

Saving Brains

Save brains. Save money.
Change lives.

#SavingBrains

Rebuilding lives after stroke

Stroke
Association

"My thrombectomy was so quick and so effective – it's miraculous really."

Karen, stroke survivor

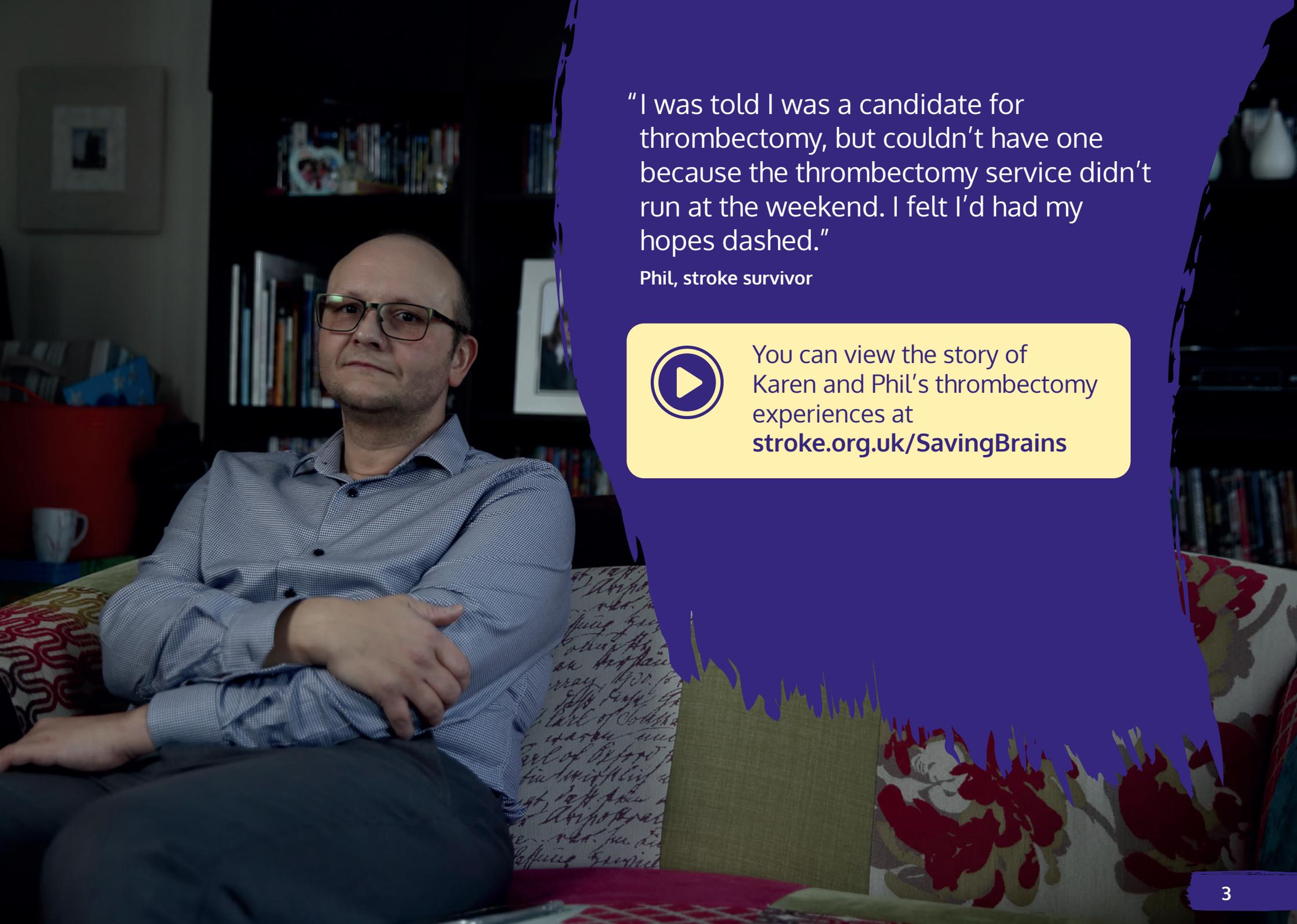


Contents

Introduction	4
Summary and recommendations	6
What is a thrombectomy?	12
What can a thrombectomy patient's journey look like?	14
2020/21 access and rates across England	16
How can we improve thrombectomy rates?	20
Challenges and opportunities	20
Methodology	34
Glossary	35
References	36

"I can't see what would be more important than a procedure that saves someone's life or stops them being disabled. Nothing beats the feeling of doing a thrombectomy and seeing someone the next day drinking their tea, sitting up, walking around."

Dr William Mukonoweshuro, Interventional Neuroradiologist (INR), Derriford Hospital, Plymouth



"I was told I was a candidate for thrombectomy, but couldn't have one because the thrombectomy service didn't run at the weekend. I felt I'd had my hopes dashed."

Phil, stroke survivor



You can view the story of Karen and Phil's thrombectomy experiences at stroke.org.uk/SavingBrains

Introduction

A stroke happens in the brain, the control centre for who we are and what we can do.

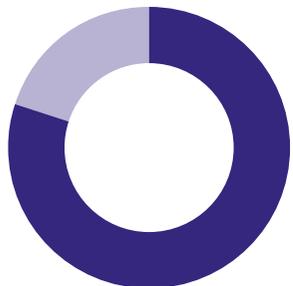


Stroke strikes every five minutes. It's a leading cause of death and disability in the UK.

Thrombectomy is a game-changing treatment for stroke. It changes the course of recovery from stroke in an instant, significantly reducing the chance of disabilities like paralysis, visual impairment and communication difficulties.

It is also extremely cost-effective. Rolling out thrombectomy fully could save the UK £73 million a year, by reducing demand for rehabilitation and community support services.

But thrombectomy isn't currently available for everyone who needs it (~10% of all stroke patients). The treatment is subject to a postcode lottery and in 2020/21, nearly 80% (5,889) of patients in England who needed a thrombectomy missed out.⁴



In 2020/21 nearly 80% (5,889) of patients in England who needed a thrombectomy missed out.⁴

Despite brilliant efforts from stroke doctors, nurses, paramedics and their teams to expand thrombectomy to more patients, provision is patchy due to pathway challenges and a lack of staff and capital funding. Whether you can have a thrombectomy currently depends on where you live and when you have your stroke.

24/7 access to thrombectomy is essential to reducing disability after stroke and tackling the persistent postcode lottery. Addressing health inequalities is a key priority for the government and NHS. Universal access to thrombectomy in England would enable 1,600 more people to be independent after stroke each year, and thousands more would live with fewer disabilities. With the right support and resources, stroke services could transform access to this treatment.

This report features some of the amazing people working tirelessly to improve outcomes for stroke patients, under challenging circumstances and often at a personal cost. And most importantly, it shows how truly life-changing thrombectomy can be for patients.

The Stroke Association hopes this report will galvanise action at government and ICS levels that will benefit both stroke patients and professionals. **We must urgently secure access to a 24/7 thrombectomy service, for every stroke patient who needs it.**

NHS policy context

In 2019, NHS England's Long Term Plan committed to rolling out thrombectomy fully by 2022, recognising the enormous benefits of this treatment to patients and our health service. Yet, current rates stand at just 2.8% in England, far off the 10% needed.⁵

The 2022-23 NHS Mandate⁶ outlines increasing access to thrombectomy as a key priority this year, with all seven NHS England regions currently undertaking Thrombectomy Quality Reviews to identify areas for local improvement. Thrombectomy is also a key aspect of NHS England's National Stroke Service Model - the blueprint for improving stroke services across the country.

This summer, NHS England is revising its stroke targets as part of a refresh of the Long Term Plan. We want to see an ambitious new target for thrombectomy so that by 2029, no patient who needs a thrombectomy misses out.

But words are not enough. We also need the associated staff, funding and resources to make it happen, as well as the involvement of the whole stroke community - including professionals, researchers, patients and their families and industry partners. England's 42 new Integrated Care Boards (ICBs) must take leadership on stroke - acting together with specialised commissioning, regional medical directors and Integrated Stroke Delivery Networks (ISDNs) to improve thrombectomy access.

Current rates of thrombectomy in England

Current rates stand at just **2.8%**



Far off the **10%** needed



This report focuses on the barriers and challenges to increasing thrombectomy rates in England. The four UK nations have different stages of thrombectomy rollout and implementation. To see the progress and recommendations in Scotland, Wales and Northern Ireland, please visit stroke.org.uk/get-involved/campaigning/saving-brains.

Summary and recommendations

Summary



Thrombectomy saves brains.

It significantly reduces the chance of disabilities like paralysis, visual impairment and communication difficulties after stroke.⁷

Saves money.



Evidence shows thrombectomy could save the health and care system £73 million each year.⁸



And changes lives.

Universal access to thrombectomy in England would support 1,600 more people to be independent after stroke each year.

Access to thrombectomy varies hugely across England, creating a postcode lottery. Whether you can have a thrombectomy depends on where you live and when you have your stroke.



Nearly 80% (5,889) of patients in England who needed a thrombectomy missed out in 2020/21.⁹



This is unacceptable at a time when reducing health inequalities is a government and NHS priority.

We also lag behind other developed health systems internationally.



A stroke can happen to anyone at any time, and thrombectomy procedures have to be performed quickly.

The procedure can be performed up to 24 hours after a stroke, but is most effective in the first six hours.¹⁰ However, only 6 of the 24 centres operate on a 24/7 basis, and 10 only operate Monday to Friday or limited hours.



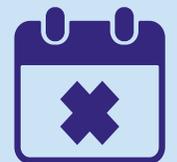
Gradually, more patients are receiving thrombectomy, but the current rate (2.8%) is still far below the original commitment to rollout thrombectomy fully (10%) by 2022.



If thrombectomy rates stayed at 2020/21 levels, 47,112 patients will miss out on the procedure by 2029/30.

The NHS Long Term Plan's new 2029 thrombectomy target provides a huge imperative and opportunity to increase rates.

However, this requires regional buy-in, prioritisation and collective ownership of pathway improvements, as well as strong leadership from Integrated Care Boards (ICBs).



That's why we're calling for thrombectomy to be available 24/7 for all patients who need it as soon as possible.

Our recommendations

The UK Government and local system leaders must recognise the 'size of the prize' for thrombectomy. There are huge gains to be made by improving thrombectomy access. This treatment deserves priority, investment and action so that thrombectomy is available to everyone who needs it.

NHS England's revised Long Term Plan thrombectomy target must be ambitious, supported with a roadmap for delivery. To realise this commitment:



Treating every patient who needs thrombectomy could save the health and care system £73 million each year.¹¹



Upfront capital funding

- The Treasury should provide urgent funding for thrombectomy in the Autumn Budget 2022, for infrastructure, equipment, workforce training and support, targeting both thrombectomy centres and referring stroke units.
- The seven NHS regions should prioritise thrombectomy capital funding over other demands, due to its life-changing impact and cost-effectiveness.¹²



Sustainable stroke workforce

- The General Medical Council and Royal College of Radiologists should work together to agree and approve a thrombectomy credential that ensures safe, effective scaling of thrombectomy capacity.
- The Department for Health and Social Care should develop a sustainable stroke workforce plan in its upcoming workforce strategy, considering all the professionals involved in thrombectomy services.



Addressing ambulance pressures

- Where possible, ambulance crews should wait whilst the patient is being scanned as per the National Optimal Stroke Imaging Pathway, and thrombectomy inter-hospital transfers should be prioritised to avoid harmful delays.
- NHS England should address the wider system challenges in its upcoming Urgent & Emergency Care Plan, to mitigate ambulance pressures that prevent quick access to thrombectomy.



Local quality improvement

- Local systems (including Hospital Trusts, Integrated Care Boards and Integrated Stroke Delivery Networks, supported by Regional Medical Directors) should work together to optimise current thrombectomy pathways, learning from what works elsewhere.
- Local systems should enact the recommendations from each of the seven regional Thrombectomy Quality Reviews.



Innovation into practice

- Well-evidenced innovations (such as AI imaging software and video triage in ambulances) should be universally adopted, to speed up and maximise the benefits of thrombectomy.
- Research funders should fund further research in thrombectomy, to help increase rates and the number of patients who can access it, as per the Stroke Priority Setting Partnership's findings.¹³



“The thrombectomy, coupled with John’s sheer motivation, have allowed him to make such a good recovery. He is able to do all of the things that are important to him.”

Like most GPs, Dr John Stephens had heard of thrombectomy although he hadn’t seen a patient who had received it. But now he’s had a thrombectomy himself, John’s convinced it should be available to everyone who needs it.

John, 59, had his stroke at home in Dorset in September 2021, whilst he was getting ready for work. Once John was taken to the Royal Bournemouth Hospital for initial scans, he was transferred to Southampton General Hospital for the thrombectomy.

John said: “I was scared. I thought I was going to die. The consultant held my hand and reassured me. He was brilliant, it was very compassionate medicine. It was done under local anesthetic and took about an hour. I remember them putting a catheter in my groin. They didn’t quite remove the whole clot, but they removed enough to allow me to make a good recovery.”

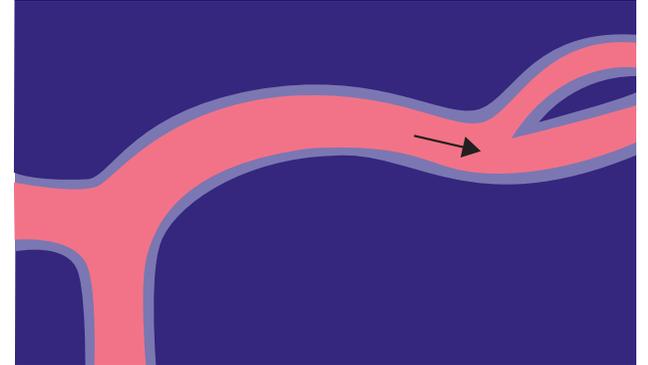
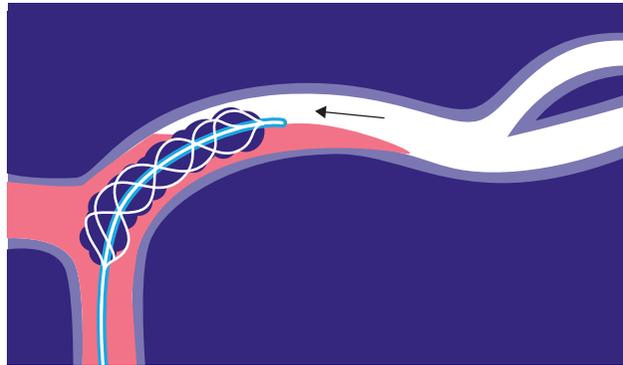
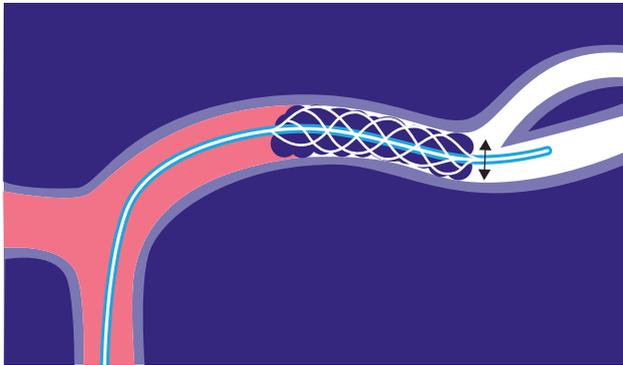
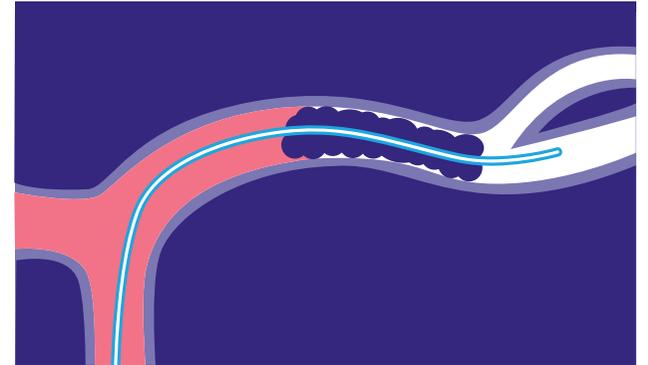
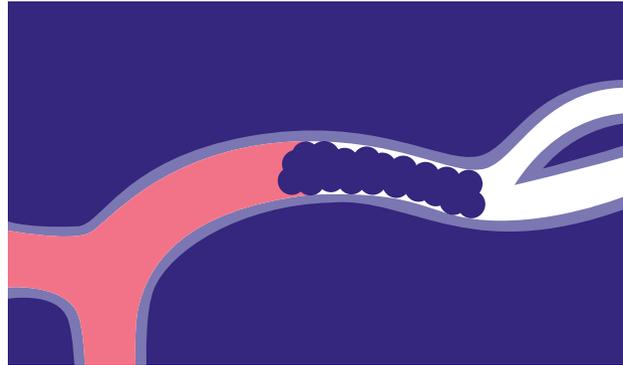
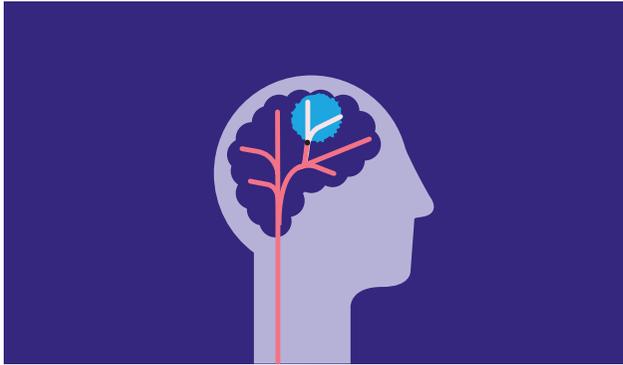
His wife Margo, 59, a speech and language therapist, had been waiting anxiously for news. She said: “The stroke consultant said that blood was flowing through the artery again. I knew immediately that meant there was a good chance that his brain could recover.”

After three days in Southampton, John was transferred to Poole Hospital and spent three weeks on the stroke unit. He was still unable to stand or walk, and had difficulties with speech and vision. But after self-funded intensive physiotherapy, John eventually returned home independent. He continues to see a physiotherapist and sports therapist regularly.

Six months after his stroke, after a lot of hard work rebuilding his strength, John was able to return to sailing and racing his boat in Poole Harbour.

“I got back on the boat by March. It was a very emotional moment. It’s incredible what I have been able to achieve already and we continue to see improvement week on week.”

Margo and John feel fortunate that John was in the right place at the right time to be able to have a thrombectomy. Margo adds: “The thrombectomy, coupled with John’s sheer motivation, have allowed him to make such a good recovery. He feels that life is now back to normal and he is able to do all of the things that are important to him. The physio says he’ll be able to ski again next winter, no problem.”



What is a thrombectomy?

Thrombectomy is one of the most effective medical interventions ever discovered. For the 10%¹⁴ of stroke patients (~7,510 patients in 2020/21¹⁵) suitable for thrombectomy in England, this treatment can be life-changing.

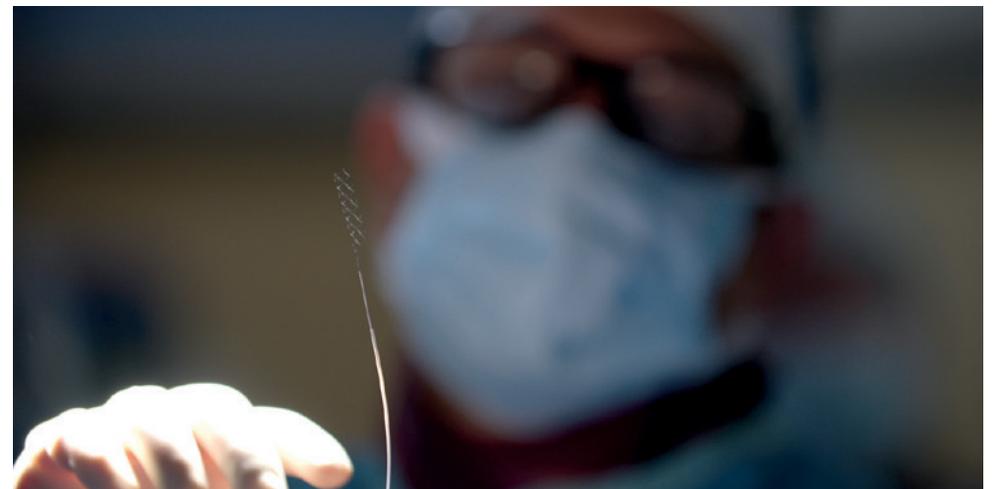
The majority of strokes are caused by a blood clot blocking an artery in the brain, depriving it of blood supply. For as long as the clot stays there, brain tissue can die. For some of these strokes, regardless of the patient's age, thrombectomy treatment is possible.

During the procedure, a specialist doctor inserts a tube with a tiny wire cage into an artery near the groin. It is then guided up through the body right into the brain. Once in the right blood vessel, the cage closes around the clot and removes it – immediately allowing blood to flow freely again. Removing the clot in the first go, or the 'first-pass effect', has been shown to lead to better outcomes for the patient.¹⁶ The patient can often be awake throughout the whole procedure, or it may be performed under general anaesthetic.

It significantly reduces the chance of disabilities like paralysis, visual impairment or communication difficulties after stroke.¹⁷ Some doctors call it close to a 'miracle treatment' because many patients can walk out of hospital the next day.



Thrombectomy is a very time-sensitive treatment - a matter of minutes and hours. The quicker the procedure happens, the more brain tissue the doctor can save. This is because for every minute a stroke is left untreated, 1.9 million brain cells die. Thrombectomy can be performed up to 24 hours after a stroke, but it is most effective in the first six hours.¹⁸ For every 10 minutes of delay, the procedure has a 1% reduction in chance of patient benefit.¹⁹



Why invest in thrombectomy?



It saves brains. Thrombectomy is a very powerful treatment that restores blood flow to the brain. It can treat severe strokes that would otherwise cause multiple disabilities or death.



It saves money. Thrombectomy is 100% cost-effective, saving the NHS £47,000 on average over five years per patient.²⁰ Money that could be reinvested in healthcare services. Setting up thrombectomy across the UK could cost around £400 million, but would save £1.3 billion over 5 years.²¹



It changes lives. Rolling out thrombectomy fully in England would allow 1,600 more people to be independent after a stroke each year, and thousands more would live with fewer disabilities. 39% of thrombectomy patients experience reduced disability.²²

“If we prioritise stroke, we can reduce disability and reduce people’s need for NHS rehabilitation and post-stroke care.”

Dr William Mukonoweshuro, INR, Derriford Hospital, Plymouth



What can a thrombectomy patient's journey look like?



Facial
weakness



Arm
weakness



Speech
problems



Time
to call 999



Stage 1

It is vital to act FAST and call 999 if someone spots the signs of a stroke. Acting FAST gives the person having a stroke the best chance of survival and recovery. An ambulance is dispatched to the patient.

Stage 2

The suspected stroke patient is admitted to an emergency department in the nearest hospital with an acute stroke centre. The ambulance will pre-alert the hospital so that doctors are ready to treat the patient as quickly as possible.

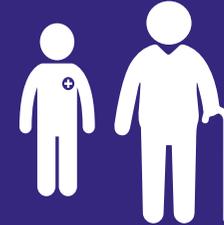
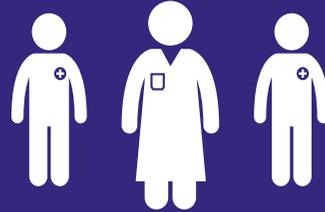
Stage 3

Initial brain scans determine the type of stroke and whether thrombectomy is suitable. AI software can support clinicians to make quick decisions. The patient may also receive other initial treatments like thrombolysis.²⁵

Lack of awareness of the FAST symptoms, or somebody having a stroke during their sleep (called a wake-up stroke), may mean they present at hospital too late to receive treatment.

Recent ambulance response times for Category 2 patients – like those with suspected stroke – have averaged nearly three times the 18-minute target.²³ It's also taking longer to get people to hospital.²⁴

Non-optimal pathways, workforce shortages and other network challenges can lengthen this time-critical process. Stroke and thrombectomy should be given parity of esteem with major trauma at this crucial stage.



Stage 4

Patients who need a thrombectomy are urgently transferred to a specialist thrombectomy centre by ambulance if they are not already there. Time is of the essence - thrombectomy is most effective in the first 6 hours.

Stage 5

The game-changing procedure is typically performed by an Interventional Neuroradiologist (INR), alongside a whole team of skilled professionals. The blood clot is removed, quickly restoring blood flow to the brain.

Stage 6

The patient is then taken back to the original stroke unit, to receive inpatient rehabilitation and Early Supported Discharge if appropriate. The length of inpatient stay will vary depending on the impacts of the stroke.

Lengthy hospital and ambulance delays can prevent quick treatment. Median times between a patient arriving at a referring stroke unit and getting to the thrombectomy centre range from 2 hours 26 minutes (to John Radcliffe Hospital Oxford) to 4 hours 27 minutes (to Queens Hospital Romford).²⁶

Common barriers mean that round the clock thrombectomy services can be impossible or hard to maintain. Currently, only 6 of the 24 centres operate on a 24/7 basis.

Stage 7

Once discharged from the stroke unit, stroke survivors should receive ongoing community rehabilitation if required. Life after stroke support should be available to help stroke survivors rebuild their lives.



2020/21 access and rates across England

Despite being life-changing and cost-effective, access to thrombectomy is extremely unequal and it is often not available round the clock. Thrombectomy is a suitable treatment for around 10% of stroke patients. But currently, just over a quarter of these patients (2.8% of all patients) in England receive it, and all others (7.2%) miss out.²⁷

Access to thrombectomy varies greatly according to where and when you have a stroke. In some areas of England, there's no thrombectomy service available at the weekend, or outside of the working day. Data shows just a quarter (25%) of thrombectomy centres operate 24/7 services, whilst almost half (42%) operate Monday to Friday during office hours.

Almost 8% of stroke patients receive a thrombectomy in London, compared to 0 to 3% in other areas, where geography, funding, ambulance pressures and workforce pose significant challenges.*

This creates an unacceptable postcode lottery of stroke treatment at a time when tackling health inequalities is a key priority for the government and NHS. Rates are rising gradually due to sustained efforts from national and local stroke teams, but progress is far slower than it needs to be. England's thrombectomy rates also lag far behind other developed health systems internationally.²⁸



Almost **8%** of stroke patients receive a thrombectomy in London, compared to **0 to 3%** in other areas.

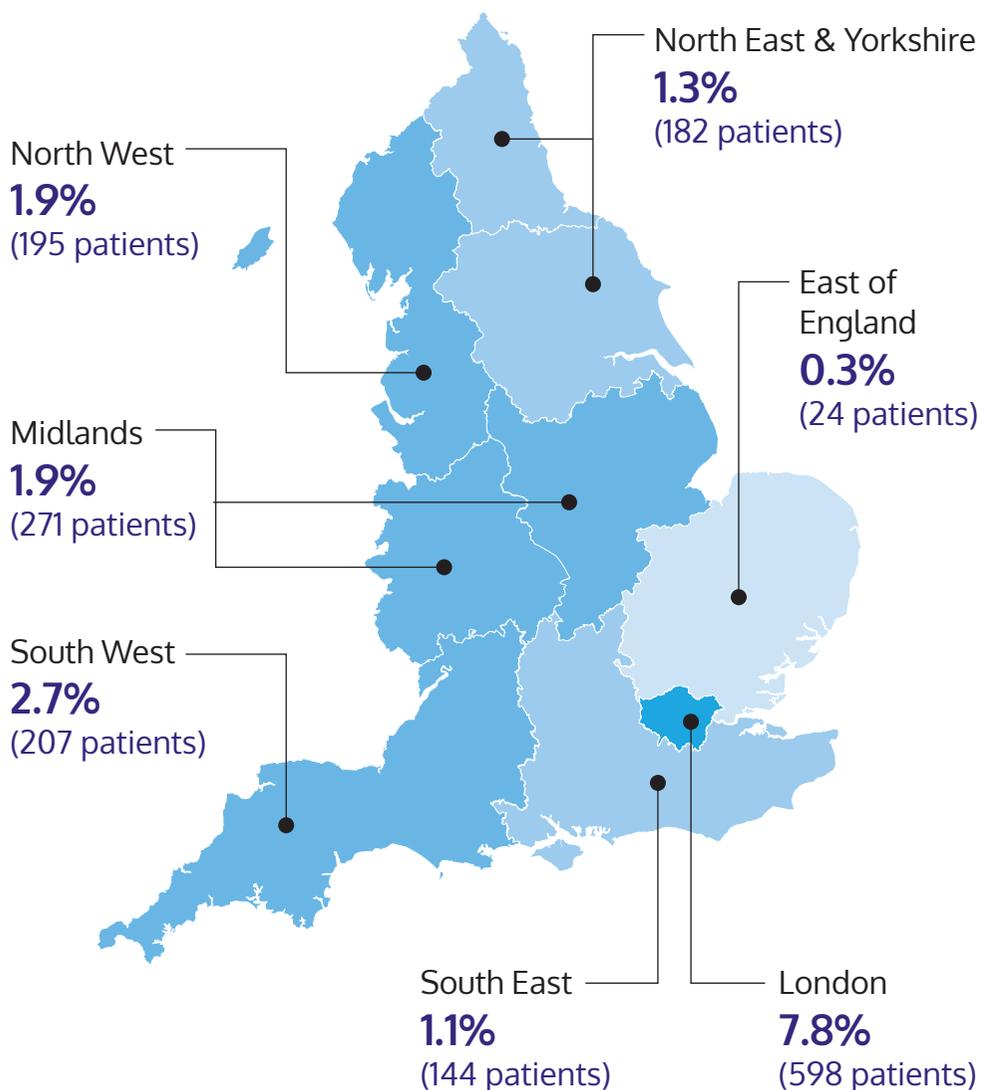
A stroke can happen to anyone, anywhere, at any time, and 'time is brain' when responding to a suspected stroke. That's why we're calling for thrombectomy to be available 24/7 for all patients who need it as soon as possible.

Thrombectomy procedures are typically performed in specialist neuroscience centre hospitals – resourced with the latest equipment and skilled staff. There are currently 24 thrombectomy centres across England, with patients referred from their wider locality. Evidence shows that patient outcomes are better in higher volume centres, rather than many smaller centres, because centres that perform more thrombectomies maintain optimum staff skills and numbers.

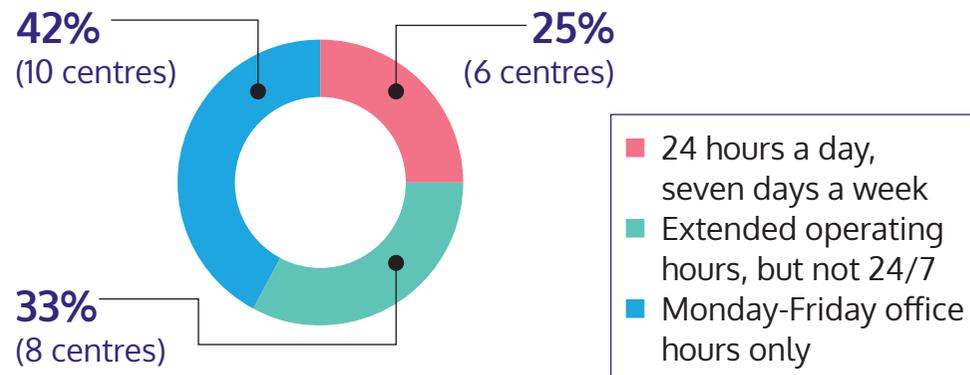
* Some stroke units have pathway arrangements in place so their patients may receive a thrombectomy in a different region. For example, the East of England regularly transfers patients to London. This would not be included in the original region's percentages.

** This latest publicly available data covers the period 2020-21, but many region's rates have improved gradually since then.

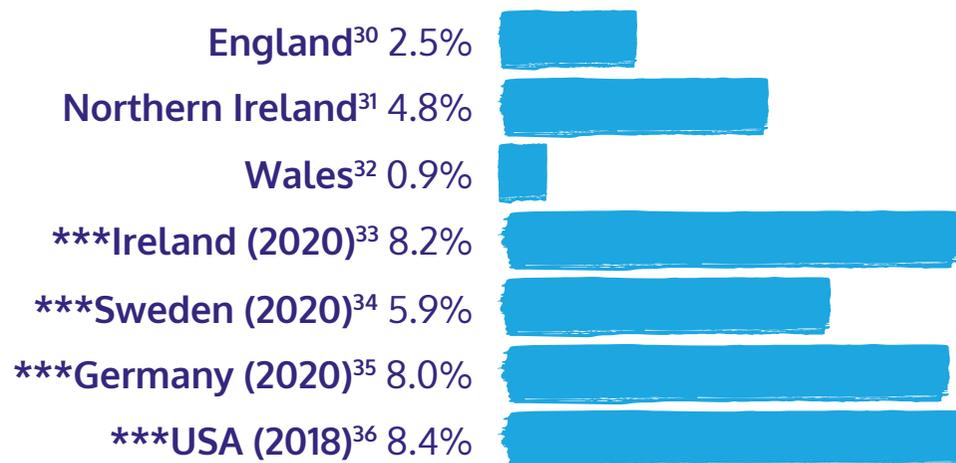
****% of patients given thrombectomy in 2020/21²⁹**



Thrombectomy centre hours of operation in Oct-Dec 2021



% of ischaemic stroke patients receiving thrombectomy



*** Ireland, Sweden, Germany and the US record their thrombectomy rates as the number of thrombectomies for ischaemic stroke patients only. Therefore, the 2020/21 England, NI and Wales figures above are calculated estimates, for the purposes of international comparison only. Scotland's thrombectomy data is not currently comparable.



“I know we can’t live on ‘what ifs’ but we always think what could have happened if Paul had received a thrombectomy.”

Because Paul Smith, 43 from Liverpool, had his stroke on a bank holiday weekend, he was unable to have the life-changing procedure. He and his wife Jane want to make sure others don’t end up in the same position.

Paul’s stroke struck on Easter Sunday in April 2018. Jane found Paul slumped on the kitchen floor unable to speak. She called an ambulance immediately.

In hospital, Jane signed a consent form for Paul to have a thrombectomy at a nearby centre, to remove the blood clot from his brain. But then Jane was told that it would take hours to set up, and Paul would miss the time window for the treatment. Shockingly, Jane was also told that no one was available to do the procedure on the bank holiday.

“I kept asking what we should do next but I really wasn’t hearing what they were saying. We were still within the timeframe for a thrombectomy but no one was available to do it – I was massively frustrated and shocked.”

Paul spent over three weeks in hospital having physio and speech and language therapy, which continued for six months. He struggled to swallow. Paul’s aphasia was so severe that he could only say ‘yes’ and ‘no’, and couldn’t understand questions.

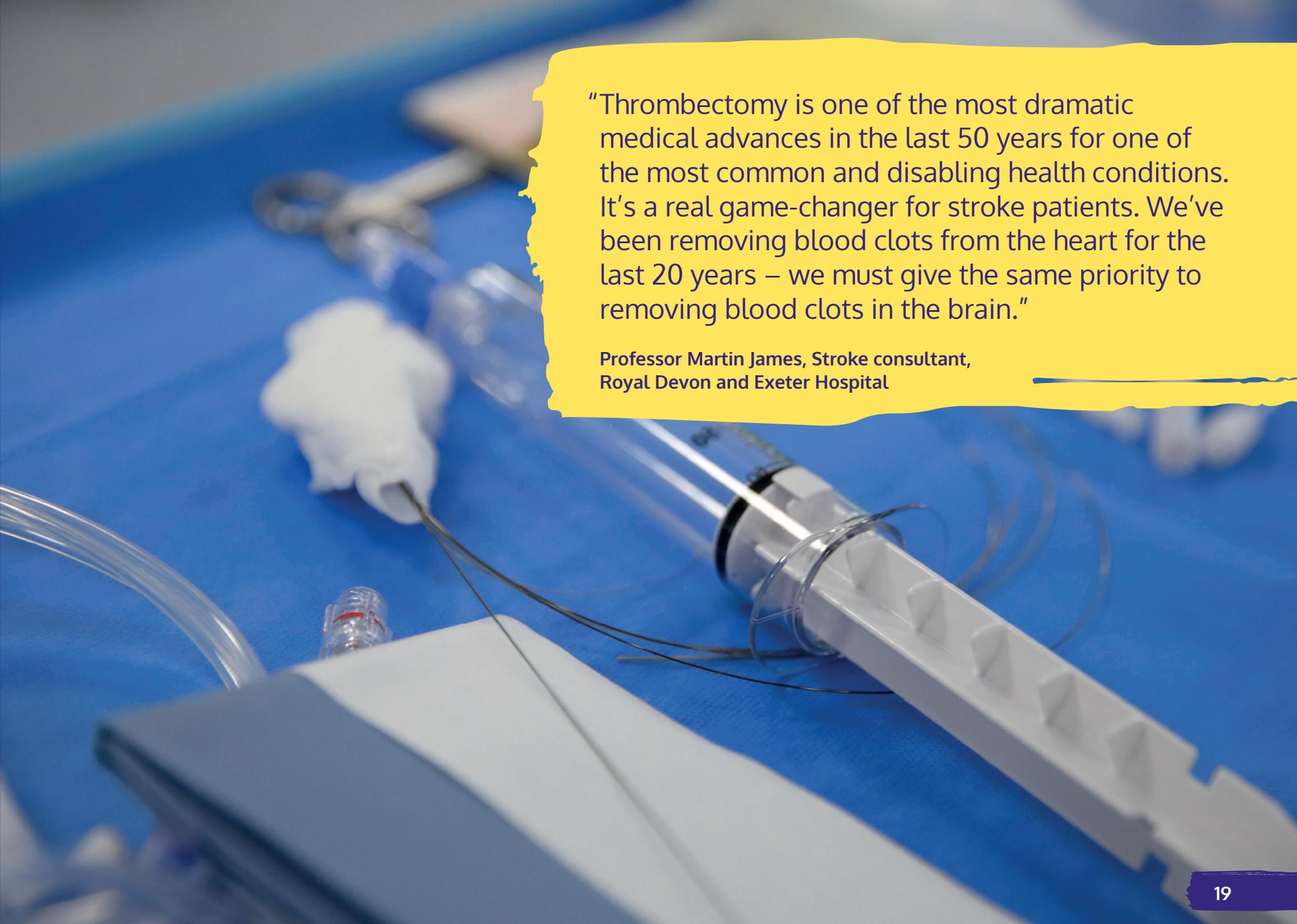
Thankfully, after a few days Paul managed to walk with assistance. He began to show improvements in his mobility and swallowing. But even now, Paul feels the impact of his stroke. Severe aphasia limits his speech, and he experiences one sided weakness, fatigue and cognitive issues. He still has to take care when eating and drinking.

For Paul and Jane, it’s now the ‘what ifs’ that are difficult to forget.

Jane explained: “I know we can’t live on ‘what ifs’ but we always think what could have happened if Paul had received a thrombectomy. We felt so unlucky and it didn’t seem a good enough reason to just say it was a bank holiday! Paul’s biggest issue is his speech, so we always wonder what could have happened if we were luckier.”

Thrombectomy is now available 24/7 in Liverpool. But 24/7 services are still not available in many places across England.

“It’s not just the initial impact, it’s the long-term devastation that strokes cause. I don’t ever want to live on ‘what ifs’ but I know it’s only natural. Paul’s had many problems, but I’m so proud of the progress he has made.”

A close-up photograph of medical equipment on a blue surface. In the foreground, a clear plastic syringe is partially visible, with a thin, dark wire or catheter inserted into its barrel. The syringe is mounted on a white plastic holder with several triangular indentations. In the background, there are other medical instruments, including a pair of forceps and a white gauze pad. The overall scene suggests a clinical or laboratory setting.

“Thrombectomy is one of the most dramatic medical advances in the last 50 years for one of the most common and disabling health conditions. It’s a real game-changer for stroke patients. We’ve been removing blood clots from the heart for the last 20 years – we must give the same priority to removing blood clots in the brain.”

Professor Martin James, Stroke consultant,
Royal Devon and Exeter Hospital

How can we improve thrombectomy rates?

Challenges and opportunities

Stroke teams across England are working tirelessly to expand their services and deliver thrombectomies to more patients who need them. In December 2020, NHS England also established a thrombectomy strategic leadership group to address challenges to expansion. And we are seeing progress – thrombectomy rates are improving gradually year on year.

But progress is too slow. Common systemic barriers threaten their efforts, and each service also faces unique challenges depending on its location, infrastructure and workforce challenges. Failure to rapidly expand thrombectomy services is the result of system-wide issues in the NHS.³⁷

But with investment and attention to tackle these barriers, stroke services can make the changes they know are needed to increase patient access to thrombectomy. In this section, we explore the key factors impeding progress, leading to 5,889 patients missing out on thrombectomy in 2020/21, and what can be done to address them.



5,889 patients

missed out on
thrombectomy in 2020/21.



Lack of capital funding

Unlike in many other countries, thrombectomy in England has lacked national investment and drivers from the very beginning. This has prevented universal nationwide provision. Today, thrombectomy expansion is still significantly underfunded. Although thrombectomy needs upfront funding, it becomes highly cost-effective over just a few years.

The NHS saves £47,000 per thrombectomy patient over 5 years, and treating every suitable patient could save the health and care system £73 million annually.³⁸

Other evidence found that implementing a full UK thrombectomy service 'including devices, staff salaries and set up costs' could cost up to £400 million, yet would save £1.3 billion over five years³⁹ - clearly an investment worth making. Thrombectomy leads to these huge cost savings because of the 'significant reduction in disability and long-term costs to healthcare systems.'⁴⁰

Each thrombectomy service across England has different funding needs and individual centres can find setting or scaling up its thrombectomy service expensive and burdensome. Some centres need urgent infrastructure improvements, whilst others need equipment or workforce to expand their hours.

"Where government has failed by not really engaging with an upfront investment to thrombectomy centres. The tariff payment that centres receive when they perform a thrombectomy is for the actual procedure, not for the upfront investment, which is needed as there are costs associated with upscaling. Centres need to escalate to be able to perform the treatment 24/7. It is a completely different thing to scale up and is a lot more expensive."

INR, England



A full UK thrombectomy service could cost up to **£400 million**.



Yet would save **£1.3 billion** over five years.



Each thrombectomy patient saves the NHS **£47,000** over 5 years.

Many centres only have one neuro bi-plane suite (for advanced medical imaging and delivery of the thrombectomy), but this equipment is also used for non-thrombectomy patients. If the suite is in use, the thrombectomy patient has to wait, delaying their time for treatment. In high volume centres, funding for a second bi-plane suite would speed up access to thrombectomy.

Thrombectomy is funded through a 'tariff' system (a payment to the thrombectomy centre for each treatment), but there is no capital funding to help scale and expand services. Also, the stroke units that initially transfer thrombectomy patients do not currently receive any payment to help improve their service and referral pathways. This needs to change.

Cardiac services have seen vast improvements with sufficient investment. For example, rates of a treatment (PPCI) for suitable heart attack patients increased from 39% in 2008 to 90% in 2011.⁴¹ The cardiac network structure achieved this through 'substantial centrally funded investment from NHS Improvement and the Department of Health'.⁴² The same should be provided for thrombectomy.

A lack of upfront investment to date makes it very difficult for thrombectomy services to plan sustainable expansion or continuation of services. The existing tariff system simply does not allow services to escalate and improve. That's why thrombectomy centres – and the referring stroke units – urgently need upfront capital funding.

"We need hard promises for additional capital investment and a clear top-down blueprint for what they'd expect... it's very hard for services to grow rapidly without significant capital investment that was never offered in the beginning. When cardiac services were expanded, they had a cash injection and received a lot of investment. Finances can't just be directed at the receiving thrombectomy centre, as thrombectomy requires the whole network to be well oiled and there's five or six referring sites. This is an issue that has been a little bit ignored – they've not seen any investment."

INR, England

"Had we invested in neuroscience centres staff and infrastructure as comprehensive stroke centres from the start, we wouldn't have thrombectomy rates of 2-3%, we'd be looking at rates of at least double that by now."

Professor Phil White, INR, Newcastle



“The lack of funding for equipment is a barrier. Currently, the hospital only has funding for one bi-plane suite to perform thrombectomies and they’re very expensive. National funding would make a big difference as we can’t keep the one suite open 24/7 all year around.”

Dr Oliver Spooner, Consultant Stroke Physician and Stroke Lead for Mechanical Thrombectomy, Royal London Hospital

Recommendation: Upfront capital funding

- The Treasury should provide urgent funding for thrombectomy in the Autumn Budget 2022, for infrastructure, equipment, workforce training and support, targeting both thrombectomy centres and referring stroke units.
- The seven NHS regions should prioritise thrombectomy capital funding over other demands, due to its life-changing impact and cost-effectiveness.⁴³



Workforce shortages

The stroke workforce is phenomenal – dedicated, passionate and committed to delivering the best possible treatment and care to patients. Yet, significant staff vacancies across the whole stroke workforce are impacting the safety, quality and viability of thrombectomy services, and putting enormous pressure on existing staff.

Thrombectomy requires a whole team of specialist staff, from paramedics to nurses, stroke physicians, INRs, support staff, anaesthetists and radiographers. But many services face shortages, recruitment and retention issues across these professions.



52% of stroke units in England have a stroke consultant vacancy.

For example:

- 52% of stroke units in England have a stroke consultant vacancy, which remain unfilled for an average of 18 months.⁴⁴
- Only 46% of stroke units meet the minimum recommended staffing levels for senior nurses.
- The NHS-commissioned 'Diagnostics: Recovery and Renewal' report found the general NHS imaging workforce needs 2,000 more radiologists and 4,000 radiographers, as well as other support staff and 'navigator' roles.⁴⁵

These shortages are a major factor contributing towards treatment delays, slowing down a time-critical process. They also result in a huge personal cost to those working to deliver thrombectomy, including working extra-long shifts and being on call very frequently.

Thrombectomy is a complex and specialised procedure. Currently, 106 professionals can perform thrombectomy in England - around 4 per cent. But one third of INRs are based in London, exacerbating the postcode lottery of access. Universal 24/7 access to thrombectomy could require almost double the current number of INRs.⁶ There is no current standardised way to train and recruit INRs, and attracting professionals from overseas is also challenging.

The Royal College of Radiologists (RCR) calls the lack of 24/7 Interventional Radiology services a 'significant present risk to patient safety [that] will increase unless urgent action is taken to address workforce shortfalls.'⁴⁷

The General Medical Council and RCR are developing a credential to allow other specialties to train to deliver thrombectomy.⁴⁸ While this may help to increase capacity, it cannot solve the wider stroke workforce shortages spanning the pathway.

The INR community explains that it 'overlooks the major and arguably much greater system-wide challenges that will continue to delay MT service expansion regardless of operator numbers', because the NHS is 'comprehensively under-resourced' in Acute Stroke Centres (ASC), Ambulance Trusts and Comprehensive Stroke Centres (CSC).⁴⁹

Workforce shortages risk patient safety and prevent centres from increasing thrombectomy access. Stroke patients deserve access to treatments they need, and safe, high-quality care. And our stroke workforce deserve fully-staffed services to alleviate undue pressures and support their wellbeing. That's why we need a workforce plan that considers the whole stroke pathway.

This would also help to increase the stroke workforce in Wales, Scotland and Northern Ireland, that each struggle with similar workforce shortages.



Dr Alex Mortimer, INR, and Sarah Barr, Stroke Advanced Nurse Practitioner (ANP)

North Bristol Hospital has steadily improved access to its service over the last few years.

Dr Alex Mortimer, INR & Sarah Barr, Stroke Advanced Nurse Practitioner (ANP) said: "Until you have staff for the service, it is not sustainable. Any improvements we've seen in services so far has been based off a drive of the people in centres that operate it.

"In 2015, we had three INRs but they were not 'full-time' as a percentage of their time was spent on diagnostic reporting, which had to change. As well as INRs, for a full-time service, you also need an increase in stroke physicians, nurses and radiographers in the thrombectomy centre plus nursing and medical staff at referring sites. Our stroke department was a shadow of what it is now. Historically we had one or two nurse practitioners and two-three full time equivalent stroke consultants.

"Now we're lucky to have a much more robust stroke consultant rota and 10 ANPs who work together very closely. The ANPs are critical to enabling the service - they keep the whole process going as they know practically what the best things are to get people through the system quickly. There are general shortages in stroke nursing though and the move towards 24/7 means working patterns will need to change."

Recommendation: Sustainable stroke workforce

- The General Medical Council and Royal College of Radiologists should work together to agree and approve a thrombectomy credential that ensures safe, effective scaling of thrombectomy capacity.
- The Department for Health and Social Care should develop a sustainable stroke workforce plan in its upcoming workforce strategy, considering all the professionals involved in thrombectomy services.

“Workforce issues are a challenge. It was really difficult when we went 24/7 in 2019. The new shifts were disruptive and had a big impact on the team’s work/life balance. Some nurses left because of unmanageable working patterns. Thrombectomy is such a team effort, you need to have a full and functioning Interventional Radiology department to achieve the best possible service for patients. Our team is more stable now which is leading to higher thrombectomy rates, but we still have vacancies.”

**Ana Dias, Clinical Nurse Specialist (CNS),
Charing Cross Hospital, London**

“At a national level, the focus seems to be on expanding the number of INRs. But we are the end point - investment needs to occur at every pinch point. Locally, we’re spending a lot of money on perhaps the most expensive aspect of the pathway. For us, the biggest hurdle to a 24/7 service has been the recruitment and retention of support staff, who also need specialist training for this procedure. I’m hugely proud of the team we have and the service we provide to Greater Manchester, but there is still a lot of work to do in getting the right patient, to the right place within the right timeframe.”

Dr Hannah Stockley, INR, Salford Royal Hospital

“Investment for high band nurses at both ends of the referral pathway would also be beneficial to keep the pathway running smoothly.”

**Dr Oliver Spooner, Consultant Stroke Physician and Stroke Lead
for Mechanical Thrombectomy, Royal London Hospital**





Ambulance pressures

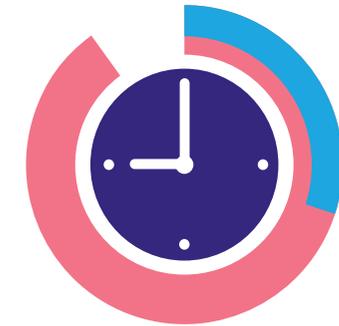
Thrombectomy is very time-sensitive - the window for treatment is a matter of hours. Yet ambulance response times, lengthy handovers and delayed inter-hospital transfers from a stroke unit to the thrombectomy centre pose logistical challenges and cause some patients who need to have the treatment to miss out.

Thrombectomy is more effective the quicker it happens.⁵⁰ A well-functioning ambulance service and pathway is essential, to quickly transfer patients to the thrombectomy centre, usually via a local stroke unit.

Yet the average ambulance response time to a Category 2 call – including strokes – is now regularly three times longer than the 18-minute target.⁵¹ In addition, over the last seven years, the time between symptom onset and arrival at hospital has increased by 41 minutes.⁵² These ambulance delays pose a danger to patients, and cause some to miss the time window for thrombectomy.

Rapid inter-hospital transfers from a stroke unit to the thrombectomy centre are also vital once the patient is deemed suitable for treatment. However, conveyance times to thrombectomy centres vary and can be unacceptably long. Times range from only 14 minutes to reach Leeds General Infirmary thrombectomy centre, to 2 hours 19 minutes to reach Hull Royal Infirmary.⁵³

In an optimal stroke pathway, ambulance services should have the capacity to treat thrombectomy patients with the upmost priority. This includes the crew waiting for the stroke patient as they are initially scanned for thrombectomy suitability⁵⁴, to avoid a lengthy delay as the patient waits for a second ambulance. Some services have also agreed to treat thrombectomy inter-hospital transfers as 'critical' - creating a key opportunity to speed up conveyance.



The average ambulance response time to a Category 2 call – including strokes – is now regularly **three times longer than the **18-minute** target.**

Variation in conveyance times to thrombectomy centres.



Helicopter transfers can also benefit patients⁵⁵, transporting them from rural and remote areas where it is not appropriate to have a thrombectomy centre.⁵⁶ In 2021, helicopter transfers were used by 21% of sites. However, these arrangements are locally decided, expensive and funded by charities.

Ambulance delays – which pose a real risk to safety - are a symptom of a health and care system under enormous pressure, caused by system-wide issues including patient flow and social care availability. Services must be supported to give thrombectomy patients time-critical priority, formalising solutions to speed up the process. And the NHS must tackle the more systemic issues affecting ambulances urgently, so that the service is fit for future demand.

“The main problems are waiting for the secondary transfer of a patient, and primary response times being slower. The category stroke patients fall into is so broad that it’s hard to up-triage patients.”

INR, England



**Dr Sanjeev Nayak,
INR, North Midlands**

The North Midlands team recognised it was vital to get ambulance teams on board with thrombectomy, as paramedics are a key element of the pathway. Transfer times between the referring district hospitals and thrombectomy centres can often be an issue, due to lengthy response times and ambulance handovers as a result of system pressures.

Dr Sanjeev Nayak, INR in the North Midlands, explains how they’ve managed to tackle the problem of hospital transfers:
“We’ve made it a ‘critical code’ when it’s a handover, which reduces the time the handovers take and speeds up the process. To do this, I knew it involved having honest conversations with those at the pre-hospital end of the pathway. I invited ambulance leads to attend our thrombectomy meetings to show them the importance of prioritising thrombectomy patients, so they can see the impact thrombectomy had first-hand. They could see the huge benefits and how every moment mattered for outcomes, so they agreed on transfer response times between sites being eight minutes.”



Recommendation: Mitigating ambulance pressures

- Where possible, ambulance crews should wait whilst the patient is being scanned as per the National Optimal Stroke Imaging Pathway, and thrombectomy inter-hospital transfers should be prioritised to avoid harmful delays.
- NHS England should address the wider system challenges in its upcoming Urgent & Emergency Care Plan, to mitigate ambulance pressures that prevent quick access to thrombectomy.

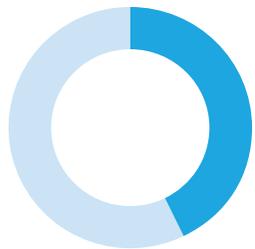
"I got home from a 16-hour shift and had 30 minutes of rest before I was rung about another patient that needed a thrombectomy. My team and I got to the centre at 2am but, because of long ambulance delays, the patient didn't arrive until 6am. We were just waiting, meanwhile the patient's likelihood of a good outcome was only getting worse."

Dr Paul Bhogal, INR, Royal London Hospital



Pathway challenges

Each service faces unique challenges, depending on its location and reach, and the prioritisation of stroke among health leaders regionally. These contribute to a postcode lottery of patient access to thrombectomy, mostly outside of London. Services requires strong leadership and buy-in to address these persisting health inequities.



43% of stroke patients are not scanned within one hour of arrival at hospital.⁵⁷

Each thrombectomy service is part of a network of multiple stroke units. These make the logistical aspects of thrombectomy challenging, leading to unwarranted variations. For example:

- 43% of stroke patients are not scanned within one hour of arrival at hospital.⁵⁷ Many emergency departments are severely pressured, causing delays to scanning stroke patients and impacting thrombectomy access.⁵⁸
- Average door-in-door-out times for processing patients at a stroke unit before transfer to a thrombectomy centre are 2 hours, but range from 1 hour 28 minutes at Hull Royal Infirmary to 3 hours 8 minutes at Queens Hospital Romford.⁵⁹
- Patients presenting directly to a thrombectomy centre hospital are more likely to receive a thrombectomy than those transferred from another stroke unit.⁶⁰

Every stage of the thrombectomy pathway has the potential for incremental gains, and optimisation can help to shave minutes off the time-critical journey to treatment. But this requires leadership and buy-in across the network of sites, and from health leaders outside of stroke.

Stroke professionals tell us that too often, improvements rely on local 'champions', both in thrombectomy centres and referring stroke units, advocating hard and persistently to decision-makers. This is despite thrombectomy having a '100% probability of being cost effective'⁶¹ and making a life-changing difference to stroke patients.

Transforming thrombectomy rates requires the regional health leaders, including new ICBs, specialised commissioning and regional medical directors, to realise the 'size of the prize'. Stroke is sadly often under recognised, under commissioned and underfunded. But with regional buy-in, prioritisation and collective ownership of pathway improvements, stroke networks will be able to make big steps towards sustainable 24/7 thrombectomy. Adherence to the National Optimal Stroke Imaging Pathway is a key component to success, and Integrated Care Boards should prioritise the stroke imaging pathway, which would benefit all stroke patients.

Each NHS region is currently undertaking a Thrombectomy Quality Review, to identify more localised quality improvement steps. Alongside their recommendations, a wealth of guidance – including the Oxford Academic Health Science Network's (AHSN) thrombectomy implementation guide⁶² – can help inform service improvements.

"Many of the perceived barriers and issues with establishing the service can be overcome through collaborative working within a regional network. Setting up a 24/7 mechanical thrombectomy service requires a change in institutional mind-set. Patient champions were also very powerful to make the case for change, more so than the data."

Dr Sanjeev Nayak, INR, Royal Stoke University Hospital, North Midlands

Recommendation: Local quality improvement

- Local systems (including Hospital Trusts, Integrated Care Boards and Integrated Stroke Delivery Networks, supported by Regional Medical Directors) should work together to optimise current thrombectomy pathways, learning from what works elsewhere.
- Local systems should enact the recommendations from each of the seven regional Thrombectomy Quality Reviews.

"You realise that if I don't fight for this patient, there is no other advocate for them."

Dr William Mukonoweshuro, INR, Derriford Hospital, Plymouth

"The East of England Integrated Stroke Delivery Networks have seen some substantial collaboration across the region and with colleagues from the London stroke network. This has resulted in a significant improvement in thrombectomy rates for our region. We will continue to work closely with our ICB colleagues to ensure that mechanical thrombectomy remains a regional priority."

Jo Clayden, Senior Programme Manager, East of England ISDNs



Innovations and stroke research

Back in 2011, we funded the PISTE⁶³ clinical trial on thrombectomy at the University of Glasgow. 11 years on, the treatment has saved thousands of brains. Recent clinical trials suggest that thrombectomy could be expanded to treat more types of stroke, and explore how it can be delivered more efficiently using innovations like AI software and video triage.

Multiple international trials have robustly demonstrated the patient benefits of thrombectomy.⁶⁴ In 2015, the results from completed trials around the world were so convincing that many active trials, including PISTE, stopped early - the existing evidence was so compelling that data monitoring committees agreed there was simply no need to continue assessing efficacy.

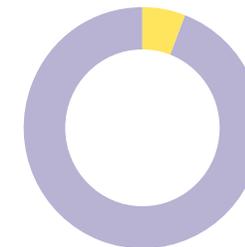
Innovations have huge potential to help increase thrombectomy rates. For example, AI-powered imaging software with image-sharing capability can support fast and efficient imaging processes. The software acts as a decision-support tool to allow consultants to quickly decide if a patient is suitable for thrombectomy, and enables the rapid transfer of images. Although 72 stroke centres now routinely use AI, some areas still do not have this in place.⁶⁵

NHS England is also piloting pre-hospital video triage in areas across England, following successful projects in North Central London and East Kent. Paramedics are using digital platforms like FaceTime to contact acute stroke services via iPads or other mobile devices. This allows stroke doctors to remotely triage patients via video and ensure they are sent to the right place, avoiding lengthy transfers to different sites and potentially increasing the proportion of patients that can receive thrombectomy.⁶⁶

The Stroke Association has funded stroke research for 30 years, but we're one of only a few dedicated stroke research funders.

Current funding levels do not go far enough towards tackling one of the UK's leading causes of death and disability. In 2018, the UK's public and charity research spend on stroke was just 6% of that spent on cancer research.⁶⁷

It's vital that well-evidenced innovations that can speed up thrombectomy are universally adopted, to support efforts to increase thrombectomy rates quickly. And future research, into other interventions like video triaging and early diagnosis, has huge potential to transform thrombectomy access in the future.



In 2018, the UK's public and charity research spend on stroke was just **6% of that spent on cancer research.⁶⁷**



**Dr Oliver Spooner,
Royal London Hospital**

The Royal London Hospital has scaled up its thrombectomy service significantly since 2019, growing its reach to patients in areas with no access. Having rapid imaging pathways and AI enabled software has been key to success, enabling quick sharing and transfer of brain scans.

Dr Spooner explains:

“We now have the largest stroke AI-assisted imaging network in England. We’ve worked closely with an AI software company. We now have 6 sites online which improves the imaging and referral speed. It speeds things up by flagging cases to a clinician earlier and allowing us at the thrombectomy centre to see the images at these sites straight away. We’ve noticed significantly reduced door-in door-out times with referring sites who have implemented AI assisted imaging.”

But the set-up has not been without challenge. Dr Spooner said “there can be significant delays to implementation – sometimes by 6 months or more - pending approval by local information governance. Implementation can also be delayed pending IT department approval. There can be multiple unnecessary blockers. Sorting out this issue relied on good relationships with in each of the individual Trusts. It also required people having knowledge of what the software does, it’s value and why it is used.”

Dr Spooner also explained that “access to advanced imaging and instant access to CT and CTA imaging at the same time” is key. Yet “some units won’t do them at the same time, so by the time they call a thrombectomy unit, it’s too late because the imaging is already out of date. This is a block to reaching the 10% target.”

Recommendation: Innovation into practice

- Well-evidenced innovations such as AI imaging software and video triage in ambulances should be universally adopted, to speed up and maximise the benefits of thrombectomy.
- Research funders should fund further research in thrombectomy, to help increase rates and the number of patients who can access it, as per the Stroke Priority Setting Partnership’s findings.⁶⁸

Methodology

“As well as improving the efficiency of existing emergency pathways, it is crucial to support research in ambulance services to address inequalities in access to thrombectomy, including the development of new communication processes and diagnostics tests which identify potentially treatable patients as early as possible.”

Chris Price, Professor of Stroke and Applied Health Research, Newcastle University

This report is based on a mix of quantitative and qualitative insight. This includes analysis of current SSNAP data, and a series of in-depth interviews with those working to deliver thrombectomy on the ground across England. We spoke to INRs, who perform the procedures and who understand the pathways and procedures locally – as well as other health care professionals, local and national decision makers, researchers and representative groups. And, most importantly, we spoke to stroke survivors and their families, to understand how having a thrombectomy can transform the course of recovery from stroke in an instant, and the life-altering consequences of missing out.

Glossary

- **Aphasia** - a complex language and communication disorder that can occur after a stroke due to damage in language centres of the brain.
- **Artificial Intelligence (AI)** - AI uses computers and machines to problem solve.
- **Bi-plane suite** - specialist equipment needed for thrombectomies.
- **Comprehensive Stroke Centre (CSC)** - large centres of excellence where patients can access hyper-acute and acute stroke care and inpatient rehabilitation, as well as thrombectomy and neurosurgery.
- **CT and CT angiography (CTA) scans** - scans that are used to help diagnose stroke patients and show if they are able to have a thrombectomy.
- **Getting It Right First Time (GIRFT)** - a national programme designed to improve treatment and care through reviewing services and presenting data.
- **Integrated Care Board (ICB)** - statutory organisations that bring the NHS together locally to improve population health.
- **Integrated Stroke Delivery Networks (ISDN)** - 20 networks responsible for transforming stroke care across the country. ISDNs aim to improve and join up care across the whole stroke pathway by bringing together key stakeholders in the area.
- **Interventional Neuroradiologist (INR)** - specialist doctors who perform operations on the brain, spine, head and neck blood vessels.
- **Ischaemic stroke** - an ischaemic stroke happens when a blockage cuts off the blood supply to the brain. It may also be referred to as a clot. Around 85% of strokes are ischaemic.
- **Mechanical thrombectomy** - a game-changing treatment for around 10% of stroke patients. During the procedure, a specialist doctor inserts a tube with a tiny wire cage into an artery near the groin. It is then guided up through the body right into the brain. Once in the right blood vessel, the cage closes around the clot and removes it – immediately allowing blood to flow freely again.
- **National Optimal Stroke Imaging Pathway (NOSIP)** - a pathway that allows for the rapid diagnosis of stroke.
- **National Stroke Service Model (NSSM)** - the blueprint for improving stroke care across the country.
- **Neuroscience centre** - where stroke patients have access to the latest equipment and specialist staff that are able to perform thrombectomies. There are currently 24 thrombectomy centres across England.
- **NHS Long Term Plan** - a ten year plan for the NHS that includes goals, including to prevent up to 150,000 heart attacks, strokes and dementia cases over the next 10 years.
- **PPCI heart attack treatment** - an emergency treatment for some heart attack patients.
- **Referring unit** - the stroke unit that sends patients to a thrombectomy centre to receive treatment.
- **SSNAP** - the Sentinel Stroke National Audit Programme (SSNAP) measures the quality and organisation of stroke care in the NHS and is the source of stroke data in England, Wales, and Northern Ireland.
- **Thrombolysis** - giving a clot-busting drug to suitable patients with ischaemic strokes. The drug aims to disperse the clot and return the blood supply to your brain.

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When stroke strikes, part of your brain shuts down. And so does a part of you. Life changes instantly and recovery is tough. But the brain can adapt. Our specialist support, research and campaigning are only possible with the courage and determination of the stroke community. With more donations and support from you, we can rebuild even more lives.

Donate or find out more at stroke.org.uk

Rebuilding lives after stroke

Stroke
Association

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Act FAST

Stroke strikes every five minutes in the UK. It can happen to anyone, of any age, at any time. It's vital to know how to spot the signs of a stroke in yourself or someone else.

Stroke is a medical emergency. The FAST test can help you recognise the most common signs.



Facial weakness:

Can the person smile? Has their mouth or eye drooped?



Arm weakness:

Can the person raise both arms?



Speech problems: Can the person speak clearly and understand what you say?



Time to call 999:

if you see any of these signs.

Time is of the essence for a stroke response. Delays calling **999** could lead to some patients who need a thrombectomy falling outside of the time window for treatment. Timely access to acute stroke treatments, such as thrombectomy, is vital to make sure you have the best possible chance of better outcomes.

Acting FAST will give the person having a stroke the best chance of survival and recovery. Always call **999** straight away.