasticity are value for money, with one study suggesting a net return of £4 in health system benefits over a five-year period for every £1 spent.¹³³ Although three quarters of stroke services said they had access to spasticity services, from our visits, these appeared to be variable in their delivery and accessibility.

Technology-assisted rehabilitation

There is some evidence as to the applicability and effectiveness of virtual tele-rehabilitation from a recent Cochrane review.¹³⁴ This systematic review analysed 22 studies involving 1,937 people with stroke. They found a wide range of treatments, including therapy to improve arm function and walking ability, counselling and support for people upon leaving hospital after stroke undertaken virtually. They concluded similar outcomes for ADLs to those that received face-to-face therapy and those that received no therapy but that the evidence was of low or moderate quality with little evidence on acceptability and feasibility of telehealth interventions. At the time of our visits, we saw very little evidence of virtual tele-rehabilitation being used.

The COVID-19 pandemic has seen many teams use tele-rehabilitation as an alternative method to provide home-based stroke rehabilitation. Synchronous tele-rehabilitation uses videoconferencing facilities so the therapist and stroke survivor can communicate in real time, while asynchronous tele-rehabilitation uses computer-based interventions to remotely monitor and adapt exercises. Although there is low- or moderate-level evidence relating to whether tele-rehabilitation is a more or similarly effective way to provide rehabilitation, this approach offers exciting opportunities for innovation. Tele-rehabilitation can be used to promote self-management exercises and practice between scheduled rehabilitation sessions with therapists, providing opportunities for efficient delivery of intensive or high-dose rehabilitation and also inclusion of carers where possible and appropriate. Such techniques have been used successfully during the COVID-19 pandemic.¹³⁵

IN PRACTICE

Using virtual technology to support rehabilitation

Northampton Community Stroke Team

Despite the COVID-19 pandemic, Northampton Community Stroke Team have been able to continue providing meaningful rehabilitation after hospital discharge through the use of virtual technology. In attempts to reduce the spread of COVID-19, Northampton Community Stroke Team reduced their face-to-face contact with patients unless there was a risk of readmission. Telephone appointments were initially used; however, rehabilitation over the telephone was difficult to perform, with staff finding it challenging to form a therapeutic connection and patients feeling the therapy given was not meaningful. Consequently, the virtual platform Attend Anywhere was implemented with great success.

Training was provided using trust resources and help guides, and a staff user guide was later created by the team for setting up and completing sessions. The platform allowed therapists to send activity plans in advance and gain rapport through video calling. This opened new ways of working while still limiting the exposure for both patient and community therapist. Rehabilitation, such as upper limb or balance therapy, and movement analysis could be completed remotely, leading to greater satisfaction for both patients and staff. Patients were more empowered to take responsibility for their own rehabilitation, and activity plans could be more focused to the patients' needs due to the visual feedback. Attend Anywhere enabled the Northampton Community Stroke Team therapists to undertake successful rehabilitation while limiting exposure. Patient: 'I was glad to still receive great input whilst staying safe'.

¹³³ Health Economic Analysis of a Co-ordinated Delivery Network for Post-Stroke Spasticity Care, Kent Surrey and Sussex Academic Health Science Network, December 2019

¹³⁴ Laver KE, Adey-Wakeling Z, Crotty M, Lannin NA, George S, Sherrington C. Telerehabilitation services for stroke. *Cochrane Database Syst Rev.* 2020 Jan 31;1(1):CD010255. doi: 10.1002/14651858.CD010255.pub3. PMID: 32002991; PMCID: PMC6992923; <https://www.oxfordahsn.org/wp-content/uploads/2020/07/Restoration-and-recovery-of-stroke-services-during-the-COVID-19-pandemic-July-2020-1.pdf>

¹³⁵ <https://www.bridgesselfmanagement.org.uk/covid-19-resources/>

IN PRACTICE

Remote rehabilitation

South Yorkshire and Bassetlaw Integrated Care System

The South Yorkshire and Bassetlaw Integrated Care System's hosted network were aware that work around remote rehabilitation was taking place across the region. There was a desire to share new practice and also encourage others to 'be brave' and work differently. However, this required the network team to work in a different way and host a webinar, something in which they had not had experience. By working as a team and involving people from across the region and wider organisations, the team was able to arrange and deliver the webinar in just five days.

In total, 125 people from across the country took part in the webinar and, despite a few technical hitches, it was very well received. They are now planning a second webinar and plan to host further sessions to continue engaging with and developing the stroke workforce. The pandemic provided the impetus for the delivery of training on a virtual platform, something that the team had previously not considered. Delivering the training in this way was cost effective (no catering, venue or travel expense costs), as well as being more accessible to busy clinicians, staff on lower bandings and those outside the NHS.

Some therapies (e.g. speech and language therapy and psychology) have been more easily delivered virtually than others (e.g. physiotherapy and occupational therapy). It is important for teams to actively gain patient feedback on the use of tele-rehabilitation to help inform future developments.

Teams need to be mindful of sociodemographic issues influencing provision of tele-rehabilitation, balancing the success of working with more digitally equipped or able patients with the time needed to overcome challenges of making remote video contact with others. Face-to-face visits (with PPE) need to be provided if tele-rehabilitation is deemed unsuitable.

We recommend that providers and systems do not automatically return to purely face to face rehabilitation model once the absolute need for remote working recedes post-COVID, but consider a blended approach that draws on the benefits and efficiencies of tele-rehabilitation, tailored to individual patient needs.

There has been considerable interest and success with 'technology assisted rehabilitation' or 'robotic rehabilitation'. This is one of the potential solutions to augment hands-on therapy sessions which patients currently access. These treatments are now available outside of clinical trials and although we found limited examples of their use upon our visits, there is evidence to support their role in stroke rehabilitation.¹³⁶ We would encourage collaboration between stroke rehabilitation teams and the wider rehabilitation research fraternity to ensure stroke survivors and their teams have access to the benefits that these technological advancements offer.

Life after stroke

Care and support should be available for as long as the stroke survivor requires and should ideally be patient-led and based on need. There should be adequate signposting to information resources, support for self-care and management e.g. medication reviews and informal peer-peer support, as well as commissioned services that are essential post-discharge from formal rehabilitation pathways. Many teams reported no commissioned voluntary sector life after stroke services and stroke survivors highlight this as a poorly resourced and delivered part of the pathway.

The transition from rehabilitation pathways into ongoing 'life after stroke' care is often disjointed, and at times non-existent. Much has been written about the many elements of this journey.¹³⁷ It is complex, depending on the needs of stroke survivors, potential rehabilitation destinations, deciding when to transfer and ensuring individuals are supported after transfer. The potential discharge destinations from a stroke survivor's perspective are much more defined than for other conditions, so making sure the patient and carers are involved in the decision-making process and know what is going to happen is key.

¹³⁶ Mehrholz J, Thomas S, Kugler J, Pohl M, Elsner B. Electromechanical-assisted training for walking after stroke. *Cochrane Database of Systematic Reviews* 2020, Issue 10. Art. No.: CD006185. DOI: 10.1002/14651858.CD006185.pub5. Accessed 01 April 2021

¹³⁷ See, for example, www.rehabilitationmatters.com

The Stroke Association highlights challenges that stroke survivors often face. Opportunities to assess needs are missed and services are difficult to access within current commissioned life after stroke pathways. Their research shows that:¹³⁸

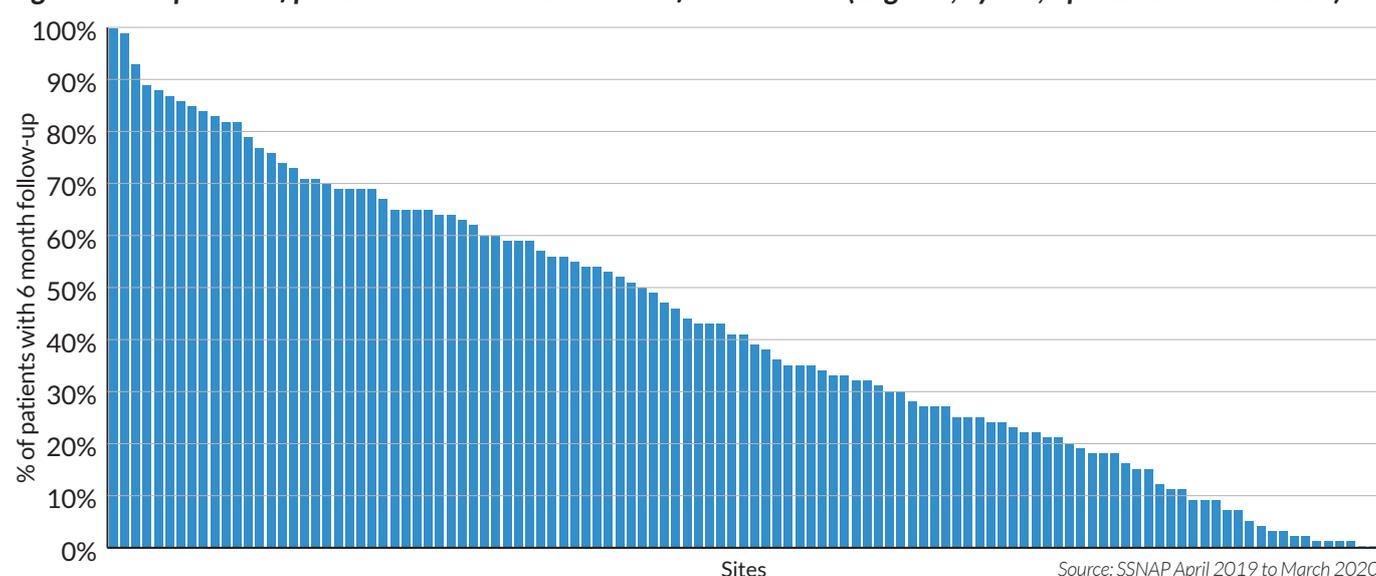
- In England, Wales and Northern Ireland, only 3 out of 10 stroke survivors who need a six-month assessment receive one.
- 1 in 5 stroke survivors in England Wales and Northern Ireland ask for psychological support at their six-month review. However, stroke survivors wait an average of 10 weeks after referral to receive psychological treatment.
- Only 15% of post-acute services in England, Wales and Northern Ireland have the resources to help people return to work after their stroke.
- 1 in 3 areas in England, Wales and Northern Ireland do not provide support to the carers and families of stroke survivors.
- 1 in 5 commissioning areas in England, Wales and Northern Ireland do not offer access to speech and language therapy for stroke survivors.

The COVID-19 pandemic has accentuated the level of abandonment and isolation that many stroke survivors have experienced. This was evidenced in the the Stroke Association paper 'Stroke recoveries at risk'.¹³⁹ This research was based on a survey of 2,000 stroke survivors and it found that seven in ten stroke survivors had felt more anxious lately and 72% of those caring for someone who had a stroke in 2020 felt overwhelmed and unable to cope.

Follow up

Stroke Association data suggests that patients with stroke are often not routinely followed up so that their needs can be re-assessed, and support tailored accordingly. The national clinical guideline recommends that all patients with stroke should be reviewed at six weeks and six months post-stroke. These reviews are an opportunity to highlight ongoing concerns and tailor rehabilitation and life after stroke support based upon individual needs and preferences. These reviews are also an opportunity to emphasise the importance of self-management. Evidence from SSNAP suggests that this is not consistently happening (see **Figure 66**) – nationally under 30% of patients with stroke are recorded as having a six-month review of their stroke care. On our visits, we noted that there is often a lack of adequate recording of the reviews in the SSNAP web tool with varying accountability and ownership for completing these reviews. We were often told ‘acute teams regard it as the responsibility of community teams, community teams think it’s the responsibility of primary care and stroke survivors get “lost” to follow-up’.

Figure 66: Proportion of patients assessed at six months after admission (England, by site, April 2019-March 2020)



¹³⁸ <https://www.stroke.org.uk/what-is-stroke/stroke-statistics>

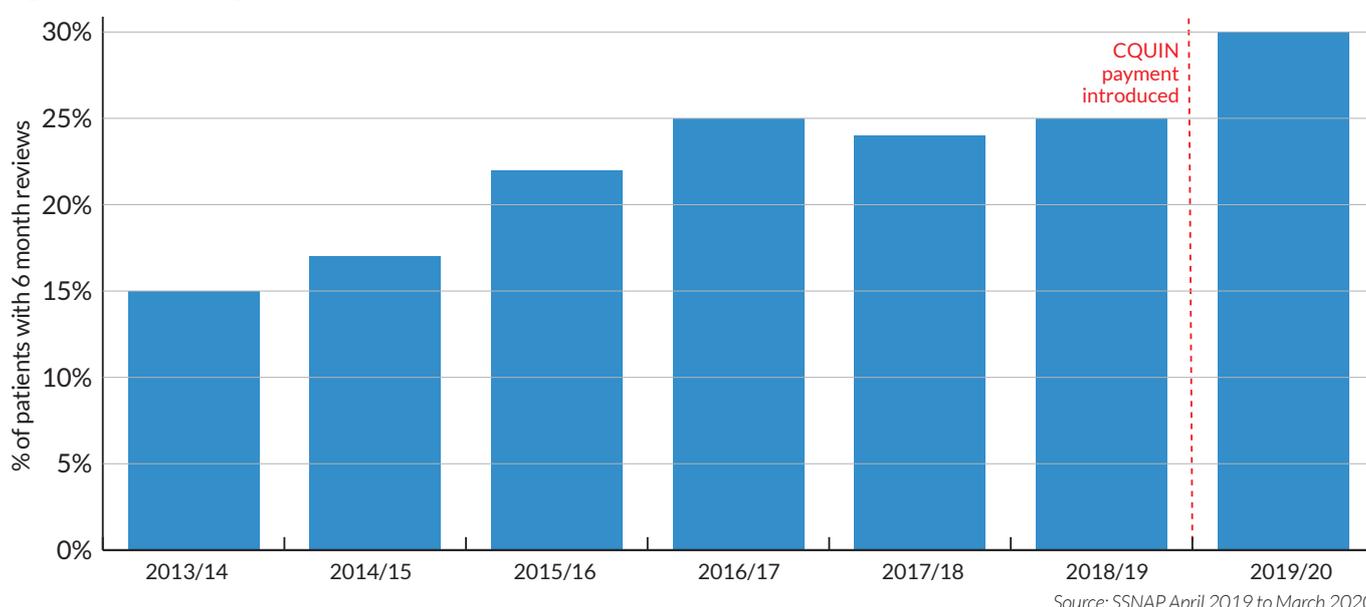
¹³⁹ <https://www.stroke.org.uk/stroke-recoveries-at-risk-report>

In 2019/20, a CQUIN payment¹⁴⁰ was made available to community service providers of stroke rehabilitation to incentivise the offer of a personalised review to patients that should be undertaken approximately six months post-stroke. **Figure 67** shows the trend in the overall proportion of patients with stroke recorded as having a six-month review – it has increased in the latest year having stalled, but overall rates are still far too low.

Insight from GIRFT's data

Based on our survey data, 43% of units report completing six-month reviews on all patients and 43% complete them with some patients – far higher than is being recorded in SSNAP.

Figure 67: Percentage of patients with stroke with a six-month review – time trend (incl. Wales and N. Ireland)



We also found great variation from our visits in who undertakes the six-month review. There has been clear commissioning guidance as to the standards required from such a review,¹⁴¹ with evidence to support particular templates to complete the review.¹⁴² From our visits we found there are still six-month reviews being undertaken by medical stroke doctors and this is confirmed in the data we collected (**Figure 68**). We recommend that these reviews as completed by community-based stroke specialist teams e.g. specialist nurses, trained voluntary sector staff. They should use standardised pro formas to support a holistic, needs based review, such as the Greater Manchester Stroke Assessment Tool (GM-SAT).¹⁴³

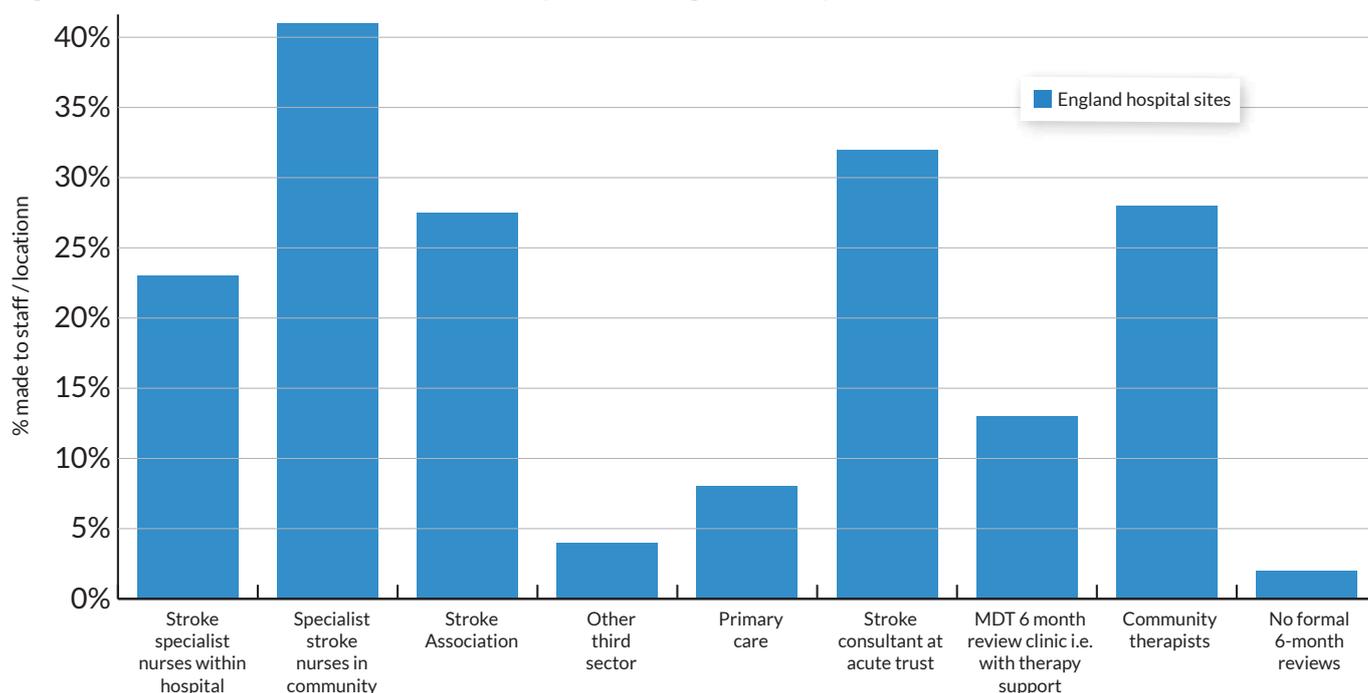
¹⁴⁰ The Commissioning for Quality and Innovation (CQUIN) framework provides additional financial incentives for services to meet specific quality improvement goals

¹⁴¹ <https://www.england.nhs.uk/south/wp-content/uploads/sites/6/2017/07/cvd-scn-stroke-6-month-reviews-commissioning-information-pack.pdf> (last accessed 7th December 2020)

¹⁴² Patchwood E, Woodward-Nutt K, Rothwell K, Perry C, Tyrrell P, Bowen A. Six-month reviews for stroke survivors: a study of the modified Greater Manchester Stroke Assessment Tool with care home residents. *Clinical Rehabilitation*, 2020;34(5):677-687. doi:10.1177/0269215520912515

¹⁴³ <https://www.england.nhs.uk/south/wp-content/uploads/sites/6/2017/07/gm-sat-algorithms.pdf>

Figure 68: Who carries out six-month reviews post-discharge from hospital?



Note: percentages do not sum to 100% as units were able to select more than one option to reflect common local practices. Question was asked of the 90% of units reporting they always or sometimes do six-month reviews.

Source: SSNAP April 2019 to March 2020

At our visits we met with many stroke survivors and noted a common theme for their attendance at our events – a desire to improve stroke services and an eagerness to inform clinical staff of the absolute benefit of a comprehensive enquiry as to their specific needs, treating them as individuals. We found that the exploration of a stroke survivor's own subjective needs were inconsistently undertaken. Goals were frequently health professional centred and not patient centric. Ensuring that stroke survivors understand their diagnosis, the effect it has had upon them and empowering them to articulate their needs and wishes is critical if we are to truly put the patients' wishes first. There is evidence to suggest that empowering patients to self-monitor may improve stroke survivors' self-efficacy, outcome expectation, and satisfaction with performance of self-management behaviours.¹⁴⁴

Self-management is an important part of stroke recovery. For example, the Bridges Self-Management Programme¹⁴⁵ enables healthcare professionals to help patients affected by stroke and brain injury to self-manage their condition. They work with therapists, nurses, healthcare assistants and psychologists to put the ideas and experiences of patients and their families central to their own care—making patients more independent, and less reliant on clinical teams. Collaborating from the first and every care interaction creates efficiencies within the healthcare teams and widens access to patients to self-management.

Exercise is also shown to reduce disability, improve mood, improve quality of life and reduce falls.¹⁴⁶ Whilst exercise may feel inaccessible to many stroke survivors, there are opportunities to tailor programmes to fit individual capabilities.¹⁴⁷ Every stroke survivor should be given the opportunity to benefit from the range of rehabilitation interventions, tailored to their specific goals and made accessible.

We witnessed some services offering a 'stroke passport' to stroke survivors. This detailed their diagnosis, what interventions have been undertaken, where they may go for help and most importantly what their goals were. The Stroke Association



¹⁴⁴ Lo S, Chang A and Chau J Stroke Self-Management Support Improves Survivors' Self-Efficacy and Outcome Expectation of Self-Management Behaviors, *Stroke*, Vol. 49, Issue 3, March 2018, pp. 758-60

¹⁴⁵ <https://www.bridgeselfmanagement.org.uk/> accessed February 2021

¹⁴⁶ Saunders DH, Sanderson M, Hayes S, Johnson L, Kramer S, Carter DD, Jarvis H, Brazzelli M, Mead GE. Physical fitness training for stroke patients. *Cochrane Database of Systematic Reviews* 2020, Issue 3. Art. No.: CD003316. DOI: 10.1002/14651858.CD003316.pub7. Accessed 10 February 2021

¹⁴⁷ As an example, the Stroke Associations Getting active after a stroke guide outlines many ways stroke survivors can engage in exercise that fits their individual circumstances

promotes a stroke recovery passport idea which attempts to provide a generic template for survivors to complete.¹⁴⁸ We recommend that all services ensure patients have access to a patient-held document containing personal stroke information - this is different to the medical discharge letter. We are working with the Stroke Association, NHSX and the NHS England Personalised Care team to understand how this approach can be supported and standardised.

Some services we met offer all stroke survivors a telephone call within the first few weeks post-transfer from the acute provider to assess their recovery but primarily to act as a support tool. The Stroke Association has worked with NHS England to adapt its services (Stroke Association Connect) during the COVID-19 pandemic to provide telephone support and signposting in the very early days post-discharge. GIRFT supports this response and hopes that teams will appreciate this valuable resource for patients and either adapt their own services to meet this need or collaborate with the Stroke Association to ensure that all patients have this offer of support.

IN PRACTICE

Stroke Association 'Connect'

Stroke Association Connect service provides support to people discharged from hospital following stroke, offering reassurance, information and access to ongoing forms of support in areas where the Stroke Association is not already commissioned to provide stroke support services. The aim is to ensure all stroke survivors receive some support to rebuild their lives in the context of COVID-19. The new service underwent an initial rapid test phase in four areas of the country and is now rolling out across England for NHS trusts with no existing stroke recovery or equivalent service.

Stroke Association Connect is accessed via referral by discharging NHS teams. Patients referred to the service will receive a contact shortly after discharge – by phone or videoconferencing app, such as WhatsApp or Facetime – to answer any initial questions they may have and provide information on support services they can call upon. A follow-up contact call a few weeks later will allow them to ask any new questions and address any issues that have developed since the previous call. More information on this new service, which will run for six months initially, is available at www.stroke.org.uk/connect.

Resources

- **Stroke Helpline:** telephone (0303 3033 100) or email (helpline@stroke.org.uk) access for anyone who needs support
- **My Stroke Guide:** online information and support tool, where people can connect with others using forums and access practical tools and information to manage the effects of stroke (www.stroke.org.uk/finding-support/my-stroke-guide)
- **Here for You:** volunteer delivered support for people following stroke (www.stroke.org.uk/webform/volunteer-telephone-support-people-affected-stroke)
- **Video calling for people with aphasia:** accessible guides to support people in setting up video calling, which were developed for people with aphasia but are useful for anyone who is not confident using technology (www.stroke.org.uk/what-aphasia/communication-tools/video-calling-people-aphasia)
- **Life After Stroke grants:** a means-tested grant of up to £300 to support someone in their recovery after stroke (www.stroke.org.uk/finding-support/life-after-stroke-grants)

¹⁴⁸ https://www.stroke.org.uk/sites/default/files/4.stroke_recovery_passport_final_161215.pdf (last accessed 7th December 2020)

Monitoring quality improvement

In line with a move over the last decade by the NHS to develop community-based healthcare, now prioritised in the NHS Long Term Plan, audit programmes such as SSNAP are now expanding to address post-acute care pathways. There has been a repeat of the 2015 SSNAP Post-Acute Organisational Audit in April 2021, which will assess delivery of community rehabilitation and life after stroke care and quality indicators at an organisational level.

NHS England rehabilitation pilots starting in 2021 will assess the impact of higher intensity, seven-day integrated community stroke services and will also test new rehabilitation patient level data collection prior to inclusion in the SSNAP clinical audit. This will provide meaningful data with which to understand how different models of rehabilitation delivery relate to patient outcomes, both qualitative and quantitative, which can be used to drive evidence-based service improvements.^{27, 28} In addition, from April 2021 there will be a validated PROMs question within SSNAP in the form of the EuroQol EQ5D questionnaire collected at six months to allow ISDNs to have aggregated reporting on disability and functional outcomes over time.

With these foundations in place, newly formed Integrated Stroke Delivery Networks (ISDNs) will have the responsibility of robustly assessing their rehabilitation services against evidence-based standards, and work collaboratively with NHS England & NHS Improvement and SSNAP on how the barriers to the best care can be overcome in their area.

Actions and progress made during GIRFT's stroke programme

During GIRFT's stroke programme, the following actions have been completed or are in progress:

- Focused pilots are underway so that we have a more detailed understanding of the impact of comprehensive commissioned rehabilitation models in terms of clinical outcomes, deliverability, workforce requirements, delivery models and the use of generic rehabilitation assistants and non-registered support staff. As ISDNs review and re-commission local rehabilitation models, they will be able to take account of the learnings from these pilots.

Recommendations to support rehabilitation and life after stroke services

Recommendation	Actions	Owners	Timescale
22. Ensure daily MDT patient goal setting (including social care support to facilitate discharge planning). Stroke survivors and those that support them must be involved in goal-setting and discharge planning discussions.	a Ensure all stroke services have structured daily MDT board rounds.	Provider organisations	Within six months of publication
	b Consider domiciliary care as part of early supported discharge (ESD) and integrated community stroke services.	Provider organisations	Within 12 months of publication
	c Consider virtual MDTs between acute, community and social care teams to support discharge planning and ongoing support.	Provider organisations	Within 12 months of publication
23. All ISDNs should ensure commissioning of a needs-based 7-day accessible Integrated Community Stroke Service, appropriately staffed with stroke specialist practitioners. This ICSS should incorporate traditional elements of early supported discharge (ESD) with more generic community-based rehabilitation for the latter stages of the stroke recovery journey. Stroke rehabilitation should be accessible to all that may benefit, this should include nursing home residents and those with severe disabling stroke cared for in their own homes.	a Discuss with commissioners, as a matter of urgency, the establishment of needs-based 7-day access to early supported discharge and community stroke rehabilitation teams, where services do not already have this in place. Use the NHSE&I National Stroke Service Model (NSSM) and ICS level commissioning to ensure equitable delivery of services for stroke survivors. Commissioners should be encouraged to agree equitable provision and ensure this activity is documented within the SSNAP national audit tool as a prerequisite for funding.	Commissioners with support from ISDNs	Within two years of publication
	b Review payment and funding mechanisms for community pathways (e.g. home bed day calculations, tariff redesign and cost based principle models).	NHSE&I National Stroke Programme	Within 12 months of publication
	c Review current neuro-rehabilitation commissioning within each ISDN footprint to attempt to understand where there may be opportunities to co-commission these pathways.	ISDNs working with local and specialised commissioners	Within 12 months of publication
	d Use the recommended ICSS national staffing structure, i.e. WTE/100 patients per year, when calculating staffing requirements.	ISDNs	Within two years of publication
24. ISDNs should work with stroke teams to review current provision of Life after Stroke pathways. This should include access to psychological care, voluntary sector support and appropriate patient directed follow-up.	a Review current models of service delivery across providers and consider ISDN footprint commissioning with single lead commissioner and service specification.	ISDNs and provider organisations	Within 12 months of publication
	b Support the delivery of the principles of the Life After Stroke care pathway.	NHSE&I National Stroke Programme and Stroke Association	Within 12 months of publication
	c Consider a 'blended' approach to service delivery with a mixture of face to face, telephone/video call, voluntary-led and peer-to-peer support groups.	ISDNs, provider organisations and voluntary sector organisations	Within 12 months of publication
	d Review delivery models of psychological care post-stroke and work with ISDNs to improve access.	Led by NHSE&I National Stroke Programme and ISDNs	Within 12 months of publication
	e Introduce <i>my stroke</i> record - a stroke patient passport (personal stroke information) system, initially in paper format, moving to electronic, to facilitate education, self-directed care, and follow-up.	Stroke Association, NHSE&I Personalised Care team	Within 12-18 months of publication

Audit and review

Current data to inform quality improvement

A recurring theme in this report is that providers, networks and commissioners need to be using data consistently and in a timely way to inform decision-making, guide implementation and track progress. In our visits, we observed wide variation in how data was being used in practice. We found that many trusts and networks were not using data effectively to identify and, more importantly, address deficiencies in service delivery in a timely manner.

Individual stroke services were using data to understand how their service is performing, and they often supplement nationally available data with local intelligence to fill in any knowledge gaps. There were often doubts expressed about the validity of some of the data e.g. HES and accuracy of SSNAP data entry. These doubts risked becoming an excuse to delay change or to search for counterevidence. Many services appeared to wait for continued quarterly or even annual performance to deteriorate or plateau before initiating remedial action, with some services waiting for external scrutiny before investigating performance. In response, we encouraged greater ownership and review of data regularly (at least monthly) to improve confidence in it, making it more useful for quality improvement.

The Sentinel Stroke National Audit Programme (SSNAP) is the most established and stroke-specific source of data that is available certainly nationally and, possibly, internationally. It has been based more recently in the School of Population Health and Environmental Studies at King's College London and measures the quality and organisation of stroke care in the NHS. SSNAP has two strands: a clinical audit that examines the processes of care provided to patients with stroke and some outcomes data (e.g. modified Rankin score at discharge and six months); and an organisational audit focused on the structure and organisation of stroke services.

The Hospital Episode Statistics (HES) database provides a comprehensive view of hospital-based activity across England. It was necessary to complement the data available via HES to give single comprehensive view of hospital-based stroke care. Specifically, we needed additional information on outpatient (TIA and minor stroke) activity as diagnostic information is not routinely coded in HES or SSNAP, meaning stroke outpatient activity cannot be identified. Additional information on the inpatient pathway was also needed because this is not easily captured by the procedure-based information available in HES. The Diagnostic Imaging Dataset (DID) measures inpatient and outpatient imaging activity and can complement HES data. Awareness of this dataset has improved during our visits, this gave an opportunity to share imaging data for the first time to the stroke profession. As outlined in the GIRFT national report for radiology (2020), there are opportunities to make better use of the DID by improving data entry and the range of codes available. Nonetheless, the wealth of data available in the DID provided an excellent resource for analysis.

Other than SSNAP data, there is no nationally available routinely collected data on the provision of rehabilitation to patients post stroke once they are transferred from acute pathways. Many community teams told us at our visits that they keep local data sets, but with limited sharing of this outside of their team or organisation and very limited regional or national benchmarking.

There is also a range of population level and primary care data to inform activities around primary prevention. Earlier sections highlighted examples, including RightCare, NCVIN PHE data, the new primary care dataset and the risk-stratification tools developed by UCLPartners.

When preparing the data packs which were the evidence base for our GIRFT visits, we found a need for improved data collection, linkage and use. Specifically:

- Diagnostic information within outpatient settings would help identify stroke-specific activity. When planning services, not having an easily accessible dataset that covers TIA, minor stroke and stroke mimics activity makes it hard to undertake job planning activity and capacity planning.
- More information was needed on significant parts of the pathway, where national audits do not collect data or where fields were often incomplete. We addressed this via questionnaires for our deep-dive reviews, collecting information on actual workforce and vacant posts, TIA processes of care, thrombectomy pathways and access to cerebral imaging and use of AI decision support tools.
- Often more information is needed to identify the cause of unwarranted variation. Thrombectomy pathways are a good example of where, at the time of our review, existing metrics did not give the level of detail required to pinpoint the underlying drivers of varying practice and performance.

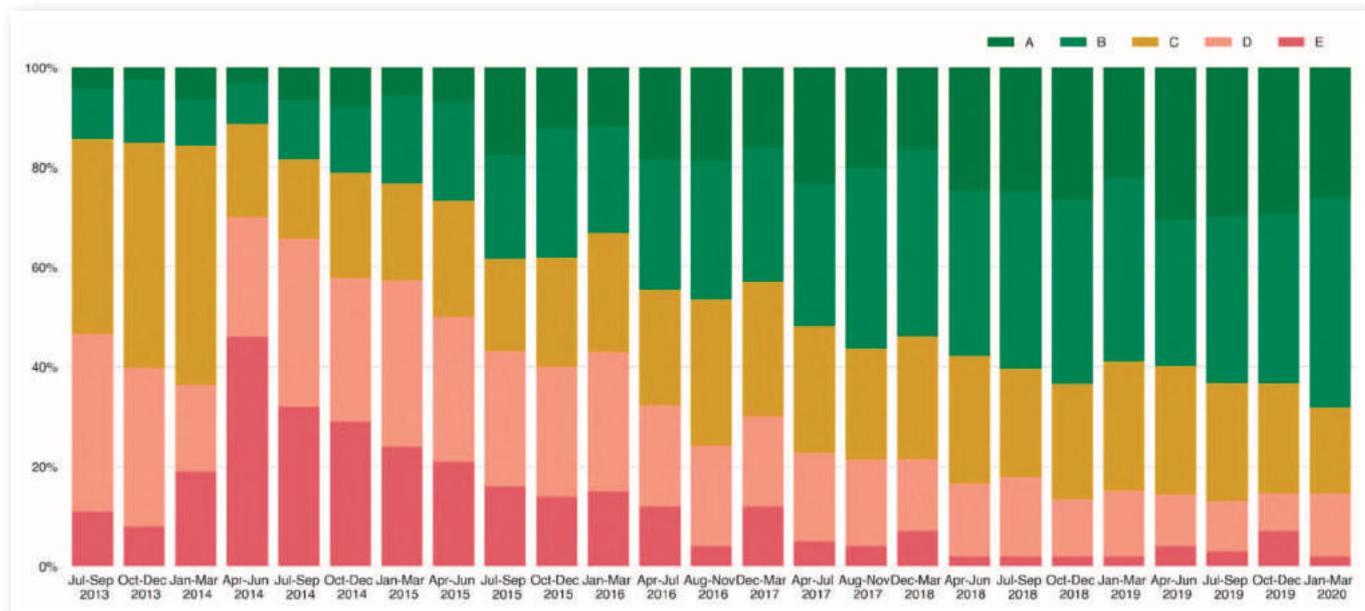
- Datasets were not routinely linked so that patients may be tracked across their pathways of care and data sets. If this were achieved, validation of the data sets may be undertaken and improvement work may use this data to measure the multidisciplinary and networked delivery of stroke care.
- Improved system-based reporting of data may deliver the opportunities of linked data and maximise benefits from networks. Stroke improvement efforts may be better coordinated and delivered beyond traditional geographic and organisational boundaries.

To inform our deep dives, we looked in detail at the metrics available to stroke teams to help them assess the quality of stroke services they provide. We identified opportunities to develop metrics which would better support continual improvement and drive improved patient outcomes. We also heard some of the concerns raised about data quality on our visits.

Supporting continual improvement

We have already observed that there are categories of metrics that stroke services currently collect which may be improved upon by offering a more precise measure of quality. We have discussed previously improved metrics around thrombectomy services. Another example is the metric used by SSNAP to measure the overall quality of stroke services. **Figure 69** shows the trend in SSNAP scores by unit, over the last seven years (an A grade is used to indicate first class quality of care whilst a score of E indicates a substantial improvement is required). Positively, this shows improvement over time leading to most services being graded as either A or B, meaning most are considered first class or good/excellent in many respects. To support ongoing improvements in these units, we can see a case for a review of the sensitivity of metrics or addition of improved delineation of higher performing units (an analogy would be the decision taken to change GCSE grading from A-E to 1-9). These may offer greater differentiation as units across the country improve. Our expectation is that such metrics would facilitate ongoing improvement by helping units continually aim for better performance and focus on progressive developments in specific areas of care.

Figure 69: Changes in SSNAP scores over time (% units achieving each score, 2013-2020)



Source: SSNAP Seventh Annual Report

Leading indicators of quality

During our visits, we often made observations which we found surprising in light of the SSNAP performance data available for a given stroke unit. For example, we observed that units meeting key SSNAP performance metrics were often poorly resourced or staffed. Whilst a positive finding in some respects, i.e. delivering 'more for less', this prompted us to consider if a similar pattern may be found between key performance indicators and outcomes. To do this we compared SSNAP scores to SSNAP's casemix adjusted mortality ratios. Although SSNAP scores were not intended to correlate closely with mortality, mortality is a definitive measurable outcome and one may expect that some measures that reflect good processes, or bundles of processes, should also have an impact on reducing stroke mortality. **Figure 70** shows that although units that are outliers on mortality rates (high overall mortality rates, highlighted in red, three standard deviations above) do have below average SSNAP scores, there is little overall correlation between mortality and a unit's SSNAP score. Based on these findings, we would encourage further review of key performance indicators used by SSNAP, with a view to maximising the opportunity to improve patient outcomes that indicators may help to drive.

Figure 70: SSNAP adjusted mortality (SMR) v average SSNAP score (by unit, April 2017-March 2019)



Note: red dots are units that are outliers (high) on mortality rates

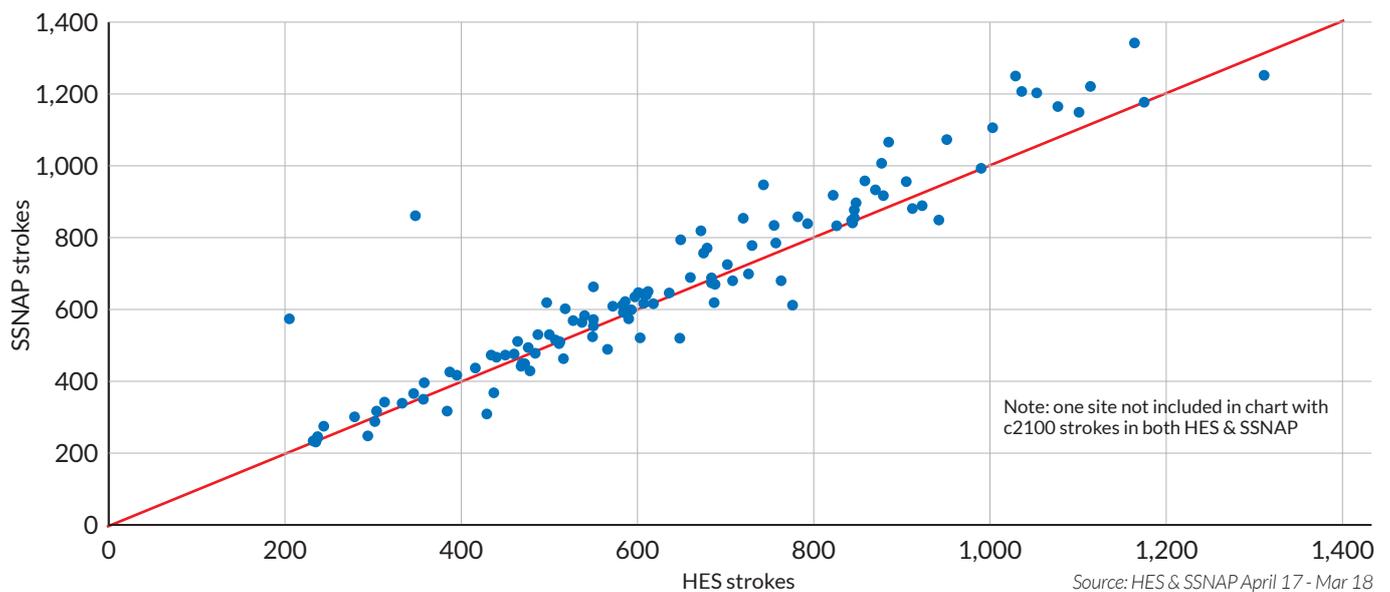
Data quality

We found that the same information was sometimes recorded in multiple datasets and those datasets did not match. As an example, we have compared the number of patients coded to have suffered a stroke in HES and in SSNAP. In principle, there should be a comparable number of strokes reported by a given unit as the primary diagnosis. We should expect the number of strokes in both datasets to be very similar and accurately reflect the clinical coding for each unit. This is important as the data is used to inform system planning and reimbursement. **Figure 71** shows that whilst the overall correlation is high, the stroke activity has some variability. We found similar examples on other measures. Resolving issues like this would address concerns we heard during our visits about making data more reliable and consistent for planning, quality improvement and reimbursement purposes. To underpin this, we encourage greater executive attention on quality improvement. The need for this is shown in SSNAP's finding that only two-thirds of stroke units meet the standard for trust executives or operational managers taking responsibility for the follow-up of the results and recommendations of the Sentinel Stroke Audit.

Insight from GIRFT's data

78% of units have formal meetings with their coding departments to improve the quality of stroke coding. This happens weekly in only 15% of units and monthly in 34% of units.

Figure 71: Comparison of the number of strokes reported in HES vs. SSNAP (England, site level, April 2017- March 2019)



Strengthening audit and review

As described above, we saw wide variation in how local systems and services use data to support quality improvement activities. This variation may decrease if the data available to support quality improvement is perceived to be more relevant and timely, with accountability and governance structures in place to ensure the data is acted upon.

ISDNs are the appropriate bodies to have accountability for quality improvement in their local geographies and will need to put in place the leadership and culture that supports transparency of data with continuous improvement.

For this to be effective, we are calling for improvements to the data that is routinely made available to support these activities. Priorities include:

- Reviewing the metrics that are made available to stroke services, expanding with new metrics to fill information gaps where necessary.
- Present data in a way that it can be aggregated easily to allow for system-level (e.g. ISDN level) analysis as well unit level.
- Link datasets, so that pathways can be tracked easily, and key constraints identified and addressed.
- Focus on making data reports more timely – the more current the data, the more likely services are to act on it.
- There should be regular reviews of data between stroke teams and coding teams, ideally weekly, so that high-quality data input is achieved and near real-time data is available to support local audit and quality review.
- There must be a greater ability for local review of data before it is published so that users regard the data as reliable and definitive, both as a measure of their own service's performance and that benchmarks with other services are meaningful and accepted.
- There must be management responsibility both for signing off data and for follow-up quality improvement activities and executive ownership.

Measuring experience and outcomes

Mortality review

During our visits we reported two mortality measures:

- **Summary Hospital-level Mortality Indicator (SHMI):** the ratio between the actual number of patients who die following hospitalisation at the trust and the number that would be expected to die on the basis of average England figures, given the characteristics of the patients treated there. It covers patients who died either while in hospital or within 30 days of being discharged from any cause. The SHMI figures use HES data linked to ONS data and includes all admissions with a primary diagnosis code relating to acute cerebrovascular disease. This is likely to include most patients with stroke but will also include some non-stroke patients. The SHMI acute cerebral vascular disease bundle may include patients with dural bleeds or subarachnoid haemorrhage and this may contribute as much 15% of the patients within this bundle metric.

Insight from GIRFT's data

83% of units have stroke-specific mortality reviews but only 55% discuss all stroke deaths.

- **SSNAP case mix adjusted mortality:** Stroke teams enter data onto SSNAP about the patients they treat, including casemix variables such as age, stroke type, whether the patient was in atrial fibrillation before the stroke, and importantly NIH Stroke Score upon admission. These variables have been found to be the most important factors in mortality prediction.¹⁴⁹ SSNAP patient records are then linked using the NHS number with data from the Office for National Statistics (ONS) to determine mortality for the directly admitted patients with known stroke type at from any cause. This metric is the only mortality score which takes into account stroke severity case mix adjustments.

Systems, commissioners and providers are advised to use both metrics when assessing mortality given the recency of SHMI and additional case mix adjustment of SSNAP. Both metrics are only as good as the coding of episodes and SSNAP entry processes.

Patient reported outcomes

Patient-Reported Outcome and Experience Measures (PROMs and PREMs) are an important component of the quality of care received and following the Cumberledge Review,¹⁵⁰ there is a renewed interest in their widespread use. They provide validated evidence from the perspective of patients about the quality of care and their experiences with care but are not routinely collected in stroke. Collecting PROMS and PREMS would complement process-based metrics by accounting for the needs and experiences of individual stroke survivors and prompting action where outcomes show room for improvement.

PROMs are starting to be used more widely in other specialties – typically for elective surgery. For example, in orthopaedics PROMs have been collected for elective hip and knee surgery for many years. It is harder for non-elective care where there may not be good baseline measure of a patient's health status with which to compare the change after an intervention.

Insight from GIRFT's data

One quarter of units report that they have never completed a formal PREMs survey seeking patient/carer views on stroke services.

However, in principle there is no reason why stroke services could not collect measures that track their impact on a patient's recovery post-stroke. This should be addressed urgently. There are ample opportunities during a stroke survivor's rehabilitation (e.g. at six-week, six-month and annual reviews thereafter) to assess changes in health outcomes using a validated PROMs metrics.

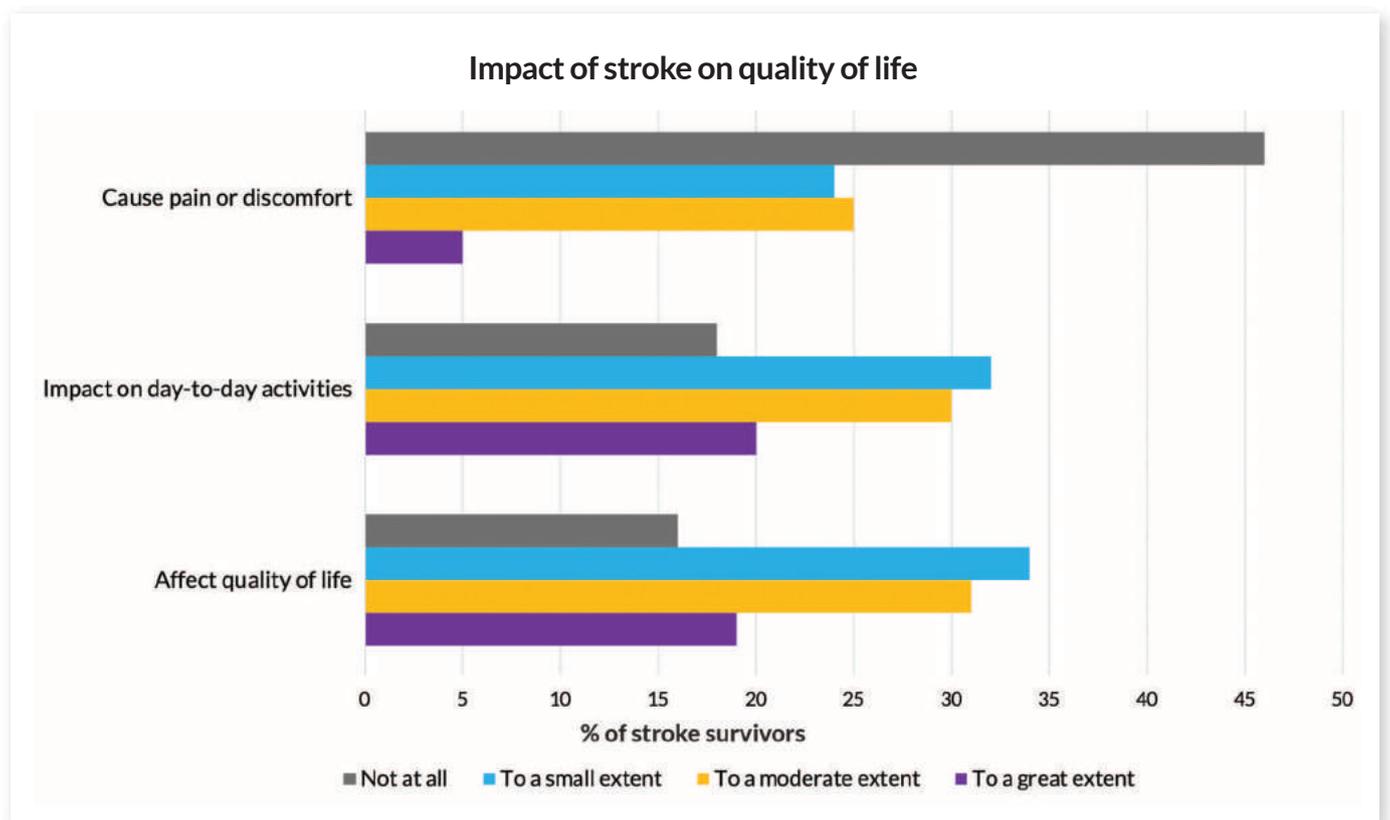
¹⁴⁹ Bray BD, Campbell J, Cloud GC, Hoffman A, James M, Tyrrell PJ, Wolfe CD, Rudd AG. Derivation and External Validation of a Case Mix Model for the Standardized Reporting of 30-Day Stroke Mortality Rates. *Stroke*. 2014; 45: 3374-3380

¹⁵⁰ The Independent Medicines and Medical Devices Safety Review (2020) First Do No Harm <https://www.gov.uk/government/publications/independent-medicines-and-medical-devices-safety-review-report>

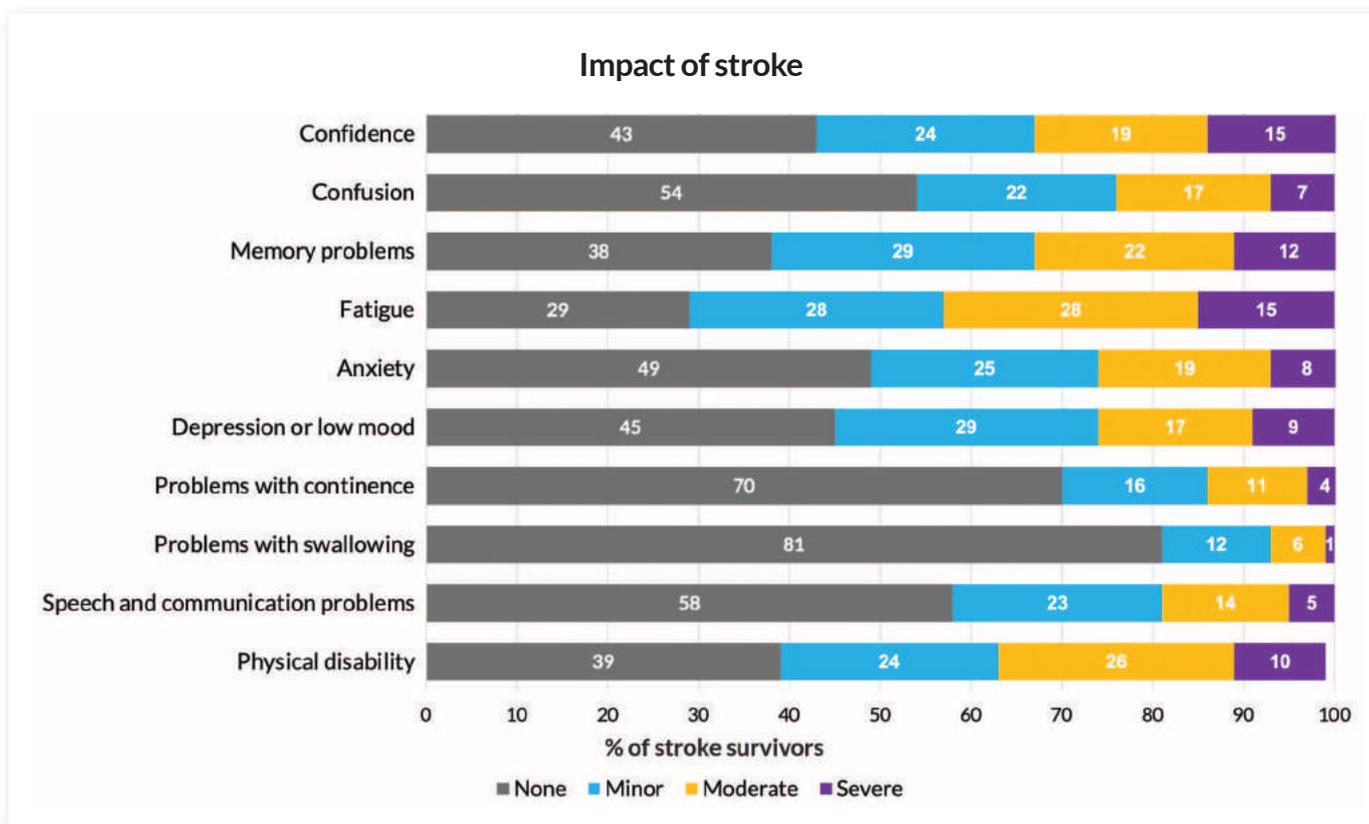
As discussed earlier, the Stroke Association has found that 45% of stroke survivors feel ‘abandoned’ during their stroke recovery or have not had access to therapy and other support services that they would like. With an assessment of PROMs, we may begin to quantify the impact of more intense rehabilitation programmes and prioritise action to deliver this. Similarly, the patient level impact of the delays in various elements of the stroke pathway, highlighted in earlier sections, may be evidenced and quantified through PREMS. Experience measures should also take account of the experiences of carers, particularly in instances where patients with stroke have died during their acute admission.

As part of the GIRFT stroke programme, the Stroke Association and GIRFT piloted the collection of patient experience data using a survey in two stroke units (Wirral University Teaching Hospital NHS FT and East Kent Hospitals University NHS FT). The survey asked 52 questions exploring patients’ outcomes and experiences of stroke care (see **Figure 72**). The questionnaires were either posted to stroke survivors or completed during a routine appointment with a stroke-specialist healthcare practitioner, usually a nurse. In total 178 responses were received (a response rate of 25%). A greater response was seen when patients were asked to complete the questionnaire during a face to face consultation with a stroke specialist and the completion rate is consistent with other published experience of an approximate 25% return rate for questionnaire surveys.

Figure 72: Measuring the impact of stroke



Source: Stroke Association and GIRFT



Source: Stroke Association and GIRFT

The survey suggested that there are areas where patient experience could be strengthened. For example, 10% of patients did not have a good understanding of their diagnosis. Nearly three quarters of patients agreed that they received enough rehabilitation after leaving hospital and whilst 73% were satisfied with the care and support they received, 15% felt abandoned on leaving hospital. Only a minority of patients reported being offered occupational therapy, a visit from a Stroke Association support worker, speech and language therapy, or counselling.

Although the pilot is based on a small sample of patients, the results do suggest that on balance patients are positive about the care they received in these two services. More significantly, the pilot demonstrates it is feasible to ask patients about their experience of stroke services to highlight areas where service and experience improvements need to be made. GIRFT, the National Stroke Programme and the Stroke Association are supporting the roll-out of a PREMS questionnaire nationally.

Other options exist for assessing outcomes following stroke. The EQ-5D is questionnaire which evaluates the generic quality of life of an individual and has been validated. The EQ-5D descriptive system is a preference-based health-related quality of life measure with one question for each of five dimensions that include:

- mobility;
- self-care;
- usual activities;
- pain/discomfort; and
- anxiety/depression.

The answers provided to EQ-5D produce 243 unique health states or can be converted into an EQ-5D index, which gives a utility score, anchored at zero for death and one for perfect health. The EQ-5D questionnaire also includes a Visual Analog Scale (VAS), by which respondents can report their perceived health status with a grade ranging from 0 (the worst possible health status) to 100 (the best possible health status).

Actions and progress made during GIRFT's stroke programme

During GIRFT's stroke programme, the following actions have been completed or are in progress:

- We are working with SSNAP and the National Stroke Programme to review stroke data collection, ensuring stroke services will receive timely, accurate, linked data to inform service improvement.
- Work has begun to define PREMs questions that can be routinely asked by services to measure experiences of patients with stroke within health care services.
- Introduction of EQ-5D index at six-month review with SSNAP.
- RightCare has begun its refresh of its Stroke Toolkit (to be completed in the summer of 2021) which will focus on primary care performance and secondary prevention, and will be reported for the first time at ISDN level.

Recommendations to strengthen audit and review

Recommendation	Actions	Owners	Timescale
25. Review stroke data collection, data fields and links to other registries, reflecting feedback from acute and community teams. This will ensure units continue to receive high-quality and actionable insights from the national audit. This must include more real-time reporting and an ability for local ISDNs to interrogate data and produce their own bespoke reports based on their own priorities and challenges.	a Review questions within the SSNAP dataset to reflect changes in care delivery pathways e.g. thrombectomy patient flows and metrics, delivery of virtual models of care and rehabilitation pathways.	SSNAP, HQIP and NHSE&I National Stroke Programme	Within six months of publication
	b Continue the commissioning of national audit including formal review of contract and prioritisation of work plan.	HQIP	Ongoing
	c Ensure the longevity and sustainability of a national stroke audit that links with other registries so that data is collected only once, is linked and accessible.	HQIP and NHSE&I	Ongoing
	d Define a minimum set of data and support development of key performance indicator (KPI) data dashboards to support quality improvement across networks.	NHSE&I National Stroke Programme in partnership with the national stroke audit provider	Within 18 months (acute-focused dashboard available within six months)
	e Enable real time linkage of SSNAP data to increase timeliness of mortality data reports.	SSNAP, HQIP and NHSE&I National Stroke Programme	Within 12 months of publication
	f ISDNs to work with local units to ensure completion of data entry from all providers across the stroke pathway.	ISDNs and providers (community and secondary care)	Ongoing
26. Formalise the ISDN assurance process for quality of SSNAP data entry and performance. There should be regular meetings between clinical and coding teams to ensure alignment with HES data and SSNAP.	a Establish quarterly independent verification of SSNAP attainment score via independent assessors.	ISDNs and provider organisations	Within six months of publication
	b Stroke teams and coding teams to engage in continuous review of the coding of patients with stroke in HES and SSNAP. This will ensure that data is accurate and comparable. Data must be available to teams in a timely to allow for case review and improvement actions.	Provider organisations	For immediate action
27. Use PROMs and PREMs collection to understand the impact and outcomes of enhanced rehabilitation and life after stroke services.	a Develop a national PREMs questionnaire with supported analysis and reporting at provider, ISDN, regional and national level.	NHSE&I National Stroke Programme in partnership with the national stroke audit provider and the Stroke Association	Within 18 months of publication
	b Integrate PROMs questions within national audit and introduce into national data set within SSNAP after initial testing in rehabilitation pilots.	NHSE&I, SSNAP implemented via ISDNs and provider organisations	Within 18 months of publication

Recovering and learning from the COVID-19 pandemic

Since the coronavirus (COVID-19) pandemic began, many changes have been made to the way in which stroke teams work and the way in which stroke services are delivered. The pandemic has demonstrated the ability of NHS stroke services to adapt and change rapidly, to use digital solutions and explore the use of new pathways and technologies. As we learn to live with COVID-19 endemically, it is critically important that stroke services continue to adopt and embed effective interventions rapidly and that we do not move back to holding on to outmoded ways of working. Some changes that have been introduced will require further evaluation and continued monitoring of patient outcomes through SSNAP and local audits. Engagement with patients and the public to understand how these changes have affected the patient experience is even more important than before the pandemic.

The discussion in this section is drawn from three publications, prepared as part of a collaboration between GIRFT and the Oxford Academic Health Science Network, with input from clinicians from across the NHS to demonstrate work in practice during the pandemic. The publications are:

- *Adapting stroke services during the COVID-19 pandemic: an implementation guide*¹⁵¹
- *Restoration and recovery of stroke services during the COVID-19 pandemic*¹⁵²
- *CVD prevention during the COVID-19 pandemic*¹⁵³

Priorities during recovery

Staff wellbeing and workforce

The COVID-19 pandemic has presented unprecedented stress and pressure for NHS staff. There is now an urgent need to recognise this, support staff as services return to the 'new normal' and look at sustainable ways of working in the future. Every effort should be made to support staff wellbeing, recognising the emotional and psychological effects of delivering care during this time and the overwhelming fatigue that many staff may be feeling right now.

Reduction in efficiency

Additional measures required to deliver safe care during the COVID-19 period – including enhanced cleaning protocols, the time taken for donning and doffing of personal protective equipment (PPE), and the need to maintain COVID-19-positive and COVID-19-negative bed bases – will all have an effect on the efficiency of processes and pathways. Stroke pathways have several time-sensitive elements, and stroke teams have put in significant work in recent years to improve the efficiency of pathways so that the best possible outcomes are achieved for patients. Stroke teams should aim to deliver care as efficiently as is possible in the circumstances; however, it should be acknowledged that some reduction in efficiency is inevitable due to the additional measures required. It should also be recognised that while virtual clinics and reviews are highly effective and allow for greater flexibility in working patterns. We heard from teams that they often take longer to deliver than traditional face-to-face methods, and this should be reflected in future workforce calculation and job planning.

Working virtually

Many elements of stroke care have moved to a virtual model. This should be continued during the restoration and recovery period (and is discussed in more detail below),¹⁵⁴ but with the acknowledgement that a return to face to face care should be resumed for some parts of the pathway. TIA clinics are a good example where virtual models were introduced rapidly to respond to the pandemic. Stroke teams should now critically review their TIA pathways to see which areas need to be remodelled in order to better facilitate virtual working. This should include reviewing clinic time allocation, recognising that it may take longer to deliver virtual reviews and being aware that a blended approach is likely to be optimal depending on the patient and history.

¹⁵¹ <https://www.basp.org/supporting-stroke-services-during-the-covid-19-pandemic/adapting-stroke-services/>

¹⁵² <https://www.basp.org/supporting-stroke-services-during-the-covid-19-pandemic/restoration-and-recovery/>

¹⁵³ <https://www.oxfordahsn.org/our-work/covid-19/covid-19-case-studies/overcoming-disruption-to-cardiovascular-disease-prevention-services/preventing-cardiovascular-disease-during-the-pandemic/>

¹⁵⁴ Further information can be found in *Adapting stroke services during the COVID-19 pandemic* (<https://basp.ac.uk/wp-content/uploads/2020/05/Adapting-stroke-services-in-the-COVID-19-pandemic-May-2020-Virtual-TIA-clinic.pdf>).

Infection control

Teams should follow national PPE guidance for both inpatient and community pathways. Some aspects of the national guidelines, including the guidance around PPE for nasogastric tube placement and swallow screens, have led to much debate within the stroke community. Staff need to feel protected and should be supported to use the level of PPE in which they feel safe. A pragmatic local approach, agreed with local infection control teams, is recommended.

In order to comply with social distancing, teams will need to adapt to new ways of delivering handover, safety huddles and MDT meetings.

Transfer of care between settings

There is a difficult balance between ensuring that patients are transferred as soon as is clinically appropriate to reduce the risk of nosocomial infection and ensuring that patients with undiagnosed or known COVID-19 do not compromise the setting to which they are being repatriated. Stroke teams need to find a pragmatic balance between rapid supported discharge and the need to protect community settings. A patient's COVID-19 status should be rechecked on discharge and, when the result is available, communicated to community teams. Stroke survivors requiring ongoing specialist stroke rehabilitation should not be routinely discharged into Discharge to Assess beds as it is highly unlikely these will be able to meet the rehabilitation needs of the majority of stroke survivors.

Early Supported Discharge (ESD) and community rehabilitation pathways

The pandemic re-emphasised the importance of effective, specialist home-based rehabilitation pathways. Some ESD services were able to expand their staffing provision during the COVID-19 pandemic and are providing a seven-day service. This should be amplified to support appropriate early transfer from hospital with a reduced risk of nosocomial spread.

Some services have not been offering community-based rehabilitation to all patients due to infection control concerns. The potential detrimental effect of not providing timely rehabilitation to patients is a risk to recovery, as well as the burden this may place on family members or other services if stroke survivors do not receive appropriate therapy. Intensity and responsiveness of rehabilitation delivery needs to be resumed to meet evidence-based guidelines, maximising the use of tele-rehabilitation where therapeutically appropriate. Rehabilitation pathways need to have a risk assessment framework in place for face-to-face visits.

Face-to-face contact and therapy, with appropriate PPE and infection control precautions, should be offered to maximise rehabilitation potential of stroke survivors, especially those with more severe disability. Virtual rehabilitation models should be incorporated alongside face-to-face rehabilitation.

Communication

In an era of face coverings and virtual communications, careful attention needs to be given to the quality of communication with patients, carers and other staff. This includes appreciating that communication may take longer and so speaking slower, using non-verbal cues, and using the support of relatives and carers if needed. Clinic schedules will need to be reviewed and administrative support made available to arrange virtual consultations.

Learning and embedding good practice - implementing telemedicine

Throughout this report, we have highlighted examples of good practice. Many of these examples come directly as a consequence of teams responding to the COVID-19 pandemic and others are often ideas that were in development, but COVID-19 hastened their implementation. Telemedicine is an example where many services have implemented new or built on existing infrastructure to rapidly adapt models.

Telemedicine is a broad term, encompassing the use of formal videoconferencing, as well as image sharing supported by remote review and decision making via telephone. The majority of stroke services providing hyperacute care in England use telemedicine out of hours to enable remote specialist decision making for thrombolysis and thrombectomy. However, a significant number still rely on face-to-face assessment for review, decision making and the delivery of thrombolysis both in and out of hours. Stroke units that do not currently utilise telemedicine should strongly consider putting a system of virtual assessment in place. Additionally, those using telemedicine out of hours should consider moving to 24/7 use of telemedicine to ensure a specialist review is available within one hour of presentation to hospital and recanalization decisions are made without delay. Out of hours cover could be at an individual trust level or at a network level.

Telestroke network

Telestroke networks involve decision making across a network of stroke physicians from different trusts. This typically includes videoconferencing connectivity and image sharing between specialists and the emergency department (ED). These networks have the advantage of involving a large number of individuals and so being resilient to staff absence. Telemedicine can also be used to support decision making for thrombectomy or referrals to neurosurgery for intracerebral haemorrhage (ICH), regional cryptogenic stroke MDTs, ISDN team meetings, peer to peer support groups and we expect will remain part of the new virtual landscape. Less formal social networks e.g. Pando, have also been beneficial, when used appropriately, to bring teams together and share encrypted patient level information.

There are challenges to implementing a telestroke network quickly. Clearly defined protocols are essential, alongside associated training. Despite these challenges, for those networks with good relationships across trusts and infrastructure to support such a service, a telestroke network may provide a resilient model to cover pressures on the availability of stroke physician expertise in individual trusts during the COVID-19 period and beyond.

Remote decision making within an individual trust

Setting up a system of remote decision making within an individual trust may be simpler to implement than across a network of multiple trusts. Transition to remote specialist decision making would reduce patient and clinician exposure and may potentially provide a mechanism for staff who are in self-isolation (but are physically well) to contribute to clinical care.

Implementation will require rapid access to high-quality images and communication between stroke physicians and front-door clinicians who are suitably experienced to take an accurate history and perform a neurological examination (e.g. a medical registrar or ED physician).

Advantages of this approach include familiarity of clinicians with existing pathways, understanding of colleagues' abilities and being covered by existing trust governance frameworks. This approach may also be used to support non-specialists covering an acute stroke unit in the context of staff shortages or relocation of the stroke unit to a different hospital site.

Governance

For trusts who do not have formal videoconferencing software in place, a pragmatic approach would be to use a telephone system alongside informal videoconferencing solutions such as FaceTime or WhatsApp. NHSX guidance for the COVID-19 period states that it is acceptable for clinicians to use these tools for video conferencing (www.nhsx.nhs.uk/key-information-and-tools/information-governance-guidance/health-care-professionals).

Ideally a local or network agreement will be in place to acknowledge that decisions about treatment may be made by a consultant working in another trust. Additionally, the General Medical Council acknowledged in recent guidance (www.gmc-uk.org/news/news-archive/supporting-doctors-in-the-event-of-a-covid19-epidemic-in-the-uk) that while doctors have a duty to recognise and work within their competence, in 'these exceptional circumstances, doctors at every level may be required to work at the limits of their comfort zone and in some cases beyond'.

Pre-hospital phase alerts

Earlier sections of this report emphasised the importance of pre-hospital alerts to aid preparedness and speed up handover on arrival at hospital. Practical considerations include:

- The option for virtual assessment by a stroke physician should be considered in the pre-hospital phase. This will help ensure that stroke mimics and those who would not benefit from admission are less likely to be inappropriately or unnecessarily transferred to hospital for further assessment.
- Ensure stroke consultants are immediately available to give an opinion – the ambulance paramedics are not able to spend time making multiple attempts at contact or waiting a long time for calls to be answered.
- Ease of use of the system is critically important if it is to be implemented quickly. FaceTime between the stroke consultant and the ambulance service (on tablet) has been tried with success in some sites.
- The paramedic should provide the patient/family/carers with an explanation of how the information will be used and should gain and document consent.
- The stroke physician should conduct the call in a private environment to preserve patient confidentiality, privacy and dignity.
- The paramedic should document the remote clinician's name.
- The paramedic should document clinical information and decision making resulting from the video call.
- The stroke physician should separately record the consultation and the advice given to the paramedic.

Video conferencing within the ED

Video conferencing may be helpful in assessing some patients. Many trusts with existing virtual assessment systems or networks use videoconferencing units. These can be mobile or fixed and enable the remote stroke consultant to visualise the patient as well as the brain scans. Practical steps to expand use of video conferencing include:

- Decide on the remote assessment facilities that will be used.
- Ensure that all stroke physicians who will be participating in the telemedicine rota have adequate internet connectivity to participate in videoconferencing (if using) and to view the images.
- Agree the system for contacting the stroke consultant on-call.
- Telephone or messaging contact is recommended in the first instance to alert the stroke consultant of a potential acute stroke admission. They will then be prepared to review the patient and CT images when available.
- It is recommended that clinicians use work mobile telephones rather than personal telephones wherever possible.
- Agree the criteria and timescales for contacting the stroke consultant on-call.
- Timing is critically important when thrombolysis or thrombectomy are treatment options. However, all patients with stroke will benefit from an early virtual review by a stroke consultant.
- Ensure the trust switchboard and the ED have the stroke consultant rota.
- Decide how the decisions made by the stroke consultant on-call will be recorded in the patient's record.
- Agree the back-up system to be used if there is a failure in image transfer or videoconferencing software.

Image sharing, artificial intelligence and decision support tools

To allow the stroke consultant to make treatment decisions, there needs to be a rapid transfer of imaging of sufficient quality. Practical steps include:

- Ensure that there is the facility to share images with the stroke consultant working remotely and test this to ensure that speed of image transfer and quality/clarity of image are acceptable.
- Decision support tools are effective in supporting individual stroke clinicians and teams with less experience in the interpretation of CTA/CTP to make a rapid decision regarding thrombectomy referral and also thrombolysis in some cases. Ensure that staff who will be sharing and making decisions on the images are trained in how to use the software.
- Systems that share images and use artificial intelligence to support decision making may also be used. These have the advantage of offering rapid image interpretation to support early referral for thrombolysis or thrombectomy.

Training

If implementing a virtual assessment system will result in an enhanced role for another member of the healthcare team – for example, reliance on nursing staff to carry out the National Institutes for Health Stroke Scale (NIHSS) – ensure that they receive training and support to enable them to do this.

Training for NIHSS can be accessed at www.nihstrokescale.org/.

Confidentiality and consent

As with any consultation or examination, it is important to consider where and how the teleconference takes place so that confidentiality can be ensured. This includes:

- If practical, the patient or family should be informed that telemedicine is going to be used and their agreement sought.
- If the remote stroke physician is not employed by the trust where the patient is located, this should also be made clear.

Learning and embedding good practice - new models for managing TIA and minor stroke

Referral

Reports from around the UK suggest that fewer patients with suspected TIA are being referred via their GP and from emergency departments (EDs) while the COVID-19 pandemic is ongoing. This may reflect changes in behaviour of those experiencing TIA symptoms or change in referral practices from primary and secondary care. The importance of referring patients with suspected TIA symptoms for immediate assessment to prevent fatal or disabling stroke should be emphasised to colleagues and in public health messages to the local community.

Referral systems should be easy to access; using preconfigured template referral forms. Referrals should ideally be accessed and triaged without the need for a secretary to forward to a clinician.

Triage

Patients with suspected TIA or minor stroke should be virtually triaged by a senior clinician to minimise face-to-face contact with clinicians and other people.

Format

Virtual consultations can be managed over the telephone for patients without access to smart technologies, but video may be preferable, as audio calls miss non-verbal cues and the ability to visualise a persistent neurological deficit in the case of patients with minor stroke. To protect personal contact details of healthcare professionals, outgoing telephone numbers from personal phones should be blocked, with calls made via a laptop or departmental phone dedicated to virtual consults for patients with stroke.¹⁵⁵

Video-based systems may also be considered (e.g. Attend Anywhere, CareRx and AccuRx).

Virtual consultations may be run by stroke consultants or specialist stroke nurses with experience of assessing patients with TIA. Utilising stroke specialist nurses can ensure more efficient use of consultant time, but additional safety nets may need to be in place, particularly during the COVID-19 pandemic, when decisions may demand more challenging risk-benefit analysis and GPs are less able to provide in-person screening, safety nets and follow-up support.

Audit of TIA clinics is recommended following service reconfiguration. This should include capturing views of patients and carers.

Preparation

Administrative staff may be able to support the virtual consultation. Patients should be notified about the one-hour window during which they will receive their call and what will be required of them. In particular:

- Patients should make sure they are able to answer the call during this period and be sat down where they will not be disturbed for a 20-30 minute consultation.
- Patients should have a list of their drugs, information on previous medical history, and weight/height to hand.
- If possible, a witness to the event should also be available to provide a collateral history, particularly if the patient does not have a good recollection of the event.

Clinicians should review existing records, including any recent blood tests and brain imaging before the call, as this will improve the efficiency of the call and minimise the amount of information exchange required. The call should be made from a quiet, private location where the clinician will not be disturbed.

Clinicians should ensure they take a detailed history, including:

- Details of what access to medications the patient has, including home supplies of aspirin, ability to obtain aspirin and access to pharmacy services locally.
- Non-verbal cues that might normally alert the clinician to anxieties or concerns can be easily overlooked. Care should be taken to specifically identify these by direct questioning.

In some circumstances it may be necessary for the clinician to examine the patient in person, and facilities must be available when this need arises.

Investigations

The ED should have a clear protocol to ensure optimal collection of appropriate routine tests recommended in NICE guidance such as lipid profile and ECG.

Local solutions, e.g. community testing hubs or 'investigation pods' that offer phlebotomy, one-lead ECG (e.g. Kardia Mobile), 12-lead ECG and BP measurement, should be considered; this would benefit a wider group of patients, not just those experiencing TIA/minor stroke.

Blood pressure

Clinicians should ask patients whether they have a blood pressure (BP) monitor or access to one. If not, arrangements need to be made to obtain a BP reading in primary or secondary care. The NHSE BP@home pilot distributed over 20,000 BP monitors to the most vulnerable and at-risk groups and has now been expanded to over 200,000 monitors being made available to CCGs over the course of 2020.¹⁵⁶ Most importantly, work is ongoing with NHSX to ensure BP readings can be uploaded to virtual platforms and medicine recommended and prescribed remotely via embedded algorithms. Clear communication of the agreed BP monitoring strategy with the GP is essential to ensure continuity of secondary prevention.

Electrocardiogram (ECG)

If an ECG has not already been performed (e.g. at ED attendance), local arrangements will need to be made to obtain a 12-lead or one-lead ECG reading. For suitable patients, consideration might be given to home monitoring for atrial fibrillation (AF) using a mobile one-lead device such as Kardia Mobile or MyDiagnostic. 12-lead ECG would need to be arranged if the screening device detects potential AF. Other options such as app-based AF detection, e.g. <https://cardiosignal.com/en/>, could also be considered.

Imaging

For patients who require imaging, this should be scheduled in advance of attendance to minimise time spent in the imaging department.

MRI rather than CT should be performed first line to reduce need for multiple attendances unless contraindicated. Vascular imaging need only be undertaken in those patients who would be suitable for carotid revascularisation (not major disability etc) and should be acquired in the same modality as cross-sectional imaging whenever possible e.g. paired MRI and MR angiography (MRA). CT and CT angiography (CTA) should only be used if MRI is contraindicated.

For some patients with a clear clinical diagnosis of TIA and previous brain imaging, it may not be essential to obtain brain imaging. The risks and benefits of attending hospital in the context of COVID-19 need to be carefully considered.

Prescribing

All hospitals should implement robust evidence-based prescribing guidelines which cover both primary and secondary care to ensure optimal outcomes for patients. Pharmacists should be present on ward rounds to advise on safe and effective prescribing. Specialist pharmacist and nurse prescribers should be used to support medicines optimisation at ward level or in outpatient clinics, with pharmacists focusing on patients with comorbidities and/or complex medications. Special care should be taken when prescribing high-risk drugs (e.g. anticoagulation, antiplatelet therapy) to communicate dose and duration of therapy.

Discharge summaries should include a management plan for primary care highlighting medicines optimisation required following discharge and any ongoing monitoring requirements – this should be communicated to the GP practice and the community pharmacy to minimise risk of errors at transfer of care.

Patients should be counselled on the medicines they have been prescribed including rationale, dose, frequency, common side effects and monitoring requirements; and this should be supported by written information.

The benefits of quick administration of secondary prevention medication once antiplatelet therapy is administered are modest and should be weighed against the risk of patients or their carers acquiring COVID-19 from interactions with healthcare providers. For example, while it might be reasonable for a patient to visit a pharmacy to purchase aspirin to self-administer; it may be prudent to start lipid-lowering therapy on a next repeat prescription.

Until national prescribing systems are in place to allow secondary care to send scripts directly to community pharmacies, local arrangements will need to be made to ensure medications can be provided in a prompt and reliable manner. There are paper based systems that can be used already and work is progressing to develop a new version of the Electronic Prescription Service (EPS) which is used in primary care to transmit the prescription message from GPs to community pharmacy. There is ongoing work to support development of EPS for use in secondary care.

If the patient is already attending the hospital for investigations, prompt review of results and decision-making in real-time might allow quick provision of medication during a single attendance using the hospital pharmacy.

New national guidance on managing oral anticoagulation therapy during the COVID-19 pandemic should be followed (www.rpharms.com/development/coronavirus-cpd-resources#warfarindoac).

Primary care network clinical pharmacy teams are important in supporting stroke prevention activities.

¹⁵⁶ <https://www.england.nhs.uk/ourwork/clinical-policy/cvd/home-blood-pressure-monitoring/>

Follow-up

The clinic letter, sent to the patient and GP, should describe whether a video, audio or face-to-face appointment has occurred. Any specific considerations regarding the circumstances of constrained healthcare provision should be explicitly described (e.g. delays to carotid imaging or surgery, risk assessment decisions around brain imaging and hospital attendances, mechanism of follow-up, mechanism of prescriptions issued and need for continuing provision of medication).

It is reasonable to follow-up TIA patients at one month and at six weeks, either face to face or virtually, for all patients post stroke.

Consideration should be given to the need for early supported discharge team (ESDT) involvement for patients with disability relating to minor stroke. Review by the ESDT in the community may be required for the purposes of assessment when physical neurological assessment has not been possible in audio or video TIA clinic. Patients discharged from A&E with ongoing mild neurological deficit should be reviewed by the stroke neurorehabilitation team ideally before discharge and ongoing therapy review plans put in place to be delivered along the ESD pathway.

Refocusing stroke prevention activities at primary care and system level

Since the arrival of the pandemic, patients are likely to have had less face-to-face contact with healthcare professionals, leading to lower detection rates for CVD risk factors such as hypertension and atrial fibrillation. Some patients with known cardiovascular risk factors may have missed their review appointments and their medication may not be optimised. Symptoms of stroke or TIA may also have gone unreported. At the same time, primary care teams have had to rapidly shift to remote working and this has meant that capacity to carry out quality improvement activities around CVD prevention may have been limited.

We suggest signposting primary care professionals to the right resources to address these and related issues, recognising that failing to address CVD prevention during the COVID-19 pandemic will lead to additional preventable cardiovascular events.

Our previously published guidance provides primary care CVD prevention teams with the information and tools to:

- Take a holistic approach to CVD prevention and avoid treating CVD risk factors in isolation.
- Make the most of all contacts with patients, especially face-to-face.
- Use the skills of the extended primary and community care team.
- Make the most of any opportunities to assess the CVD risk of their population.
- Offer lifestyle advice to all, using searches and risk stratification tools to identify those most at risk.
- Ensure patients are on the best medication for them, including the optimal dose.
- Promote self-monitoring using digital technology but ensure non-digital ways of accessing care are still available.

At a system / ISDN level we recommend that teams liaise with colleagues within their ICS and regional PHE teams to ensure there is transparent communication of strategies and interventions, so that duplication is limited but all teams can answer the following:

1. Do you know how many cardiovascular disease (CVD) checks (NHS Health Checks and structured long-term condition reviews) have been missed across your local system since the start of the COVID-19 pandemic?
2. Do you understand the likely impact of the COVID-19 pandemic on the risk of future CVD events for your population?
3. Do you understand the contribution of health inequalities to CVD within your population and how these can be addressed?
4. What steps will you take to restart and amplify CVD prevention initiatives across your system?
5. What quantified goals will you set for CVD prevention over the next 12 months?
6. How will you ensure you achieve them?
7. What indicators will you use to measure progress, report to your public and hold yourselves to account?

Reducing the impact of litigation

Each of the GIRFT programme teams have been asked to examine the impact and causes of litigation in their field – with a view to reducing the frequency of litigation and more importantly reducing the incidents that lead to it. It is important that clinical staff have the opportunity to learn from claims in conjunction with learning from complaints, serious incidents and inquests that will lead to improved patient care and reduced costs both in terms of litigation itself and the management of the resulting complications of potential incidents. As with many areas where care has been less than ideal, a breakdown in communication between medical teams and patients and their families is often reported. The importance of internal trust processes to ensure clear and regular communication, risk reporting and duty of candour is vital.

It was clear during GIRFT visits that many providers had little knowledge of the claims against them. This includes some with high litigation costs per admission as well as those at the low end. As a consequence, there is an opportunity to learn from the claims to inform future practice. Further work is needed at both a local and national level to analyse claims to maximise this opportunity to improve patient care.

It is often more difficult in stroke medicine to allocate a claim directly to stroke as a specialty, as many stroke services sit within other departments e.g. geriatric medicine, general medicine, and it is often complicated by poor coding and also complex pathways e.g. stroke as a complication of another procedure vs. stroke as a primary care pathway resulting in litigation. Despite this, we feel it is important to share these cases within trusts and the new ISDNs, for anonymised (post resolution) case sharing.

Variation in average litigation costs

Data obtained from the NHS Resolution shows that clinical negligence claim costs in stroke-related claims were estimated to have risen from £44 million to £155 million per year over the last five years. This is a three-fold increase in the cost of clinical negligence claims related to stroke of the five-year period.

Table 5: Volume and cost of medical negligence claims related to stroke notified to NHS Resolution 2013/14 to 2017/18

Notification year	Number of cases	% change in claims	Sum of total claim (£)	% change in cost
2013/14	122		£48 million	
2014/15	108	-11%	£67 million	40%
2015/16	119	10%	£66 million	-1%
2016/17	133	12%	£104 million	57%
2017/18	157	18%	£155 million	49%
Grand Total	639		£440 million	

Claims trends and causes

Acute stroke care is very time-dependent and ongoing care is usually multidisciplinary with clear guidelines supported by clinical evidence. Consequently, trusts managing these services can be at risk of legal action if appropriate care is not provided. The introduction of newer treatments, e.g. thrombectomy, and greater recognition of specialist stroke services in recent years may also result in optimum services not immediately being provided consistently throughout the NHS. This may account for the rise in litigation costs over the last five years.

The average cost of a claim related to a stroke code is £688,811. This high cost per claim is anticipated since adverse outcomes related to patients with a stroke include severe injuries including brain injury, paralysis and fatalities. Patient injuries such as brain injury and paralysis require patients to receive extensive and costly medical treatment as well the requirement for lifelong rehabilitation and support services. These future medical costs are factored into damages and total claim costs paid. Litigation in this clinical area is a significant burden to the NHS.

Table 6: Top seven specialties that clinical negligence claims related to stroke are coded under in the NHS Resolution data set

Specialty	Number of claims	% of total	Cost (£)	% of total cost	Cost per case (£)
Emergency department	140	22%	£104m	24%	£743,809
General medicine	101	16%	£44m	10%	£437,908
Cardiology	69	11%	£50m	11%	£722,041
Neurology	40	6%	£29m	7%	£723,198
Geriatric medicine	33	5%	£13m	3%	£391,500
Ambulance	33	5%	£16m	4%	£489,022
Cardiothoracic surgery	20	3%	£11m	2%	£533,345

Clinical negligence claims related to stroke are from a wide variety of medical and surgical specialties as well as ambulance services. **Table 6** demonstrates that patients with stroke are managed by several medical specialties including general medicine, cardiology, neurology and geriatric medicine. The nature of this heterogeneous group is partly due to the system of specialty coding in NHS Resolution which does not include specialist stroke services but is also due to the fact that patients have multiple comorbidities often presenting with multiple complaints. Claims can be made against the various specialties they encounter along their treatment pathway.

Furthermore, nearly a quarter of claims are coded under the emergency department. The acute nature of stroke presentations means that definitive treatment is often undertaken in the emergency department and therefore errors in management of cases in this clinical location can lead to clinical negligence claims.

Ambulance services are the provider identified in coding in 5% of claims, which highlights that the patient pathway in these presentations involves out of hospital care. Delays in transport and treatment by ambulance services are a potential cause for litigation. Furthermore, there has been a successful litigation case against an ambulance service in which a stroke patient was taken to non-specialist hospital rather than regional stroke centre.¹⁵⁷

Strokes secondary to other medical treatment are also included in this group of claims and this is a feature in interventional medical specialties such as cardiology and surgical specialties including cardiothoracic surgery.

Table 7: Top five most frequent causes for clinical negligence claims related to stroke and associated costs 2013/14 to 2017/18

specialty	Number of claims	% of total claims	Total cost (£)	% of total cost	Average cost per claim (£)
Treatment	297	46%	£145m	33%	£487,484
Diagnosis	158	25%	£109m	25%	£688,135
Medication errors	42	7%	£16m	4%	£390,738
Nursing	35	5%	£12m	3%	£348,534
Consent	24	4%	£16m	4%	£667,988

¹⁵⁷ Keeling N. Payout for stroke victim left paralysed after being taken to the wrong hospital. Manchester Evening News, <https://www.manchestereveningnews.co.uk/news/greater-manchester-news/payout-stroke-victim-left-paralysed-9604282> (7 July 2015, accessed 14:00 09/01/2020)

Causes

The table above lists of the top five 'cause' codes used for clinical negligence cases related to stroke. Of note, more than one cause code can be used for the same claim. Treatment is the most frequent cause code associated with stroke related claims accounting for nearly half of all claims and one third of claim costs. This cause group will include delays to treatment as well as incorrect treatment. Diagnosis follows as the second most frequent cause for claims with one quarter of all claims and claim costs. Updated NICE guidance published in May 2019¹⁵⁸ gives a clear protocol for management of these cases and specific time limits for commencement of treatment. If management of patients with stroke does not adhere to these guidelines, trusts can be vulnerable to legal action.

Medication errors and nursing care account for a potential estimate of £16million and £12 million in costs from clinical negligence in stroke related claims which is less on a cost per claim basis than the other causes. Potentially this may be due to lesser extent of patient injury occurring from these causes in the majority of cases.

Consent also features in the top five causes. Adequate informed consent is required for all medical treatment and is not limited to surgical procedures. In stroke care, pharmacological treatments for thrombolysis and procedures such as thrombectomy should be explained to the patient and their families ideally, but often a best interest decision will need to be made due to the need to deliver rapid brain saving intervention and the fact that an acute stroke event will often leave a patient lacking in capacity to make an informed decision about an acute emergency intervention. Consent processes must be patient centred and patient specific. Failing to ensure this can lead to a risk of exposure to litigation.

Recommendations to reduce incidents that lead to litigation

Recommendation	Actions	Owners	Timescale
<p>28. Reduce litigation costs by application of the GIRFT Programme's five-point plan.</p> <p>Although claims relating to stroke have not been directly identified in the GIRFT litigation data pack as a separate specialty, trusts can ensure they learn from claims relating to stroke by following the five-point plan for all claims listed for both medical and surgical specialties, as a proportion of these relate to patients with stroke.</p>	<p>a Clinicians and trust management to assess their benchmarked position compared to the national average when reviewing the estimated litigation cost per activity. Trusts would have received this information in the GIRFT Litigation data pack.</p>	Trusts	For immediate action
	<p>b Clinicians and trust management to discuss with the legal department or claims handler the claims submitted to NHS Resolution included in the data set to confirm correct coding to that department. Inform NHS Resolution of any claims which are not coded correctly to the appropriate specialty via CNST.Help@resolution.nhs.uk</p>	Trusts	Upon completion of a
	<p>c Once claims have been verified clinicians and trust management to further review claims in detail including expert witness statements, panel firm reports and counsel advice as well as medical records to determine where patient care or documentation could be improved. If the legal department or claims handler needs additional assistance with this, each trusts panel firm should be able to provide support.</p>	Trusts	Upon completion of b
	<p>d Claims should be triangulated with learning themes from complaints, inquests and serious incidents (SI) and where a claim has not already been reviewed as SI we would recommend that this is carried out to ensure no opportunity for learning is missed. The findings from this learning should be shared with all front-line clinical staff in a structured format at departmental/directorate meetings (including multidisciplinary team meetings, morbidity and mortality meetings where appropriate).</p>	Trusts	Upon completion of c
	<p>e Where trusts are outside the top quartile of trusts for litigation costs per activity GIRFT we will be asking national clinical leads and regional teams to follow up and support trusts in the steps taken to learn from claims. They will also be able to share with trusts examples of good practice where it would be of benefit.</p>	Trusts	For continual action throughout GIRFT programme
<p>29. NHS Resolution to develop its clinical coding to enable the identification of all claims that relate to stroke as either a primary or secondary factor in a claim.</p>	<p>a Code claims related to stroke separately to allow identification of the true prevalence of stroke in clinical negligence claims.</p>	NHS Resolution	For continual action through GIRFT and NHS Resolution's collaborative work

Financial impact and opportunities

There are opportunities to identify and limit unwarranted variation and inconsistent provision of services across the whole stroke pathway. It is recognised that many (and varied) pressures are faced by the stroke service, for example inconsistent provision of a specialist workforce, sub-optimal access to diagnostic services and interventions, limits on understanding capacity demand, and varied access to community and third sector resources to support stroke survivors on their recovery journey.

This report makes practical recommendations that will address many of these pressures, including reducing duplicative imaging and having access to a 7/7 therapy workforce. It is however recognised that investment will be required in many areas if services are to be substantially improved.

By improving the speed and effectiveness of scanning and diagnosis of suspected stroke by adopting a national optimal imaging pathway (NOSIP) - with treatment provided by an appropriately skilled workforce as part of an integrated pathway, where earlier interventions and alternative services are offered - patients with stroke would see a reduction in their hospital length of stay. The potential gross financial opportunity related to this possible reduction in stroke hospital bed days could be in the region of £70m (see **Table 8** for more detail), if all patients moved to the upper quartile length of stay. This significant opportunity could help support investment in alternative services that cross system boundaries.

Note: the gross notional opportunity does not include any activity or value related to stroke mimic patients, who tend to have longer lengths of stay due to challenges faced related to accurate diagnosis.

Table 8: Summary of financial opportunity

Improvement	Standard			Target		
	Target	Notional activity opportunity *	Gross notional financial opportunity**	Target	Notional activity opportunity *	Gross notional financial opportunity**
Improve speed and effectiveness of scanning, diagnosis and treatment (Recommendations 3, 5, 9, 10, 12) Opportunity = Reduce stroke hospital length of stay Data: HES April 18 - Mar 19 Cost estimated based on HRG stroke (AA35) average bed day cost (17/18) ref costs uplifted to 20/21 prices	<i>national average</i> 13.3 days length of stay	127,300 bed days	£43.73m	<i>upper quartile</i> 11.4 days length of stay	207,400 bed days	£71.25m
Total			£43.73m			£71.25m

Notes:

* Activity opportunities are annual figures, based on one year of activity data. Unless specified, activity that could be avoided is shown

** Costing of financial opportunity: unless otherwise stated, cost estimates are based on published national average 18/19 reference costs <https://www.england.nhs.uk/national-cost-collection/>, uplifted to 20/21 using tariff inflation.

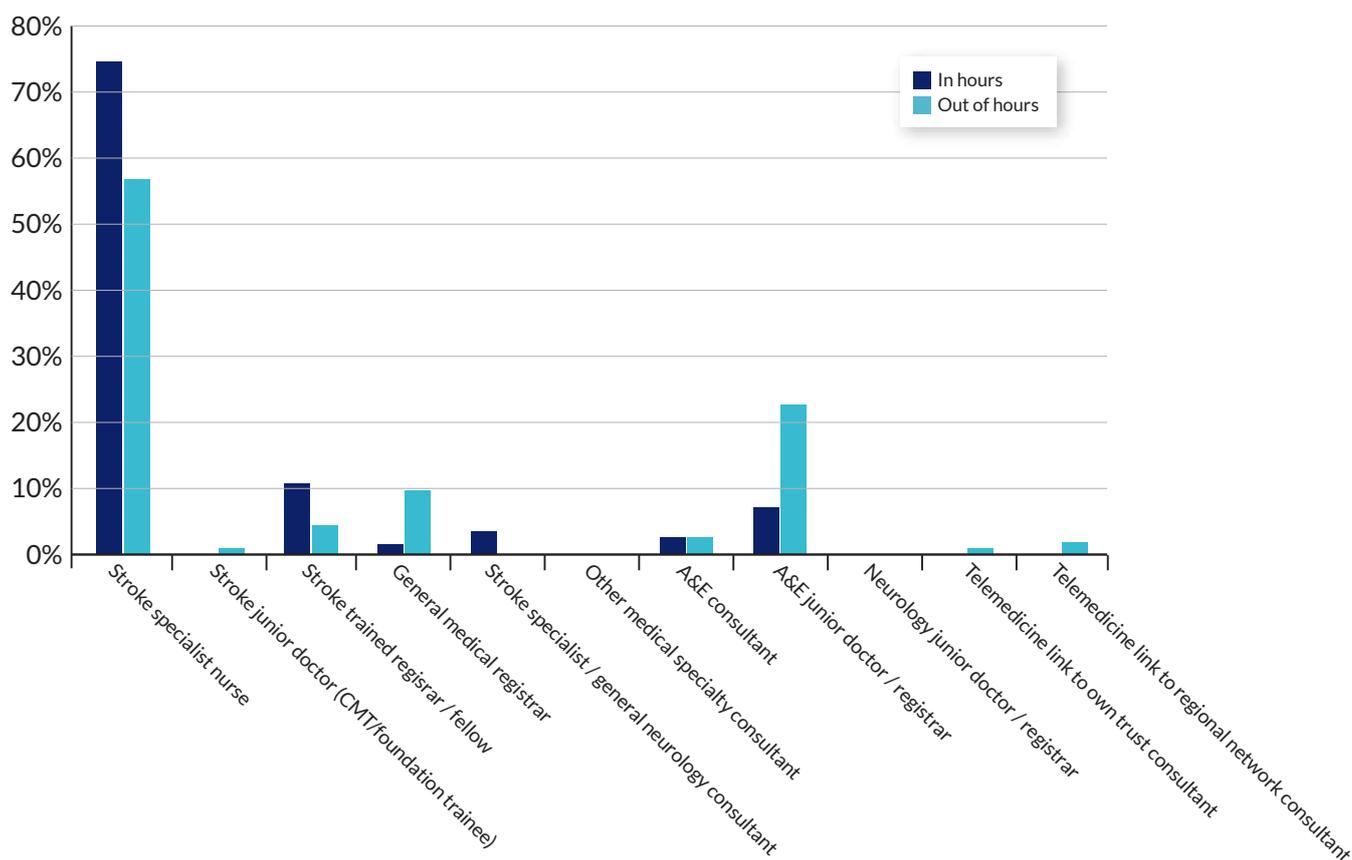
Additional findings from GIRFT's questions included in the 2019 Acute Organisational Audit

SSNAP's 2019 Acute Organisation Audit included additional questions requested and funded by GIRFT to provide additional evidence to support our review and visits. In this section we summarise all the responses (aggregated at England level) to these additional questions.

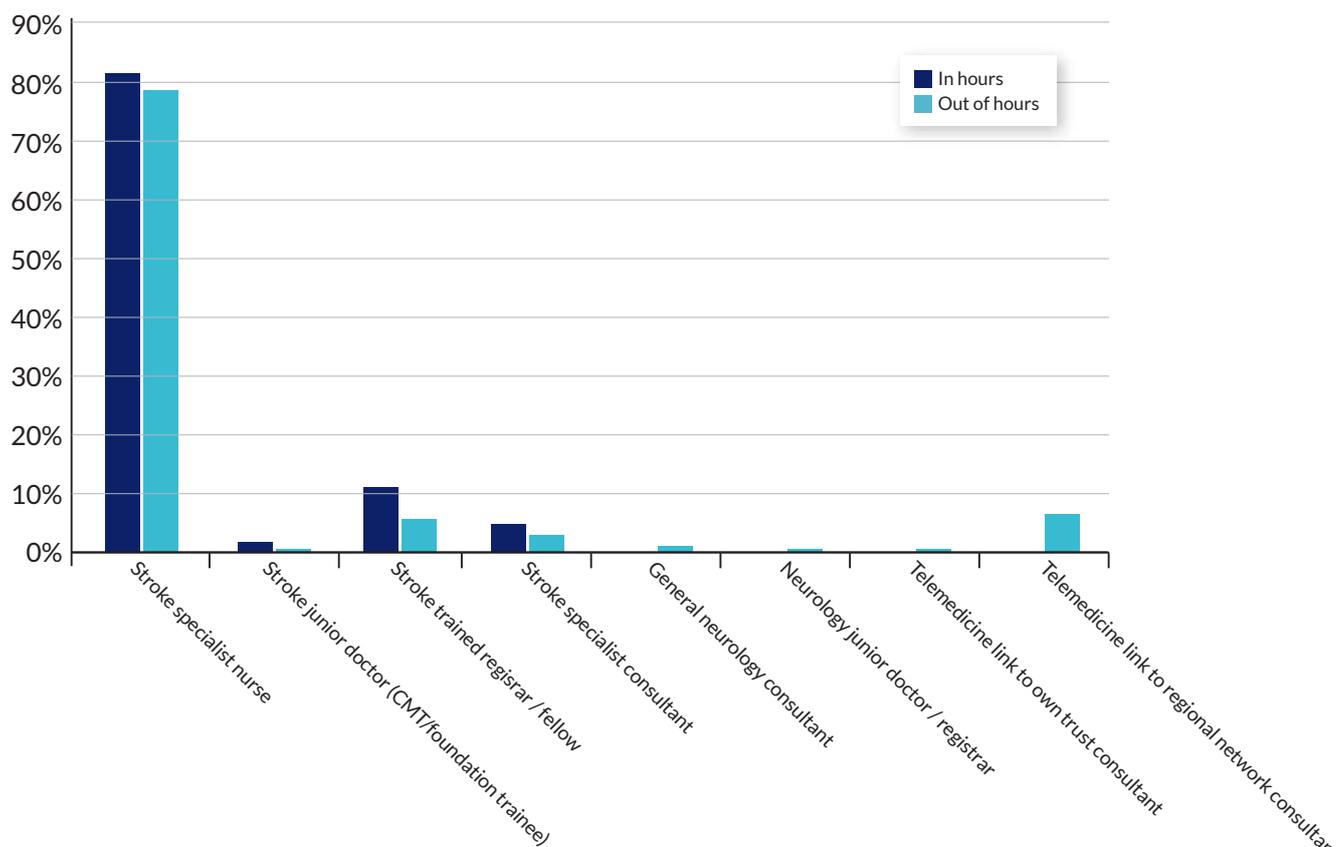
Note that in many cases, units were able to select more than one option so that they could fully reflect local practice in their response. This means totals often sum to more 100%.

Section 1: Acute presentation

Q1.2: Most of the time, who is the first person from any team to review a patient presenting to hospital with a suspected stroke: in hours & out of hours?



Q1.3: Most of the time, who is the first person from the stroke team to review a patient presenting to hospital with a suspected stroke: in hours & out of hours?



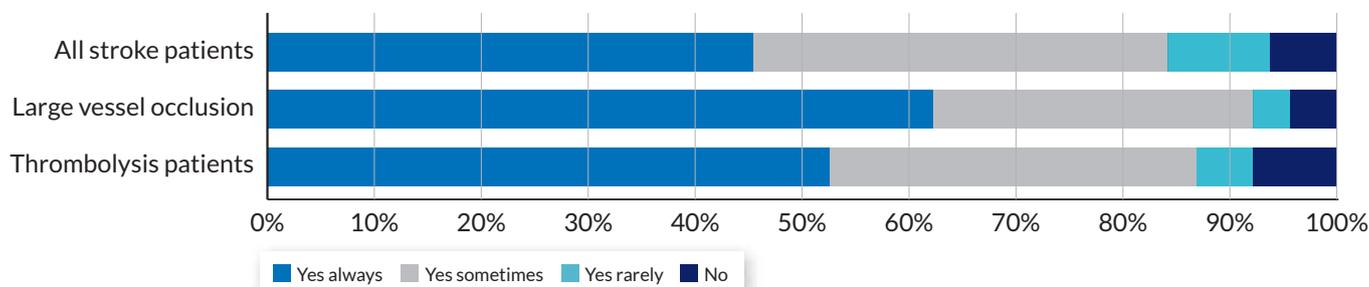
Q1.4: What initial acute brain imaging do you request for the following?

Metric	England				114 questionnaires
	CT % Yes	CTA % Yes	CTP % Yes	MRI % Yes	
What initial acute brain imaging do you request for the following:					
clinical suspicion of stroke amenable to thrombolysis	99.1%	14.9%	1.8%	0.9%	114 responses (100.0%)
clinical suspicion of stroke amenable to thrombolysis and possible thrombectomy	94.7%	87.7%	4.4%	1.8%	
clinical suspicion of stroke but over 4.5 hours since onset of symptoms	97.4%	21.9%	9.6%	10.5%	
clinical suspicion of posterior circulation stroke but not a thrombolysis candidate	97.4%	21.1%	0.9%	34.2%	
Initial acute brain imaging requested for clinical suspicion of alternative neurological diagnosis	92.1%	3.5%	0.9%	46.5%	

Q1.5: Who is responsible for initial review of brain imaging to inform decisions about thrombolysis/thrombectomy: in hours & out of hours?

Metric	England			
	In Hours % Yes	Out of Hours % Yes	In Hours 114 questionnaires	Out of Hours
Person responsible for initial review of brain imaging to inform decisions about thrombolysis/thrombectomy: in hours & out of hours				
Stroke Consultant on site	91.2%	21.2%	114 responses (100.0%)	113 responses (99.1%)
Stroke Consultant remotely via PACS	4.4%	43.4%		
Stroke Registrar	14.0%	7.1%		
Stroke Junior Doctor	2.6%	0.9%		
Neuroradiologist	21.9%	8.0%		
General Radiologist	26.3%	30.1%		
Reporting Hub	3.5%	21.2%		
A&E Consultant/Registrar	1.8%	7.1%		
Medical consultant/Registrar	0.9%	6.2%		
Stroke consultant at own Trust via telemedicine link	1.8%	11.5%		
Stroke consultant in region/network via telemedicine elink	0.9%	25.7%		

Q1.6: If not during initial assessment, brain imaging is subsequently reviewed by a radiologist with a specific competency in neurovascular imaging for...?



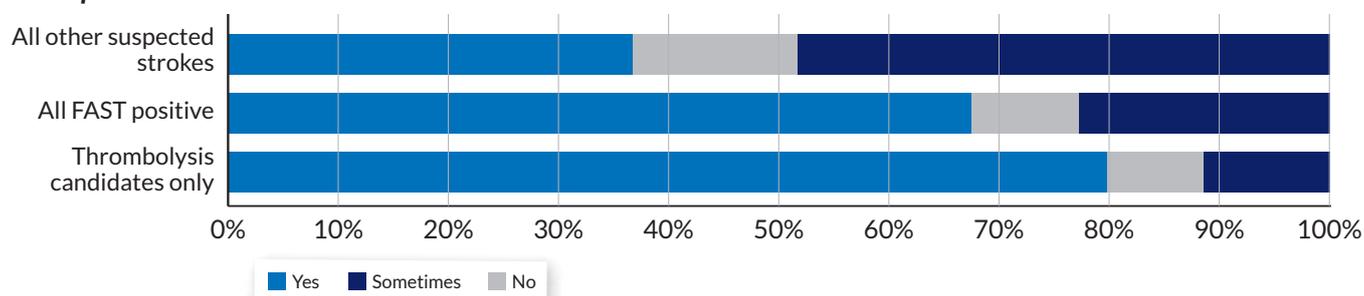
Q1.7 and Q1.8: Stroke specialist nurses

Metric	England		
	In Hours % Yes	Out of Hours % Yes	
Stroke specialist nurses			
Stroke specialist nurses (band 6 or above) undertake hyper-acute assessments of suspected stroke patients in A&E	94.7%	18.4%	114 responses (100.0%)
Stroke specialist nurses are counted within ward based nurse establishment	79.8%	28.9%	114 responses (100.0%)

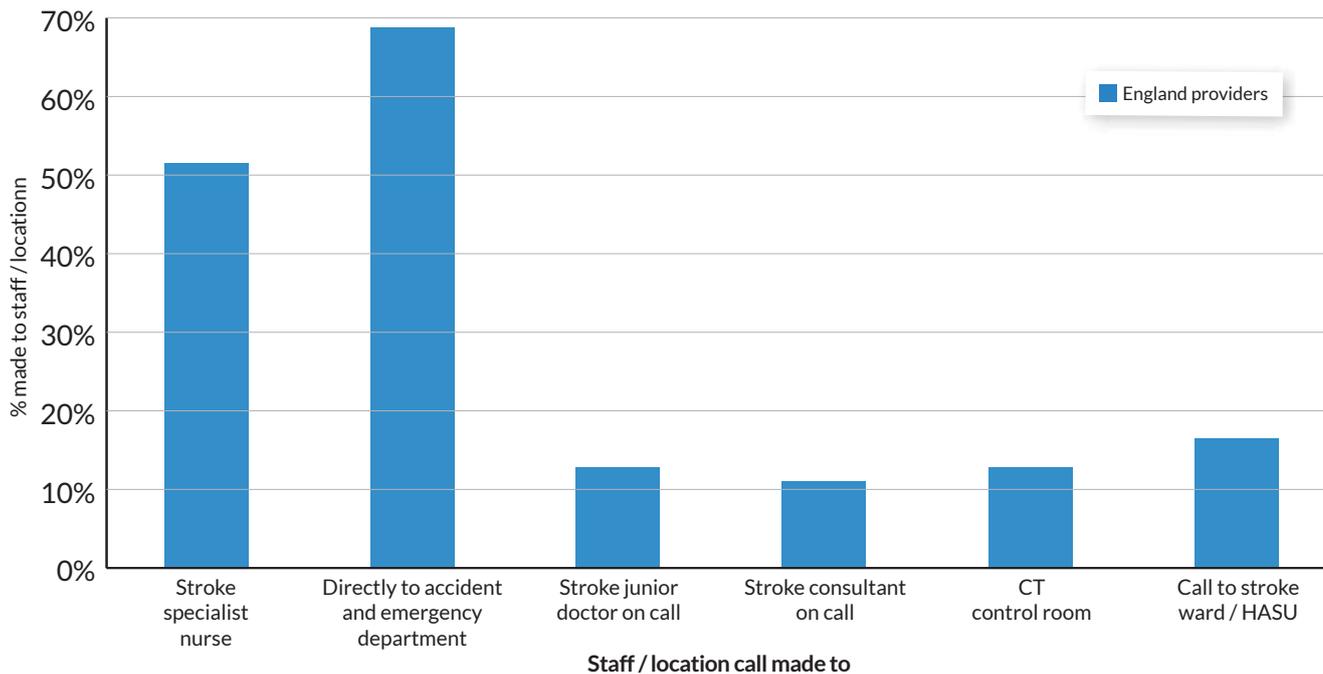
Q1.9: Do you use video telehealth to review patients with ambulance crews?

Metric	England		
	% Yes	% No	
Do you ever use video tele-health to review patients with your ambulance crews	0.9%	99.1%	114 responses (100.0%)

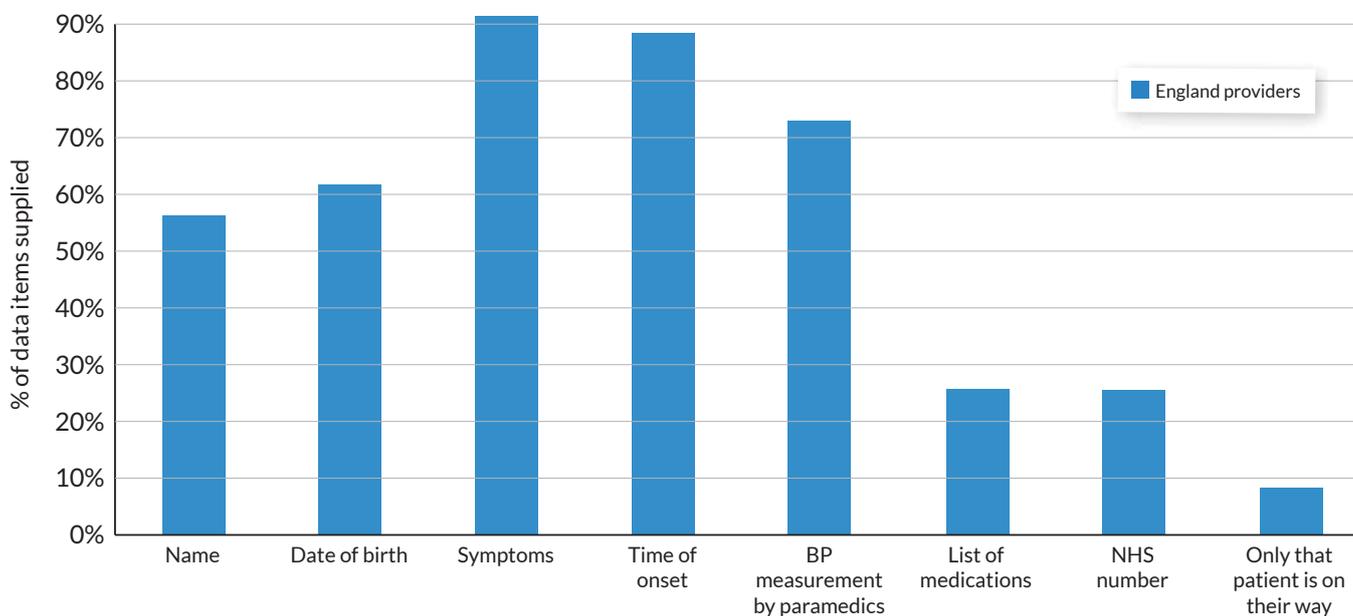
Q1.10: Do the stroke team receive a pre-alert (telephone call) from your ambulance crews for suspected stroke patients?



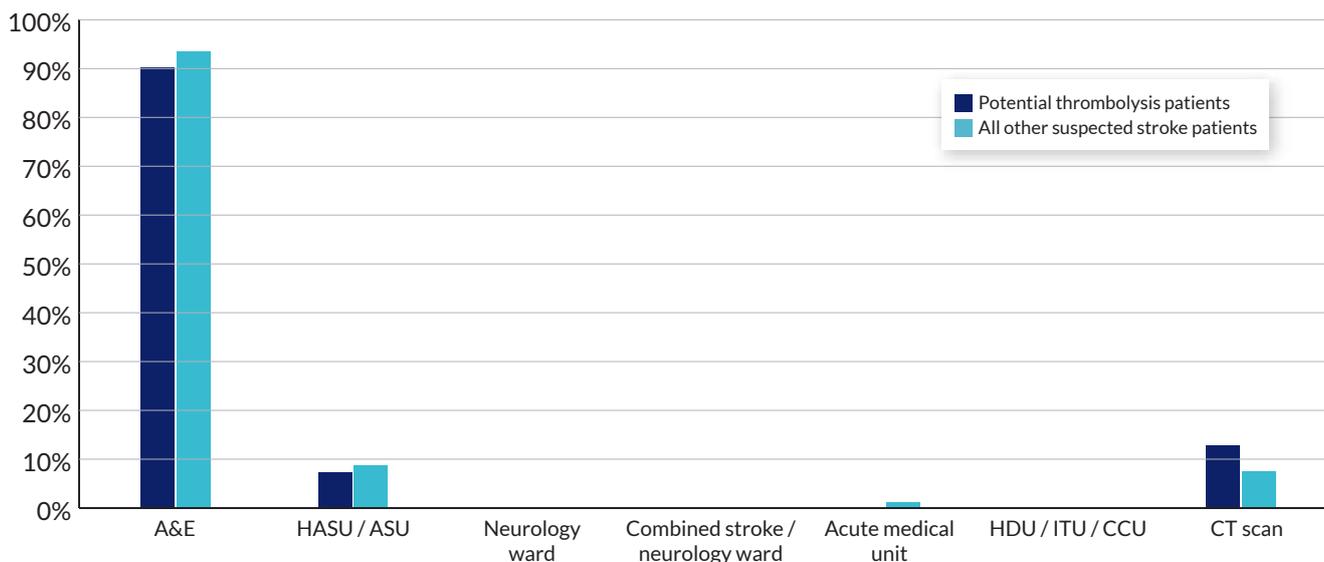
Q1.11: If the stroke team receive a pre-alert, who is the call usually made to?



Q1.12: If the stroke team receive a pre-alert, what information are they usually given by the paramedic crew?



Q1.13: Where are your suspected stroke patients that arrive by ambulance taken for assessment?

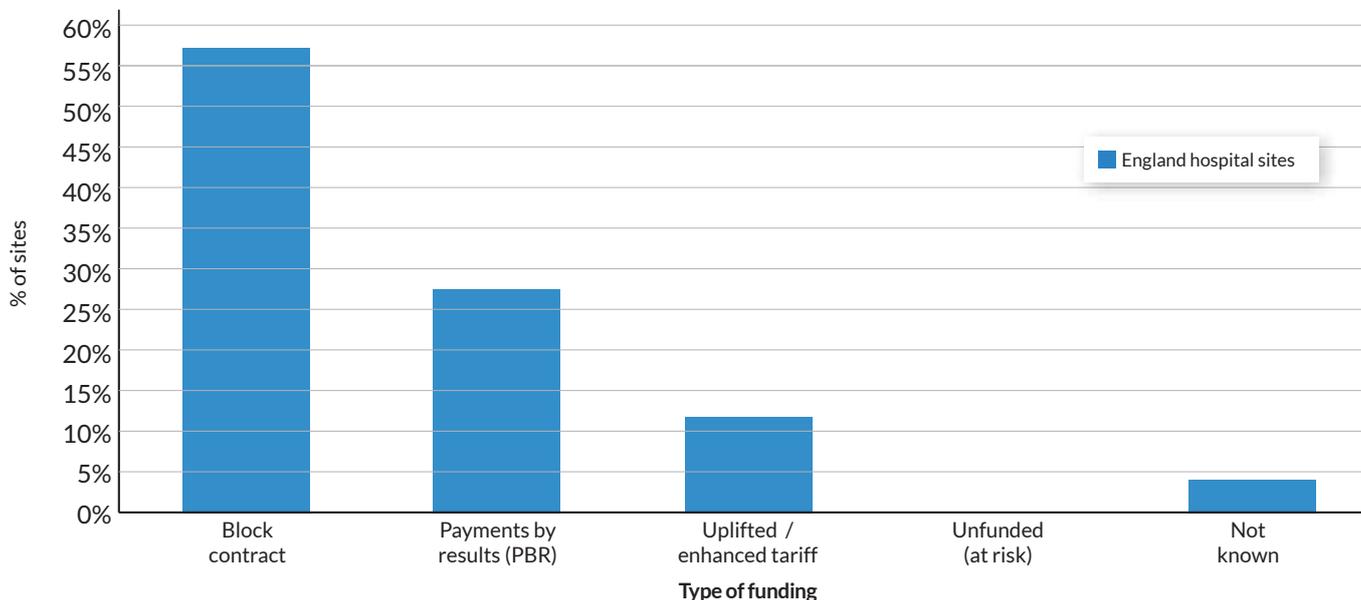


Q1.14 & 1.15: Admissions to stroke units

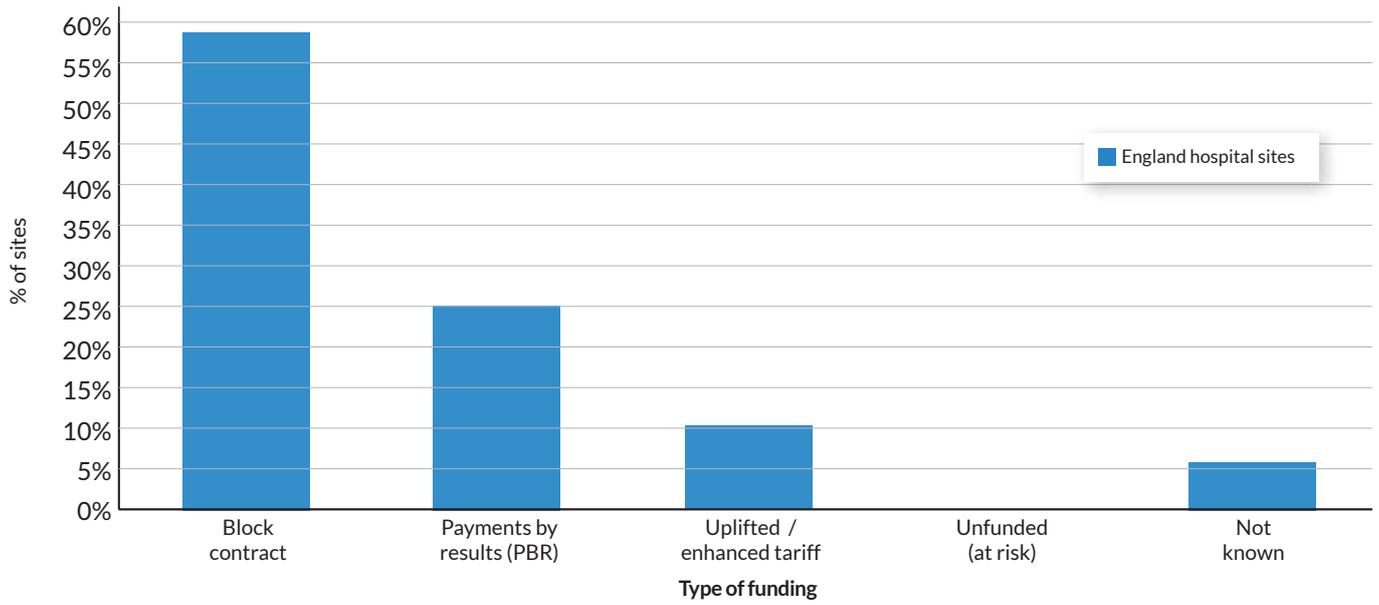
Metric	England		
	% Yes	% No	
Do you actively admit patients with subarachnoid haemorrhage to your stroke unit	21.9%	78.1%	114 responses (100.0%)
Do you actively admit patients with subdural haematoma to your stroke unit	8.8%	91.2%	114 responses (100.0%)

Section 2: Stroke units

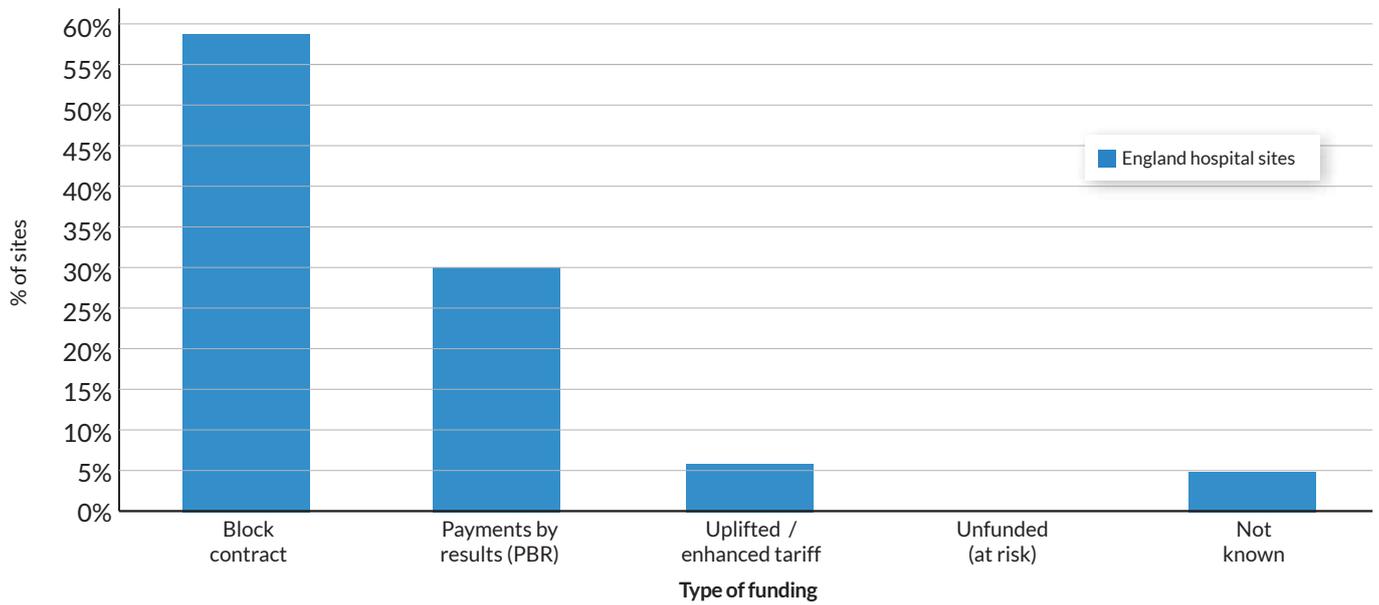
Q2.7: How are your type 1 beds currently funded?



Q2.13: How are your type 1 beds currently funded?

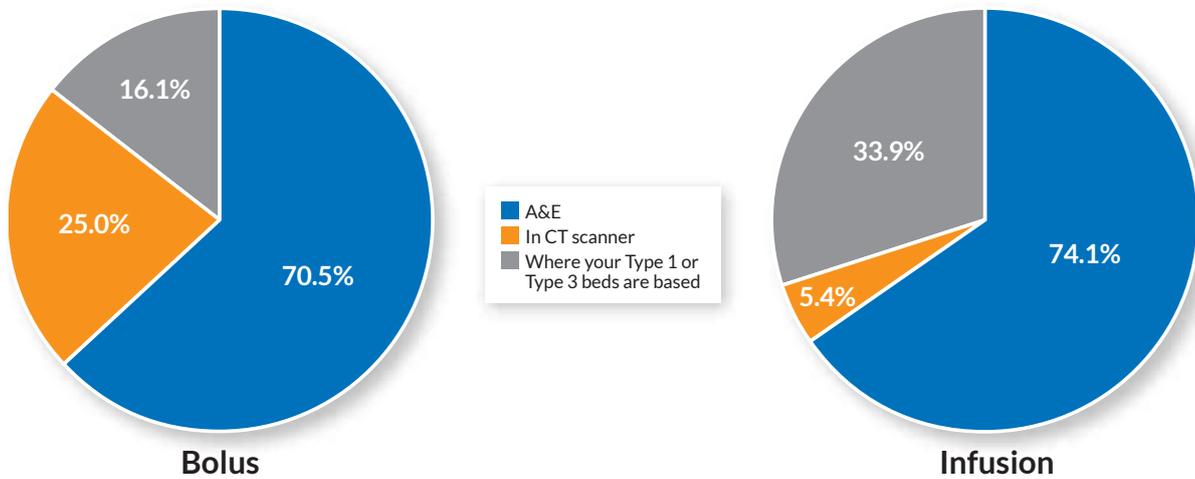


Q2.19: How are your type 3 beds currently funded?

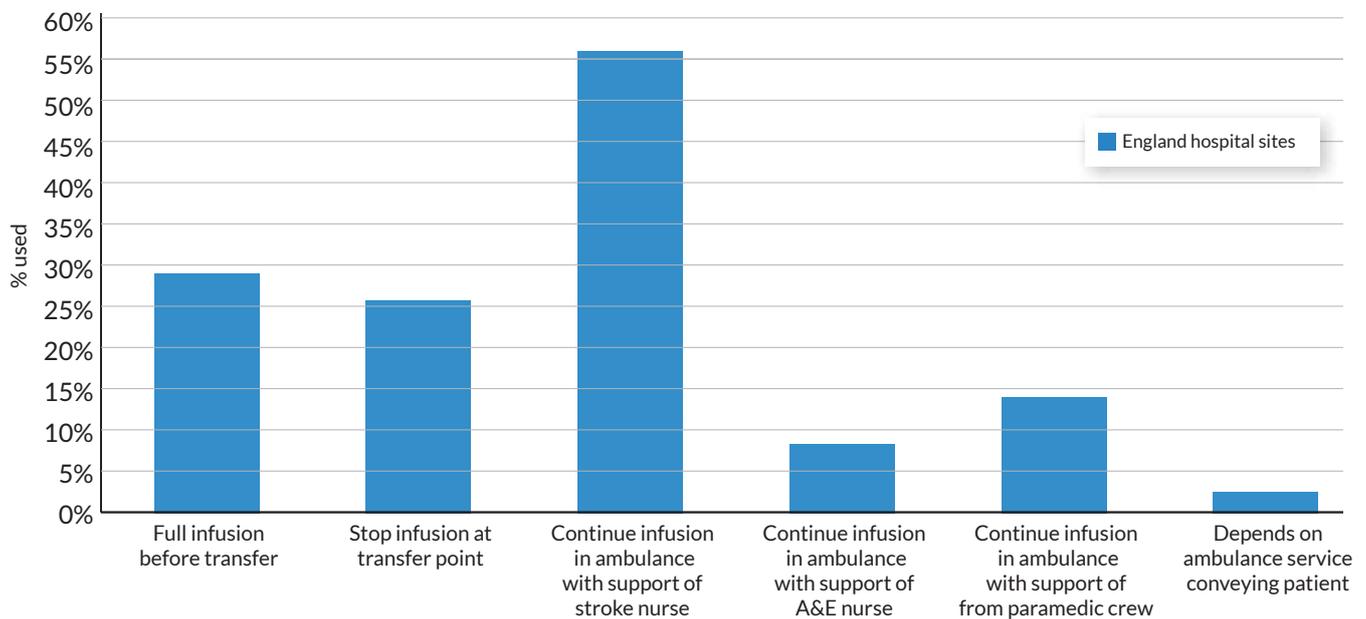


Section 3: Thrombolysis and thrombectomy

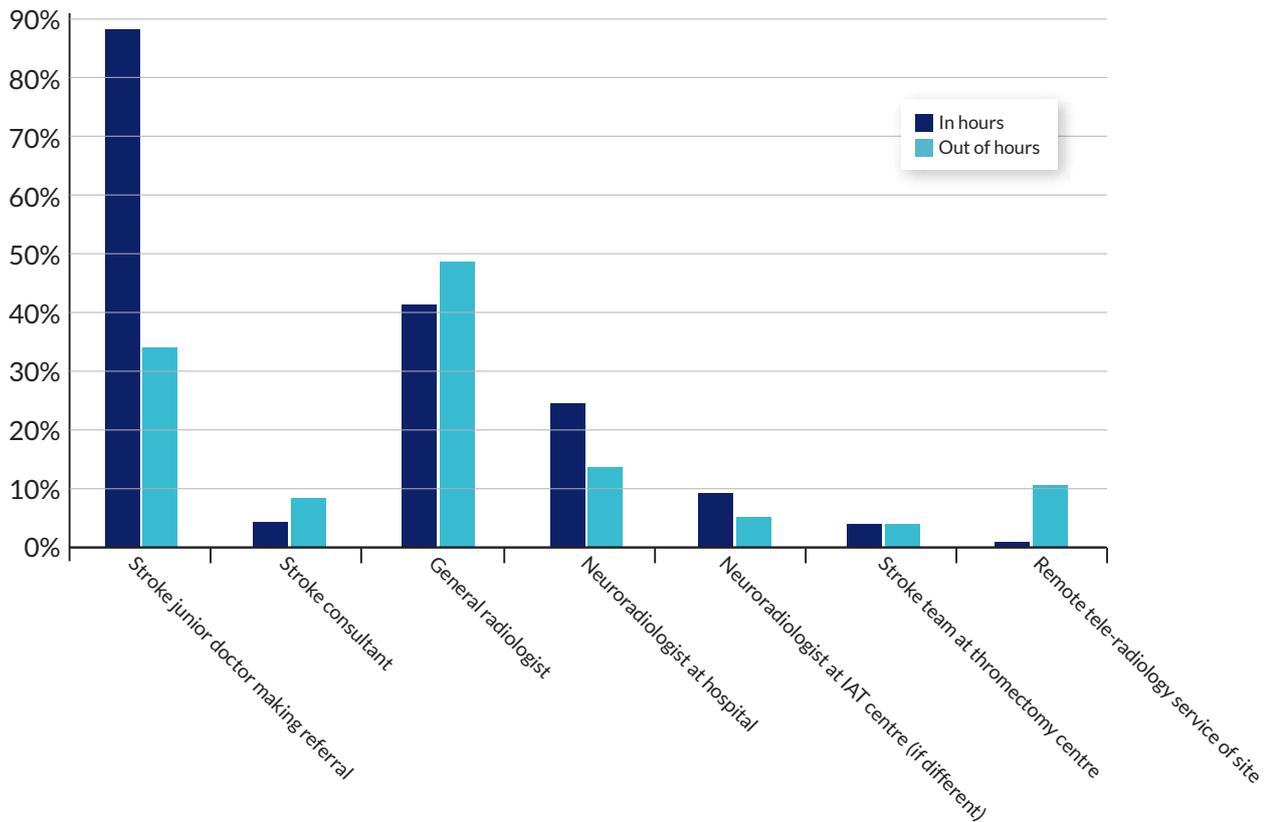
Q3.1: Where are the majority of your patients thrombolysed for each procedure?



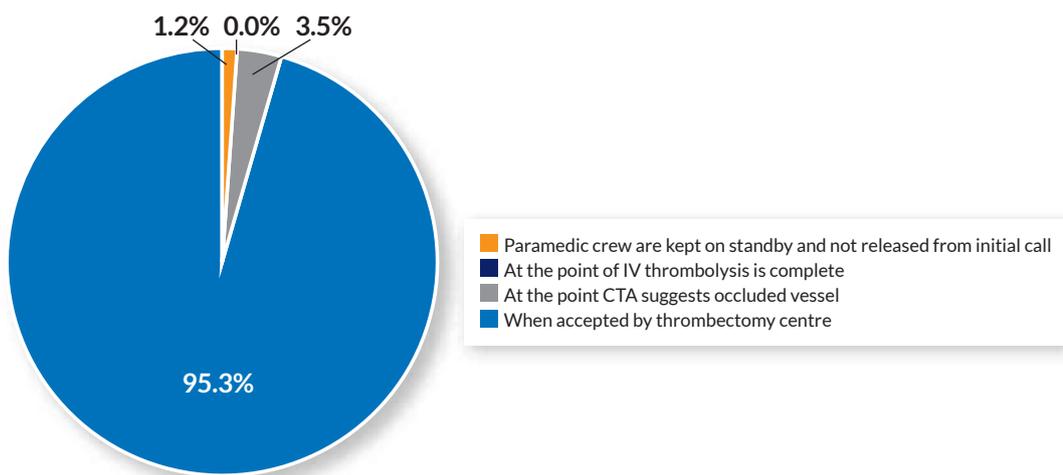
Q3.8 (For centres that refer appropriate patients to a thrombectomy centre): what is your process for IV thrombolysis prior to transfer for thrombectomy?



Q3.9 (For centres that refer appropriate patients to a thrombectomy centre): who makes the decision that there is a large vessel occlusion on CTA imaging prior to transferring for thrombectomy?



Q3.10 (For centres that refer appropriate patients to a thrombectomy centre): when a patient requires conveyance to the thrombectomy centre at what point do you call the first responder ambulance service?

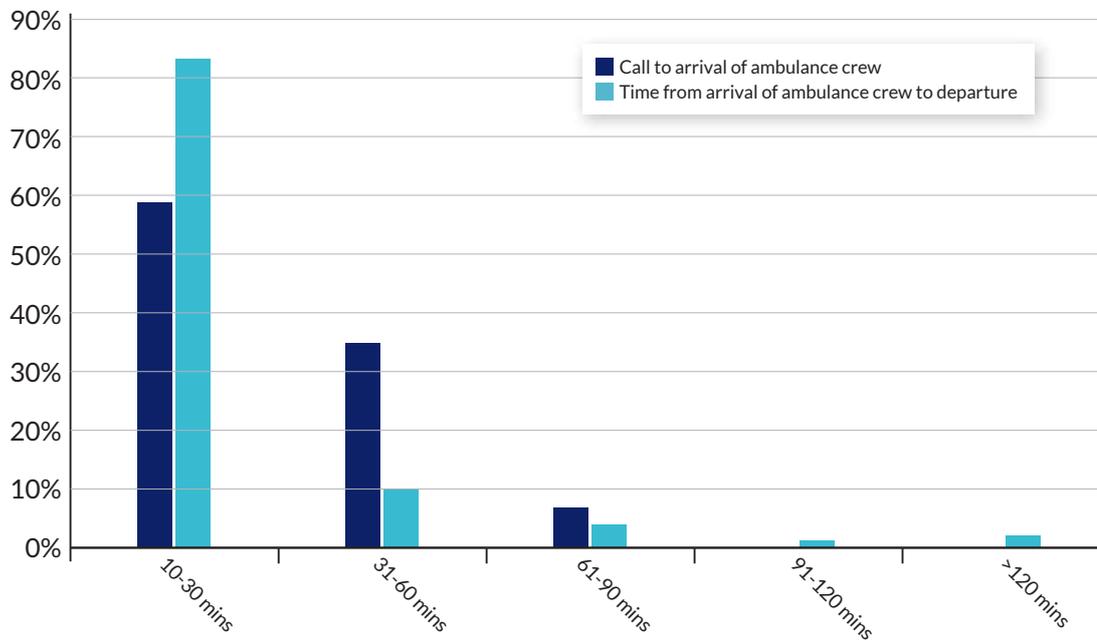


**Q3.11 (For centres that refer appropriate patients to a thrombectomy centre):
use of helicopter transfers for thrombectomy patients**

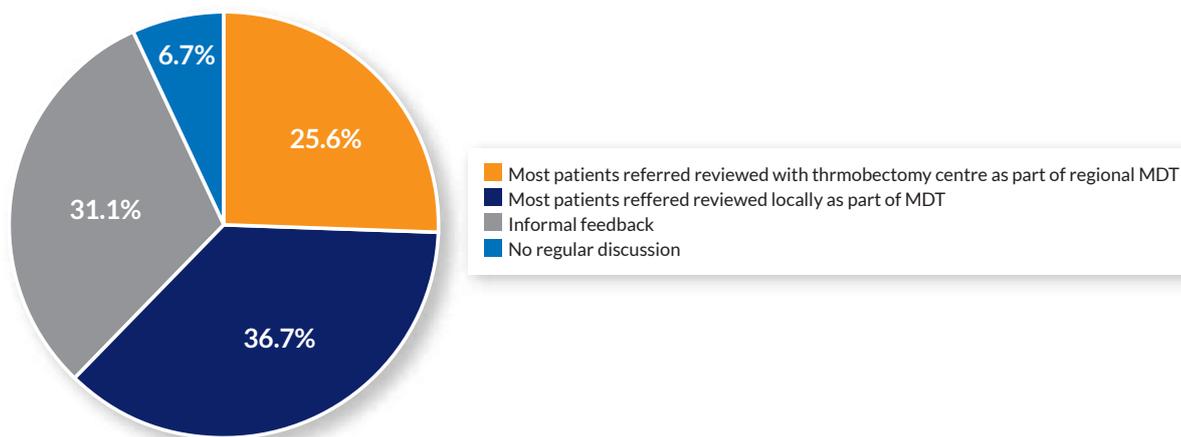
Metric	England		86 responses (100.0%)
	% Yes	% No	
Do the stroke team use helicopter transfers for thrombectomy patients	15.1%	84.9%	

Q3.12a: What is the average time between call to ambulance from acute hospital to arrival of ambulance crew at acute hospital for your last 5 cases / over last 12 months?

Q3.12b: What is the average time between arrival of the ambulance crew at the acute hospital to departure from acute hospital for your last 5 cases / over last 12?

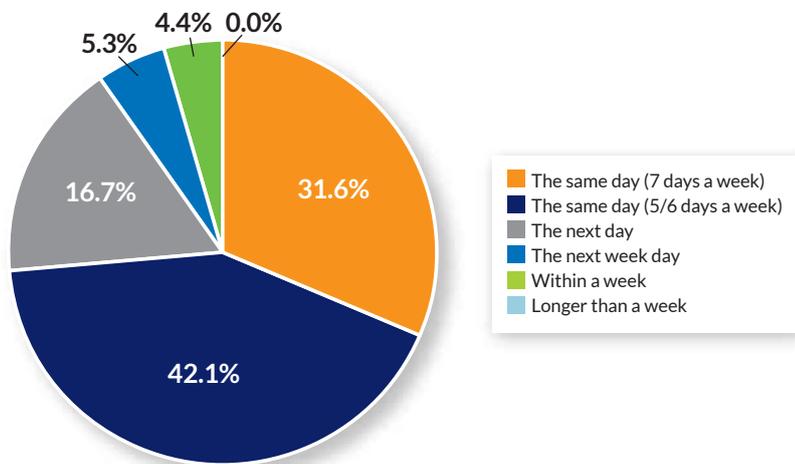


Q3.13: What are your arrangements (governance processes) for discussion of patients referred for thrombectomy?



Section 4: Specialist investigations for stroke and TIA patients

Q4.1: What is the usual waiting time for patients to receive carotid imaging?



Q4.2: Specialist investigations for stroke and TIA patients – imaging of intra-cranial vessels

Metric	England		
	% Yes	% No	
Do you ever image intra-cranial vessels for your ischaemic stroke patients	94.7%	5.3%	114 responses (100.0%)

Metric	England		
	% Yes	108 answered yes to Q4.2	
If yes to Q4.2: Do you ever image intra-cranial vessels for your ischaemic stroke patients.			
It is a routine investigation	8.3%	108 responses (100.0%)	
Only for patients that would be amenable to specific treatment if abnormality detected	91.7%		

Metric	England				
	In Hours	Out of Hours	In Hours	Out of Hours	
	% Yes	% Yes	108 answered yes to Q4.2		
If yes to Q4.2: Do you ever image intra-cranial vessels for your ischaemic stroke patients. Then which of the following methods do you use					
CTA	99.1%	83.3%	108 responses (100.0%)	108 responses (100.0%)	
MRA - (CEMRA)	45.4%	8.3%			
MRA - (ToF)	49.1%	10.2%			
No service		15.7%			

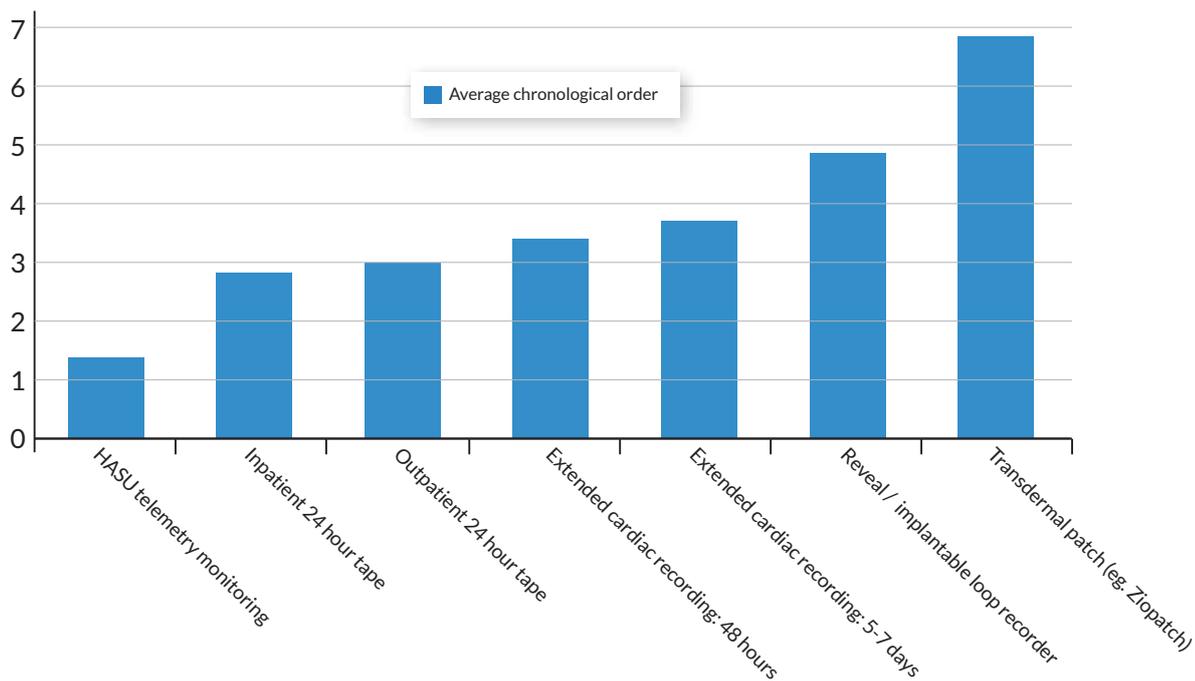
Q4.3: Specialist interventions for stroke and TIA patients

Metric	England		114 responses (100.0%)
	% Yes	% No	
Do you ever image extra-cranial vessels for your ischaemic stroke patients	96.5%	3.5%	

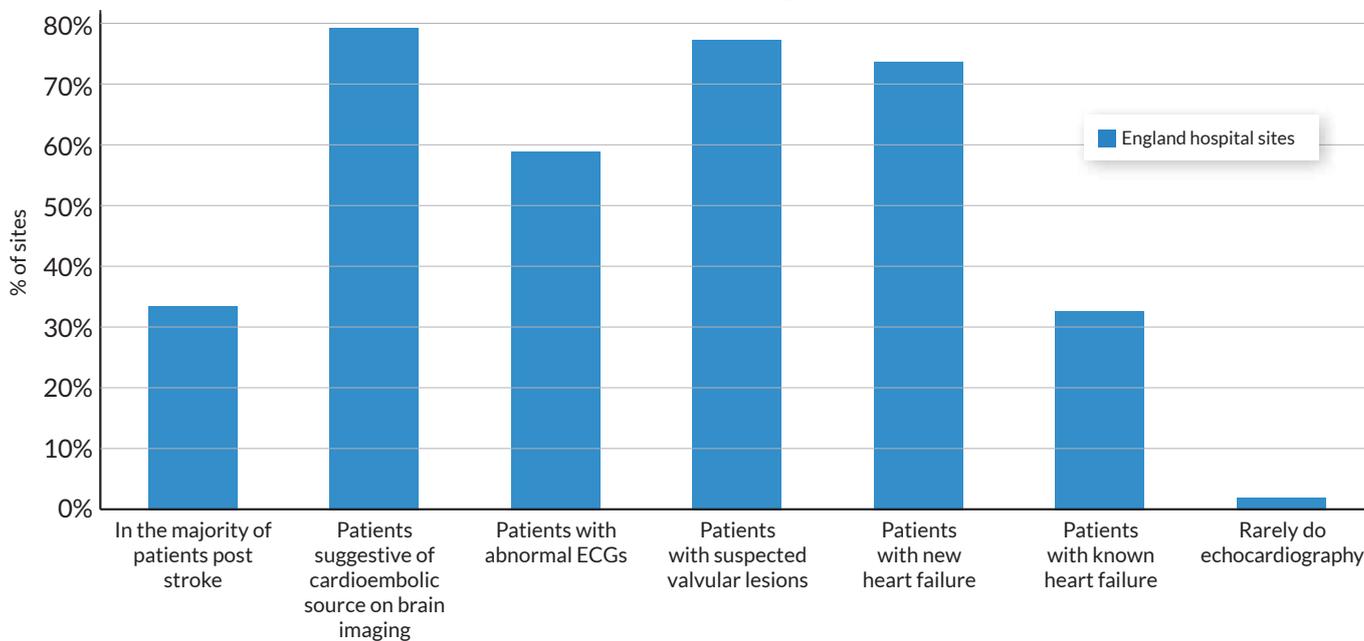
Metric	England		110 answered yes to Q4.3
	% Yes	% No	
If yes to Q4.3: Do you ever image extra-cranial vessels for your ischaemic stroke patients.			
It is a routine investigation	44.5%		110 responses (100.0%)
Only for patients that would be amenable to specific treatment if abnormality detected	55.5%		

Metric	England			
	In Hours	Out of Hours	In Hours	Out of Hours
	% Yes	% Yes	110 answered yes to Q4.3	
If yes to Q4.3: Do you ever image intra-cranial vessels for your ischaemic stroke patients. Then which imaging modality do you use as a first line to image extra-cranial vessels				
Doppler Ultrasound	82.7%	17.3%	110 responses (100.0%)	110 responses (100.0%)
CTA (AngioTac)	10.9%	60.9%		
MRA - (CEMRA)	2.7%	1.8%		
MRA - (ToF)	3.6%	0.9%		
No service		19.1%		

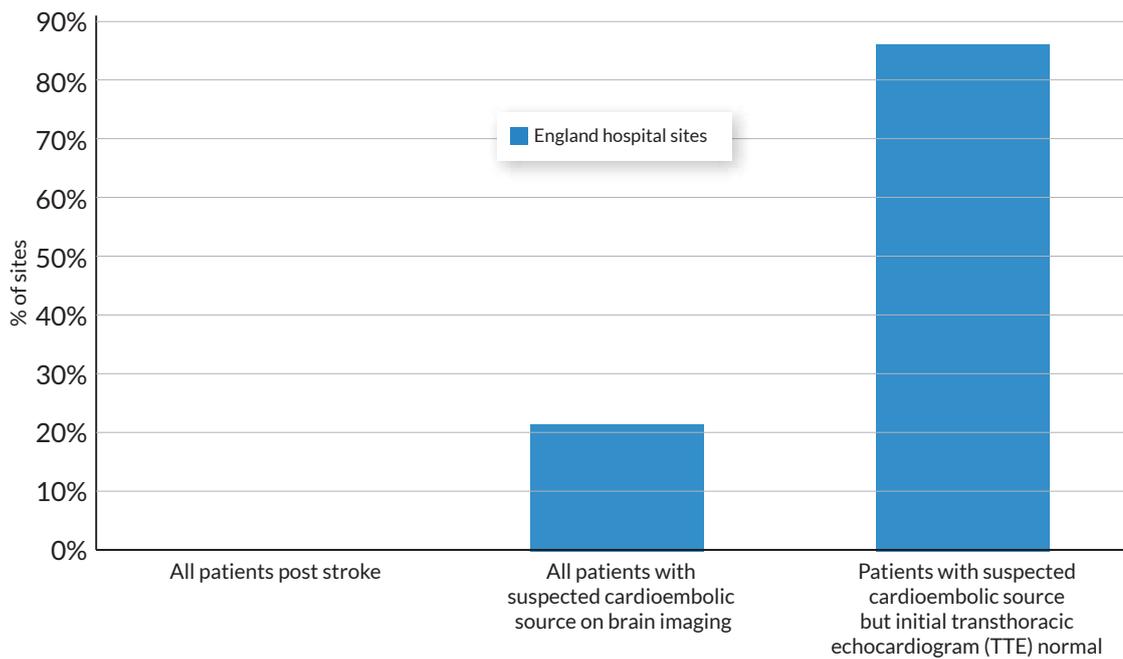
**Q4.4: What is your usual pathway for detecting paroxysmal atrial fibrillation?
(Chronological order - 1= First, 2 = Second, 7 = Last)**



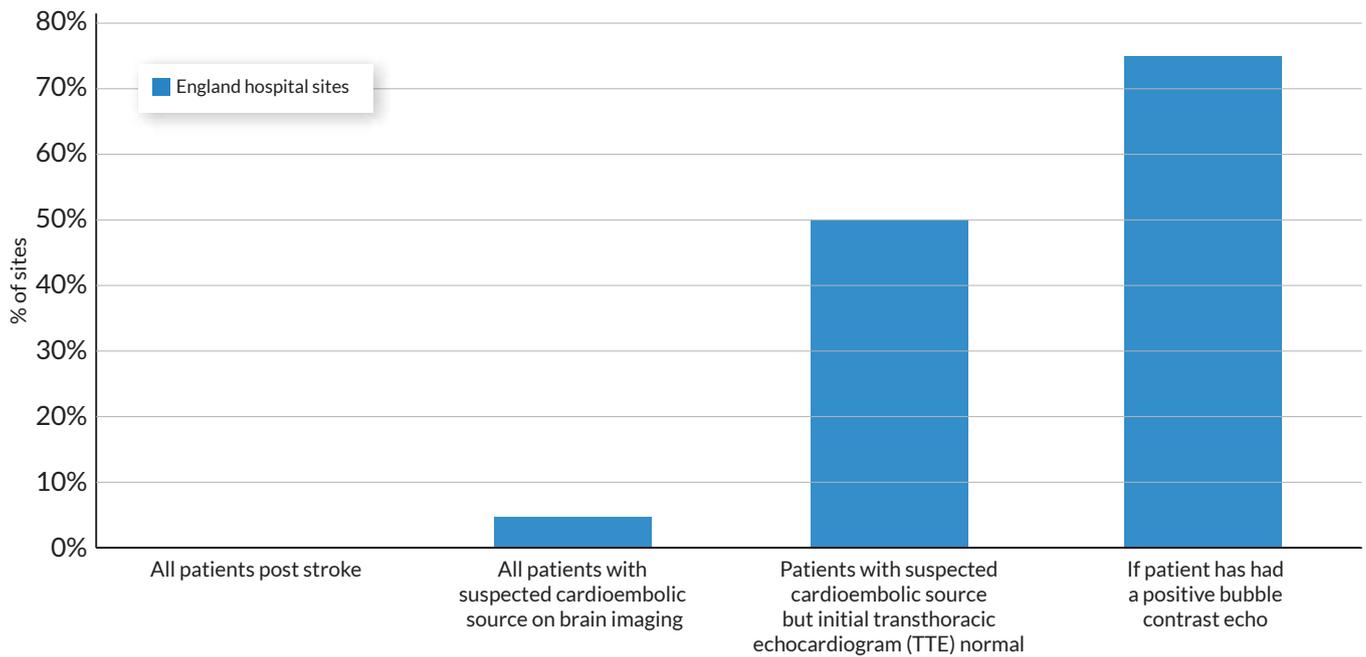
Q4.5: In which stroke patients do you normally perform echocardiography?



Q4.6: For which patients is a bubble contrast echo requested?



Q4.7: For which patients is a TOE (trans-oesophageal echo) requested?



Q4.8: Is PFO closure available local for stroke patients?

Metric	England		
	% Yes	% No	
Is PFO closure available locally for stroke patients	42.1%	57.9%	114 responses (100.0%)
If yes to Q4.8. Are all patients discussed at a specialist stroke/cardiology MDT before PFO closure is offered	87.5%	12.5%	48 responses yes to Q4.8 (100.0%)

Q4.9: In which stroke patients do you request thrombophilia screening?

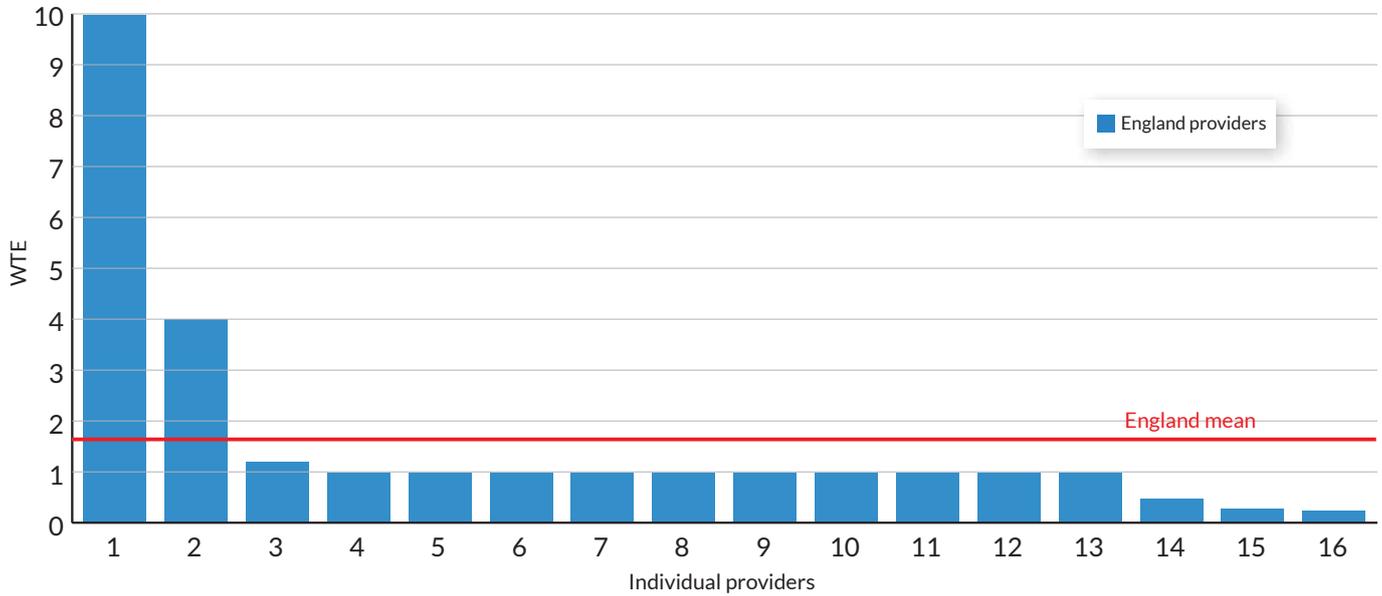
Metric	England	
	% Yes	
In which stroke patients do you request thrombophilia screening		
Majority of patients	3.5%	114 responses (237.5%)
Only patients under a specific age	72.8%	
Only patients with previous history of previous DVT/ PE /miscarriage	21.1%	
None	2.6%	

Q4.10: Use of imaging modalities

Metric	England	
	% Yes	
Which Imaging modality do you most frequently use in your neurovascular clinic for suspected TIAs: First line brain imaging		
Computed Tomography	50.0%	114 responses (100.0%)
Magnetic Resonance Imaging	45.6%	
Rarely image TIAs	4.4%	
Which Imaging modality do you most frequently use in your neurovascular clinic for suspected TIAs: First line carotid imaging		
Carotid Doppler	95.6%	114 responses (100.0%)
AngioTac	0.9%	
Contrast MRA	2.6%	
Time of Flight MRA	0.9%	
Rarely image TIAs	0.0%	
How frequently do you use first line carotid imaging in your neurovascular clinic for suspected TIAs?		
Frequently (>70%)	71.1%	114 responses (100.0%)
Sometimes (30-70%)	21.9%	
Rarely (<30%)	7.0%	

Section 5: Services and staff across all stroke unit beds

Q5.4: How many WTE physician associates work as part of your stroke team (response based on the 14% of stroke units that report having physician associates in their stroke team)



Q5.6: Review at 6 weeks

Metric	England % Yes
Reviews at 6 weeks	
Does a stroke patient get a post discharge review within 6 weeks post discharge from hospital	90.4%
If yes to Q5.6: Who completes the 6 week reviews post discharge from hospital	
Primary care	6.8%
Acute trust stroke team consultant	83.5%
Stroke Nurse in hospital/community	35.0%
Voluntary sector e.g. Stroke Association	6.8%
ESD team	17.5%
Community therapy team	10.7%
Not routinely arranged	1.0%
If no to Q5.6. Does a stroke patient get a post discharge review within 6 weeks post discharge from hospital	
Then are you commissioned to carry out 6 month reviews	27.3%

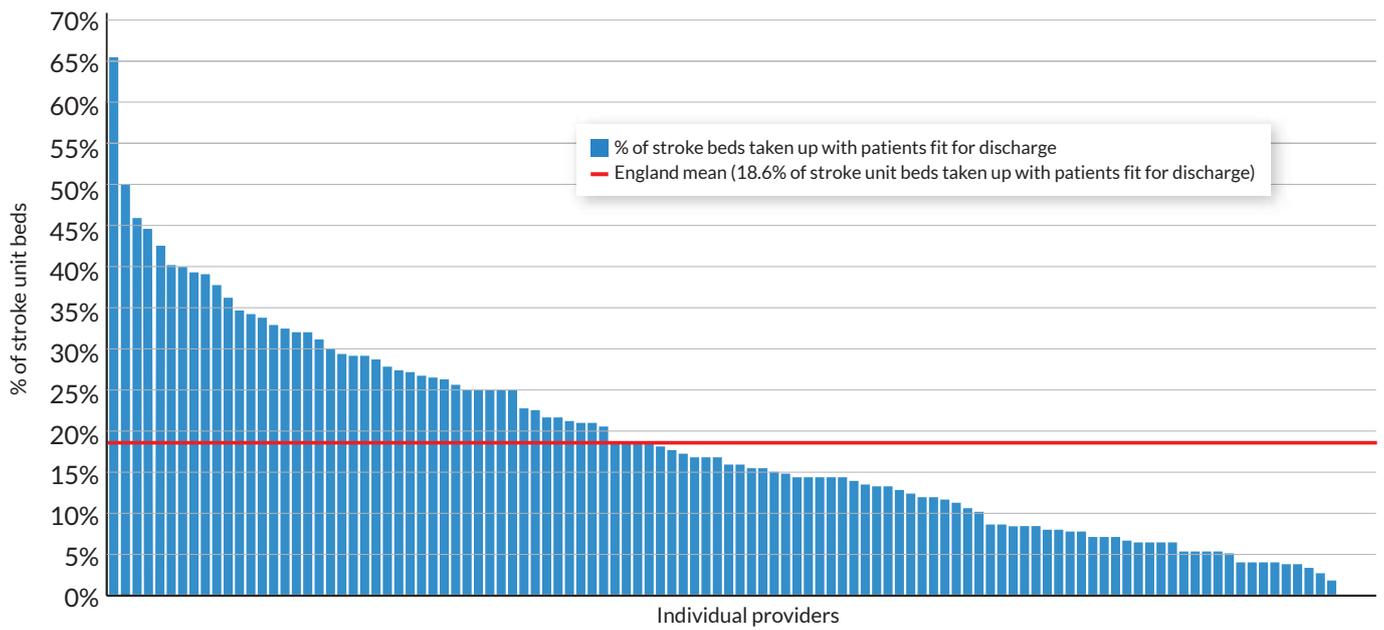
Note that units can select more than one option

Q5.9: Review at 6 months

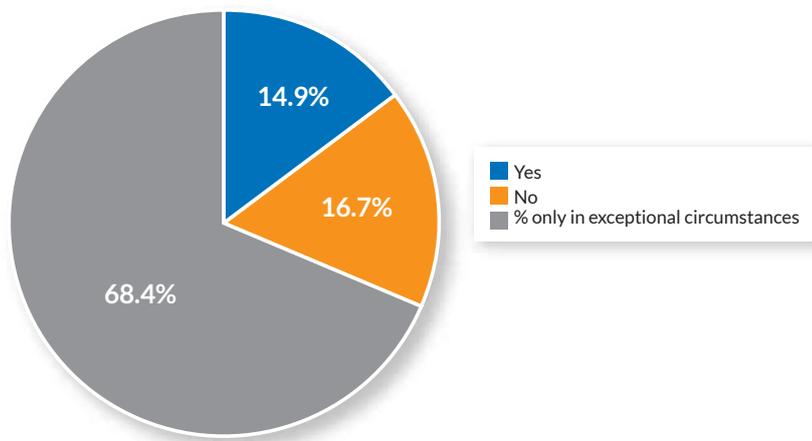
Metric	England % Yes
Are the patients that you discharge given a 6 month post stroke review	
All	43.0%
Some	47.4%
None	9.6%
Metric	England % Yes
If all or some was selected for Q5.9: Who carries out your 6 month reviews post discharge from hospital	
Specialist Stroke Nurses within hospital	24.3%
Specialist Stroke Nurses in community	40.8%
Stroke Association	27.2%
Other third sector	3.9%
Primary care	8.7%
Stroke Consultant at Acute Trust	31.1%
MDT 6 month review clinic i.e. with therapy support	12.6%
Community therapists	28.2%
No formal 6 month reviews	1.9%

Note that units can select more than one option

Q5.11: On the 3rd June 2019, how many patients on your stroke ward are medically fit for discharge?

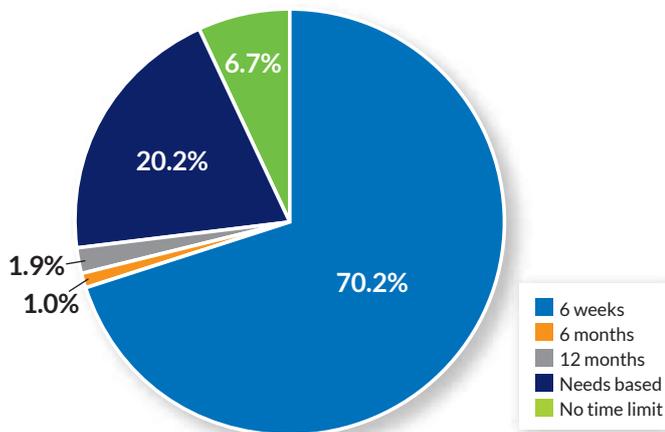


Q5.12: Do you move patients no longer receiving specific stroke intervention to other wards if you need the bed for another stroke patient?

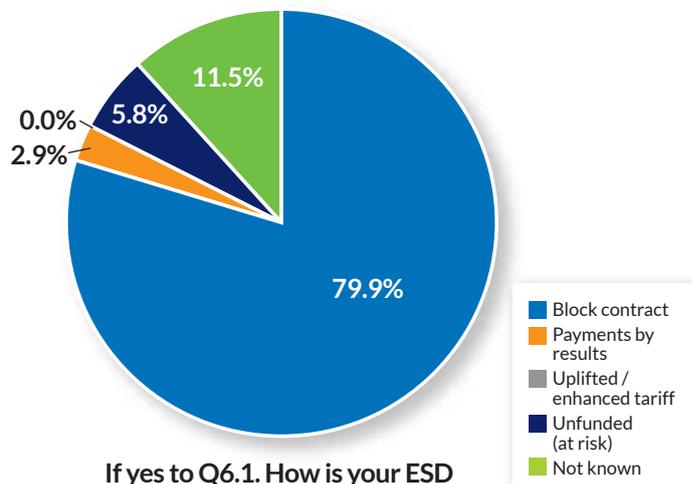


Section 6: Other stroke care models

Q6.1: Units were asked whether they had access to an Early Supported Discharge Team. The 92% responding “yes” were then asked the following additional questions:



If yes to Q6.1. For the ESD team that the majority of your patients attend, what duration of time post discharge are they commissioned for



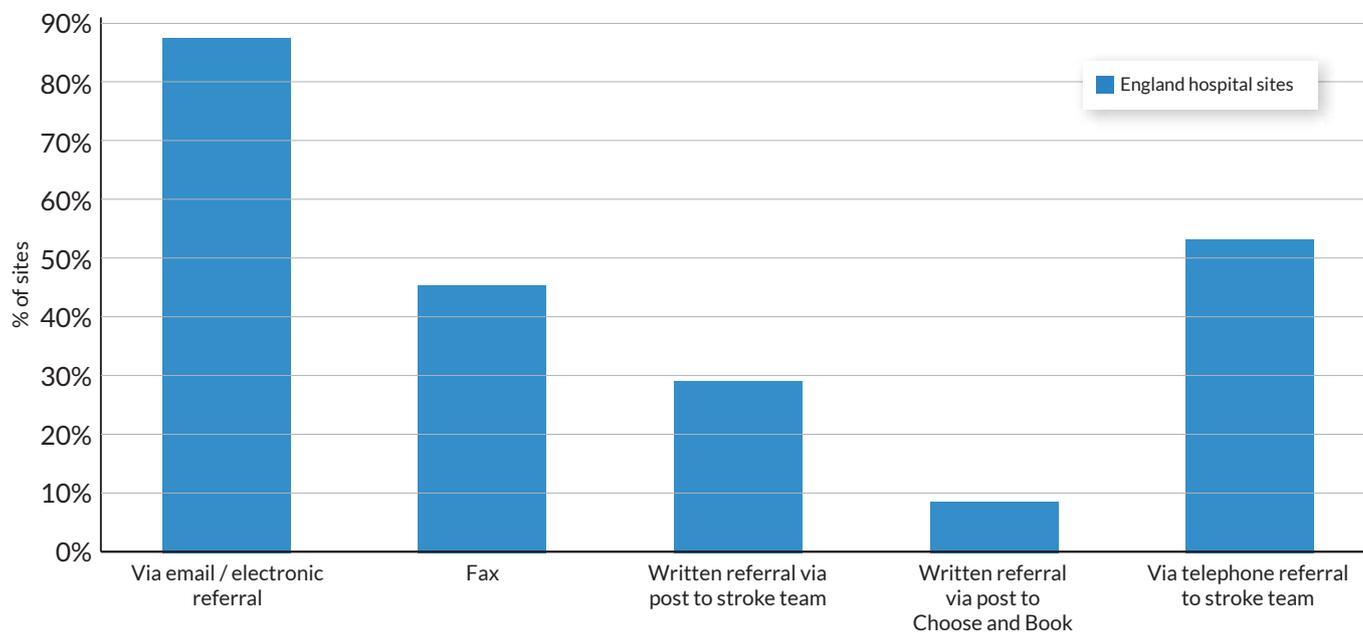
If yes to Q6.1. How is your ESD service currently funded

Q6.2: Specialist Early Support Discharge – do your teams have access to specialist spasticity services for the majority of patients?

Metric	England		
	% Yes	% No	
Do you have access to specialist spasticity services for the majority of patients	74.6%	25.4%	114 responses (100.0%)

Section 7: TIA/neurovascular services

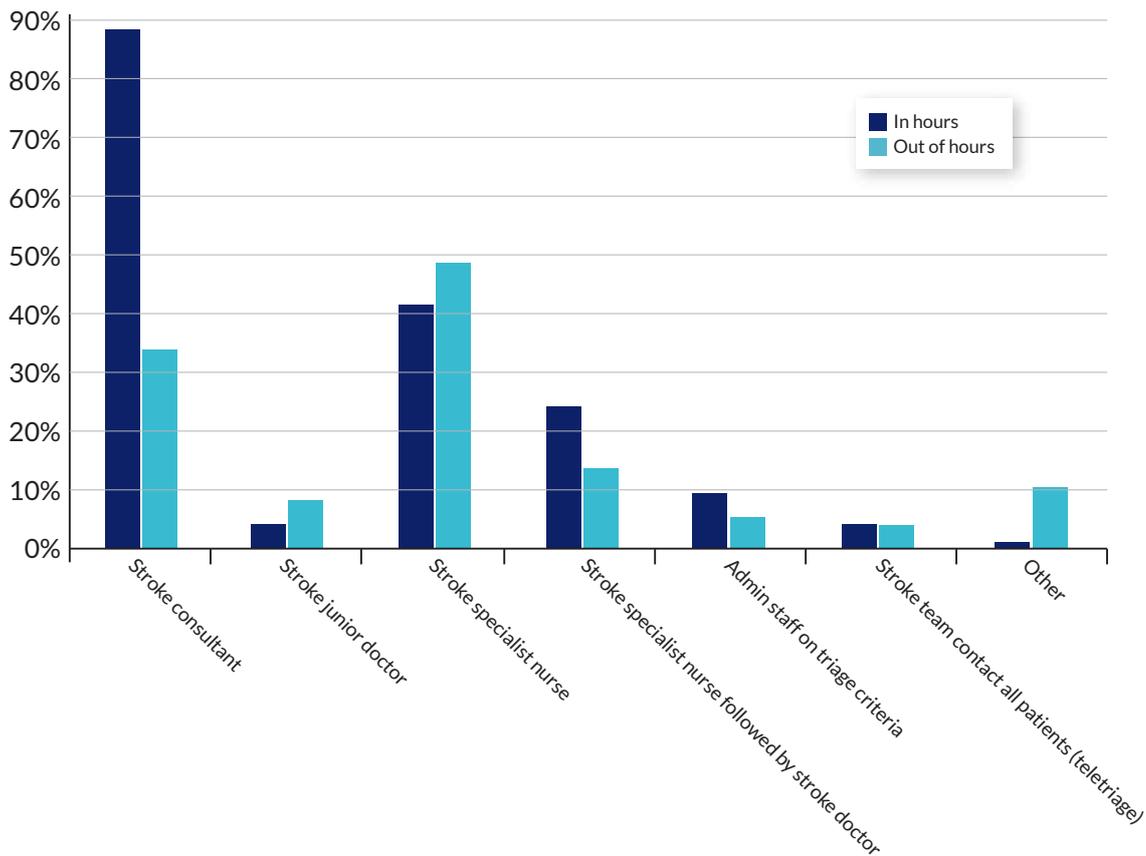
Q7.6: How are patients referred into your TIA / neurovascular services?



Q7.7 & Q7.8: Do the stroke team triage referrals to the TIA/neurovascular service?

Metric	England		
	% Yes	% No	
Do the stroke team triage referrals to the TIA /neurovascular service	85.5%	14.5%	110 responses (96.5%)
If yes to Q7.7: Does this involve a telephone call to the patient	58.5%	41.5%	94 responses out of 94 yes to Q7.7 (100.0%)

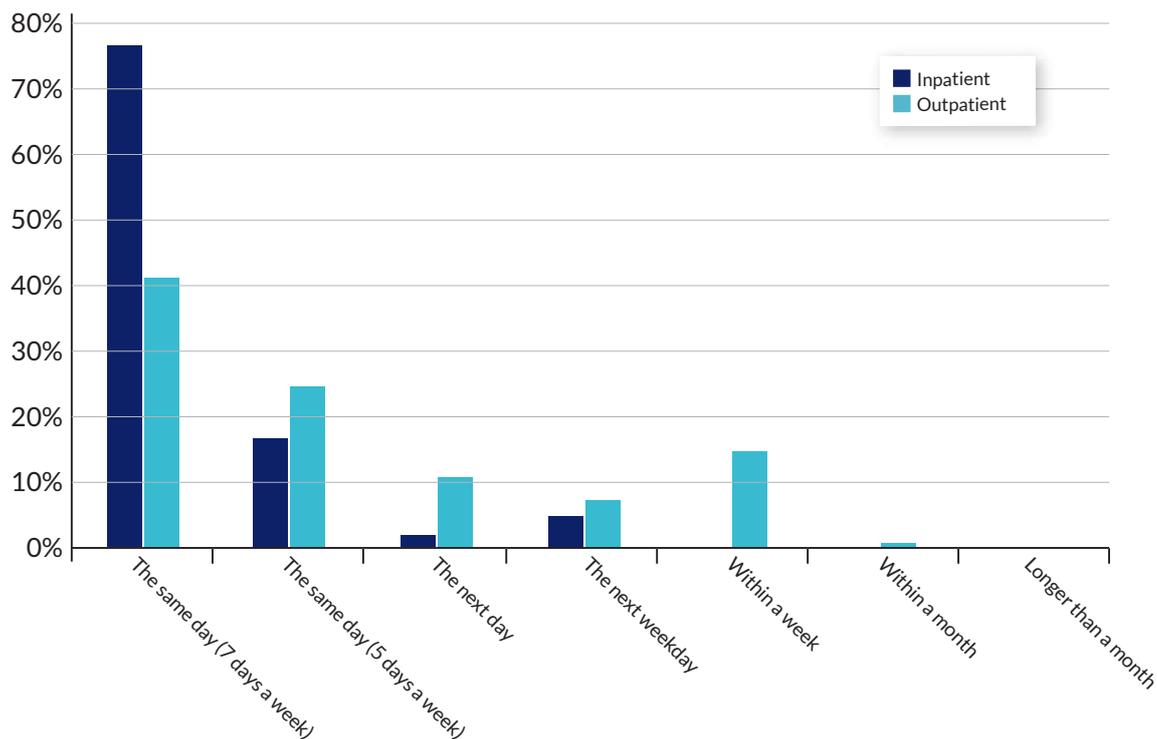
Q7.9: Who triages referrals to the TIA/neurovascular service?



Q7.10: Do you classify referrals as high risk or low risk of stroke using the ABCD(2) score?

Metric	England		
	% Yes	% No	
If yes to Q7.7: Do the stroke team triage referrals to the TIA / neurovascular service			
Do you classify your patients as high risk or low risk of stroke using the ABCD(2) score	54.3%	45.7%	94 responses out of 94 yes to Q7.7 (100.0%)

Q7.11: Within what timescale can you see, investigate and initiate treatment for ALL your TIA patients?



Section 9: Quality improvement, training & leadership and patients

Q9.3: Do you have formal meetings with your coding department to improve the quality of stroke coding?

Metric	England % Yes
Do you have formal meetings with your coding department to improve the quality of stroke coding	78.1%
If yes to Q9.3. How frequently are these formal meetings held	
Weekly	15.7%
Monthly	33.7%
Quarterly	12.4%
Annually	2.2%
ad hoc/occasionally	36.0%

Q9.4: Do you have 'breach' meetings to review performance against SSNAP quality standards?

Metric	England
	% Yes
Do you have "Breach" meetings to review performance against SSNAP quality standards	93.9%
If yes to Q9.4. How often are these meetings held	
Daily	0.0%
Weekly	37.4%
Monthly	45.8%
Quarterly	12.1%
Annually	0.0%
ad hoc/occasionally	4.7%

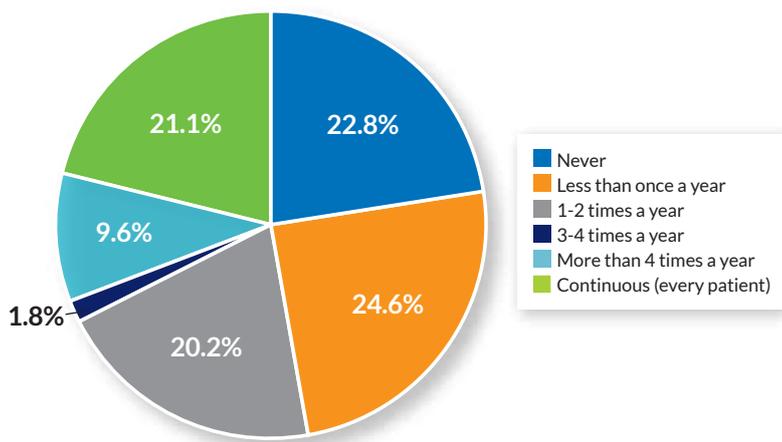
Q9.5: Do you have stroke specific mortality meetings within your trust?

Metric	England		
	% Yes	% No	
Do you have stroke specific mortality meetings within your Trust	83.3%	16.7%	114 responses (100.0%)
If Yes , are; some deaths reviewed	45.3%	54.7%	95 responses out of 95 that said yes (83.3%)
If Yes , are; all deaths reviewed	54.7%	45.3%	

Q9.6: Is there funding for external courses available for nurses and therapists?

Metric	England		
	% Yes	% No	
Is there funding for external courses available for nurses and therapists	88.6%	11.4%	114 responses (100.0%)

Q9.7: How often is there a formal survey seeking patient/carer views on stroke services?



About the GIRFT programme

Getting It Right First Time (GIRFT) is a national programme designed to improve treatment and care by reviewing health services. It undertakes clinically-led reviews of specialties, combining wide-ranging data analysis with the input and professional knowledge of senior clinicians to examine how things are currently being done and how they could be improved.

Working to the principle that a patient should expect to receive equally timely and effective investigations, treatment and outcomes wherever care is delivered, irrespective of who delivers that care, GIRFT aims to identify approaches from across the NHS that improve outcomes and patient experience, without the need for radical change or additional investment. While the gains for each patient or procedure may appear marginal, they can, when multiplied across an entire trust – and even more so across the NHS as a whole – deliver substantial cumulative benefits.

The programme was first conceived and developed by Professor Tim Briggs to review elective orthopaedic surgery to address a range of observed and undesirable variations in orthopaedics. In the 12 months after the pilot programme, it delivered an estimated £30m-£50m savings in orthopaedic care – predominantly through changes that reduced average length of stay and improved procurement.

The same model has been applied in more than 40 different areas of clinical practice. It consists of four key strands:

- a broad data gathering and analysis exercise, performed by health data analysts, which generates a detailed picture of current national practice, outcomes and other related factors;
- a series of discussions between clinical specialists and individual hospital trusts, which are based on the data – providing an unprecedented opportunity to examine individual trust behaviour and performance in the relevant area of practice, in the context of the national picture. This then enables the trust to understand where it is performing well and what it could do better – drawing on the input of senior clinicians;
- a national report, that draws on both the data analysis and the discussions with the hospital trusts to identify opportunities for improvement across the relevant services;
- an implementation phase where the GIRFT team supports providers to deliver the improvements recommended.

GIRFT and other improvement initiatives

GIRFT is part of an aligned set of workstreams within NHS England and NHS Improvement. It is the delivery vehicle for one of several recommendations made by Lord Carter in his February 2016 review of operational efficiency in acute trusts across England.

The programme has the backing of the Royal Colleges and professional associations and has a significant and growing presence on the Model Hospital portal, with its data-rich approach providing the evidence for hospitals to benchmark against expected standards of service and efficiency. The programme also works with a number of wider NHS programmes and initiatives which are seeking to improve standards while delivering savings and efficiencies.

Implementation

GIRFT has developed an implementation programme designed to help trusts and their local partners to address the issues raised in trust data packs and the national specialty reports to improve quality. The GIRFT team provides support at a local level through the NHS England regional teams, advising on how to reflect the national recommendations into local practice and supporting efforts to deliver any trust specific recommendations emerging from the GIRFT visits. GIRFT also helps to disseminate best practice across the country, matching up trusts who might benefit from collaborating in selected areas of clinical practice. Through all its efforts, local or national, the GIRFT programme strives to embody the ‘shoulder to shoulder’ ethos that has become GIRFT’s hallmark, supporting clinicians nationwide to deliver continuous quality improvement for the benefit of their patients.

Glossary of terms

ABCD(2)

A prediction tool for use in triaging patients presenting with acute TIA.

Academic Health Science Networks

NHS-led organisations that bring together health service, academic and industry members to improve patient outcomes and generate economic benefits by promoting innovation in healthcare.

Act FAST

Act FAST is a public health campaign highlighting that a stroke is a medical emergency and educating the public to take the symptoms of stroke seriously and call 999 immediately if they notice any single one of them in themselves or others.

Acute Organisational Audit (AOA)

The acute organisational audit provides a biennial 'snap-shot' of the quality of stroke service organisation in acute settings.

Acute Stroke Centre (ASC)

Stroke centre that provides hyper acute and acute stroke care and inpatient rehabilitation

Advanced practitioner

Healthcare professionals such as nurses, pharmacists and therapists who have developed skills and knowledge to allow them to take on expanded roles in caring for patients.

AMPDS

The Advanced Medical Priority Dispatch System (AMPDS) is a unified system used to dispatch appropriate aid to medical emergencies.

Atrial fibrillation

Atrial fibrillation is a heart condition that causes an irregular and often abnormally fast heart rate.

Bolus injection

Intravenous injection of a drug where the dose is given all at once.

British Association of Stroke Physicians (BASP)

The British Association of Stroke Physicians BASP was established in 1999 to promote the advancement of stroke medicine within Great Britain. Members are all practising doctors who care for patients with stroke, with the aim of providing the highest standard of care.

British Society of Interventional Radiology (BSIR)

The BSIR is a charitable foundation founded to promote and develop the practice of Interventional Radiology.

British Society of Neuroradiologists

The British Society of Neuroradiologists is the professional body that represents neuroradiologists. It is responsible for developing standards, supporting education and promoting collaborative research in Neuroradiology and across the Neurosciences.

British Society of Rehabilitation Medicine

The British Society of Rehabilitation Medicine represents doctors who practise in Rehabilitation Medicine.

Category 2

Categorisation of calls to the ambulance service, based on triaging of calls and identifying urgency of response (Category 1 – life threatening illness or injury, Category 2 – emergency, Category 3 – urgent calls, Category 4 – less urgent calls).

Care Quality Commission (CQC)

The CQC monitors, inspects and regulates services to make sure they meet fundamental standards of quality and safety and then publishes data, including performance ratings to help people choose care.

www.cqc.org.uk

Clinical Commissioning Group (CCG)

Clinically-led statutory NHS bodies responsible for planning and commissioning health care services for their local area. There are 207 CCGs in England.

Clinical nurse specialist

An advanced practitioner role, specialised in a specific area of nursing.

Commissioners

Commissioning is the process through which the health needs of the local population are identified and the services purchased and reviewed to meet those needs.

Comorbidity

The simultaneous presence of two or more chronic (long-term) diseases or conditions in a patient.

Comprehensive Stroke Centre (CSC)

Stroke centre that provides hyper acute stroke and acute stroke care, including thrombectomy and neurosurgery, and inpatient rehabilitation.

Cough reflex testing

Cough reflex testing is a well-established tool within the field of respiratory medicine to stimulate a cough response.

CQUIN

Commissioning for Quality and Innovation (CQUIN) is a commissioning framework that supports improvements in the quality of services and care by setting agreed goals and incentivising best practice.

CT

A CT scan or computerised tomography scan makes use of computer-processed combinations of many X-ray measurements taken from different angles to produce cross-sectional images of specific areas of a scanned object, allowing the user to see inside the object without cutting.

CT angiogram (CTA)

A computed tomography angiogram (CT angiogram) is a test that uses X-rays to provide detailed pictures of the heart and the blood vessels that go to the heart, lung, brain, kidneys, head, neck, legs, and arms.

Diagnostic Imaging Dataset

The Diagnostic Imaging Dataset (DID) is a central collection of detailed information about diagnostic imaging tests carried out on NHS patients, extracted from local Radiology Information Systems (RISs) and submitted monthly.

DiDo

Door-In-Door-Out time – used to measure the time between a patient arriving at a stroke centre and leaving for onward referral (after assessment) to a thrombectomy centre.

Dysphagia

Dysphagia is the medical term for swallowing difficulties.

Early Supported Discharge (ESD)

Early supported discharge is an intervention for adults after a stroke that allows their care to be transferred from an inpatient environment to a community setting. It enables people to continue their rehabilitation therapy at home, with the same intensity and expertise that they would receive in hospital.

Echocardiogram (echocardiography)

An ultrasound heart scan.

Endovascular stroke treatment

Non-surgical treatment for the sudden loss of brain function due to blood clots (see also Thrombectomy).

European Stroke Organisation

ESO aims to improve stroke care by providing medical education to healthcare professionals and the lay public. It acts as the voice of stroke in Europe with the goal to harmonise stroke management and reduce the burden of stroke.

GMC

General Medical Council. The GMC helps to protect patients and improve medical education and practice in the UK by setting standards for students and doctors.

www.gmc-uk.org

Haemorrhagic stroke

A haemorrhagic stroke occurs when a blood vessel in the brain ruptures and causes bleeding. The bleeding compresses brain tissue, damaging or killing it.

Health Education England

Health Education England is a Non-Departmental Public Body. It supports the delivery of excellent healthcare and health improvement to the patients and public of England by ensuring that the workforce of today and tomorrow has the right numbers, skills, values and behaviours, at the right time and in the right place.

Health Safety Investigations Branch

The Health Safety Investigations Branch conducts independent investigations of patient safety concerns in NHS-funded care across England.

Healthcare Quality Improvement Partnership (HQIP)

An independent organisation led by the Academy of Medical Royal Colleges, the Royal College of Nursing and National Voices.

www.hqip.org.uk

Hospital Episode Statistics (HES)

Data collected during a patient's time at hospital and submitted to allow hospitals to be paid for the care they deliver. The aim is to collect a detailed record for each 'episode' of admitted patient care delivered in England, either by NHS hospitals or delivered in the independent sector but commissioned by the NHS.

Hyper Acute Stroke Unit (HASU)

Hyper Acute Stroke Units (HASUs) bring together the equipment and expertise required to treat patients with stroke all day and every day.

Infusion injection

Intravenous injection where does is given slowly at a constant rate.

Integrated Care Systems (ICS)

Integrated care systems are NHS organisations that, in partnership with local councils and others, take collective responsibility for managing resources, delivering NHS care, and improving the health of the population they serve.

Integrated Stroke Delivery Networks (ISDNs)

ISDNs will be responsible for designing and delivering optimal stroke pathways, which will ensure that more people who experience a stroke receive high-quality specialist care, from pre-hospital, through to rehabilitation and life after stroke. Their development is key to delivering on the NHS Long Term Plan commitments for stroke.

Intercollegiate Stroke Working Party

The Intercollegiate Stroke Working Party is a working group of the Royal College of Physicians, which also oversees the National Audit Programme for Stroke.

Interventional radiology

A range of techniques that use radiological images to diagnose and treat diseases in a minimally invasive way.

Ischaemic stroke

Ischemic strokes (also referred to as brain ischaemia and cerebral ischaemia) are caused by a blockage in an artery that supplies blood to the brain. The blockage reduces the blood flow and oxygen to the brain, leading to damage or death of brain cells.

Joint Stroke Medicine Committee

The Joint Stroke Medicine Committee is a committee of the Royal College of Physicians, working alongside other professional societies for stroke medicine.

Length of stay

This is a term to describe the duration of a single episode of hospitalisation.

Loop recorders

An implantable loop recorder is a small device that records the electrical activity of the heart.

MRI

Magnetic resonance imaging (MRI) uses strong magnetic fields, magnetic field gradients, and radio waves to generate images of the organs in the body.

Multidisciplinary team (MDT)

A team of healthcare professionals from different disciplines.

National Institute for Health and Care Excellence (NICE)

Provides evidence-based guidance, advice, quality standards, performance metrics and information services for health, public health and social care.

www.nice.org.uk

National Optimal Stroke Imaging Pathway (NOSIP)

The NOSIP is an evidence-based consensus pathway setting out a best practice imaging pathway for patients with stroke that guides efficient use of resources, reduces duplication and provides rapid diagnosis of acute stroke.

Neuroradiology

The application of radiological principles to the study of the central nervous system.

Neurorehabilitation

Neurological rehabilitation aims to improve function, reduce symptoms and improve the wellbeing of people with diseases, trauma or disorders of the nervous system.

NHS Pathways

NHS Pathways is a suite of clinical assessment content for triaging telephone calls from the public, based on the symptoms they report when they call.

NHS RightCare

A national programme committed to delivering the best care to patients, reducing unwarranted variation, making the NHS's money go as far as possible and improving patient outcomes. Supported by NHS England.

www.england.nhs.uk/rightcare/

NHSX

NHSX is a joint unit bringing together teams from across the Department of Health and Social Care and NHS England and NHS Improvement to drive the digital transformation of care.

Non-elective

Emergency admission and treatment/surgery that is not pre-scheduled.

Patent Foramen Ovale (PFO)

A small opening between the two upper chambers of the heart.

Patient reported experience measures

Patient-reported experience measures (PREMs) are questionnaires measuring the patients' perceptions of their experience whilst receiving care.

Patient reported outcome measures

Patient Reported Outcome Measures (PROMs) assess the quality of care delivered to NHS patients from the patient perspective.

Percutaneous endoscopic Gastronomy (PEG)

Percutaneous endoscopic gastrostomy (PEG) is a procedure in which a tube is passed into a patient's stomach through the abdominal wall, most commonly to provide a means of feeding when oral intake is not adequate.

Perfusion

Perfusion scans involve injecting a small amount of radioactive substance into the body during MRI and CT scans to create images which show blood flow.

Physician associate

Physician Associates support doctors in the diagnosis and management of patients.

Royal College of Physicians

The RCP is an independent patient centred and clinically led organisation, that drives improvement in the diagnosis of disease, the care of individual patients and the health of the whole population both in the UK and across the globe.

Sentinel Stroke National Audit Programme (SSNAP)

The Sentinel Stroke National Audit Programme (SSNAP) is a major national healthcare quality improvement programme based in the School of Population Health and Environmental Studies at King's College London. SSNAP measures the quality and organisation of stroke care in the NHS and is the single source of stroke data in England, Wales, and Northern Ireland.

Stroke Association

The Stroke Association is a third sector organisation that provides specialist support, funds critical research and campaigns to make sure people affected by stroke get the very best care and support to rebuild their lives.

Stroke recovery passport

The Stroke Passport is a document that is designed to help patients with stroke, their families and carers understand stroke. It contains information from a patient's first admission to hospital through to discharge and on-going stroke journey. It contains useful information and can be used as a tool for documenting key aspects of a patient's stroke and recovery.

Stroke Recovery Unit (SRU)

A stroke unit that provides acute stroke care and inpatient rehabilitation only.

Subarachnoid haemorrhage (SaH)

An extremely serious medical condition where bleeding from a ruptured cerebral aneurysm can cause rapid and extensive brain damage.

Subdural haematoma

A serious condition where blood collects between the skull and the surface of the brain. It's usually caused by a head injury. Symptoms of a subdural haematoma can include: a headache that keeps getting worse.

Sustainability and Transformation Partnership (STP)

Areas covering all of England, where local NHS organisations and councils drew up shared proposals to improve health and care in the areas they serve.

Thrombectomy

Thrombectomy or mechanical thrombectomy involves using a specially designed clot removal device inserted through a catheter to pull or suck out a blood clot to restore blood flow.

Thrombolysis

Treatment with injections of a medicine called alteplase, which dissolves blood clots and restores blood flow to the brain.

TIA (Transient Ischaemic Attack)

A TIA, also known as a mini stroke, is caused by a temporary blockage or decreased blood flow to the brain.

Transoesophageal echocardiography

A transoesophageal echocardiograph is a way to obtain images of the heart using an ultrasound transducer that is inserted directly into the oesophagus.

UK Neurointerventional Group

The United Kingdom Neurointerventional Group (UKNG) represents specialist doctors who perform minimally invasive operations on the brain, spine, head and neck blood vessels.

Venous thromboembolism

Venous thromboembolism is a condition where a blood clot forms (most often in the deep veins of the leg, groin or arm (known as deep vein thrombosis, DVT)) and travels in the circulation, lodging in the lungs (known as pulmonary embolism, PE).

Video fluoroscopy

A video fluoroscopy is a moving x-ray examination of swallowing.

Acknowledgements

We feel privileged to have been part of the team that have completed this comprehensive review of stroke services in England. Bringing a project such as this to fruition was a mammoth undertaking, which neither of us quite appreciated when we applied to lead the programme in 2017.

Over the last 20 years, the practice of stroke medicine and model of care delivery has evolved. Stroke medicine becoming a NHS England Long Term Plan priority will foster policy changes that will advance stroke care for all, but there is still so much to do.

Taking a networked approach from the outset seemed appropriate and obvious to us both, as we appreciated that organisations working in isolation were unlikely to achieve the improvement in care we hoped to see. Although the organisation of 22 face-to-face regional improvement days felt like planning a wedding every other week, the corresponding subsequent report writing to provide national and then regional benchmarking for each trust was a real labour of love. This novel approach required an additional set of skills and dedication from the wider GIRFT team, which we are eternally grateful for.

We are particularly grateful to our programme manager Caroline Davies, who supported us throughout our journey; to Anne and Maddy, who diligently provided the rich sources of data with humour, patience and pragmatism; and to Lara and Georgie for all their support in the 'second half'... and a supply of Diet Coke! Angus Ramsay, was a key contributor to researching and drafting the discussion about leadership and culture in this report. Angus also provided invaluable wisdom and support upon our improvement methodology and knowledge transfer quest, not to mention significant practical support as the 'Slido wizard' at our improvement events.

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The many clinical and subject matter experts who counselled us during both the planning, delivery and then review process are too numerous to name, although particular thanks to Helen Rodgers, Martin James, David Werring, Juliet Bouverie, Gary Ford and Rebecca Fisher, as well as colleagues at NHSE Clinical Policy Unit, SSNAP and BASP.

Our drive to improve both the care stroke survivors receive and also the working environment for colleagues stems from the most amazing and supportive training we both had in geriatric and stroke medicine. As with any acceptance speech, some names are omitted – not because you are not important, but because we have hopefully already told you how special you are. Your collective efforts cannot be underestimated and we hope this report is a worthy reflection of the time, care and expertise you imparted upon us. David is particularly indebted to the wisdom and support of Ajay Bhalla, Hugh Markus, Val Pomeroy and Andy Clifton. Deb's 'Yoda' will forever be Dr Anil Sharma and her Merseyside stroke family, but other cheerleaders include Michelle Kidd and Tony Rudd. We have learnt so much from our multidisciplinary team colleagues and, most importantly, we have learnt from stroke survivors and their families.

A final colossal thank you to our amazing families and friends who have supported us through this process, excusing the many long evenings and weekends we have devoted to complete this project.

We are optimistic. The combined efforts of all the dedicated stroke healthcare practitioners, working with the GIRFT stroke programme and the new NHSE National Stroke Service Model, with support from NHSE's National Stroke Programme, promises to be the beginning of an accelerated journey of continuous quality improvement in stroke care in England. We've only just begun...

Thank you.

David Hargroves and Deb Lowe

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The full report and executive summary are also available to download as
PDFs from: www.GettingItRightFirstTime.co.uk