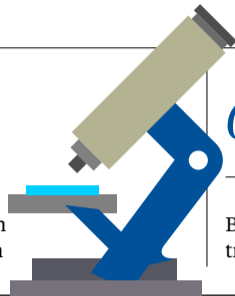


# UNDERSTANDING STROKE

## 02 Stroke care is getting better but needs cash

The chances of survival and avoiding disability after a stroke in the UK are improving, but worrying regional variations remain



## 03 New technology has the power to save lives

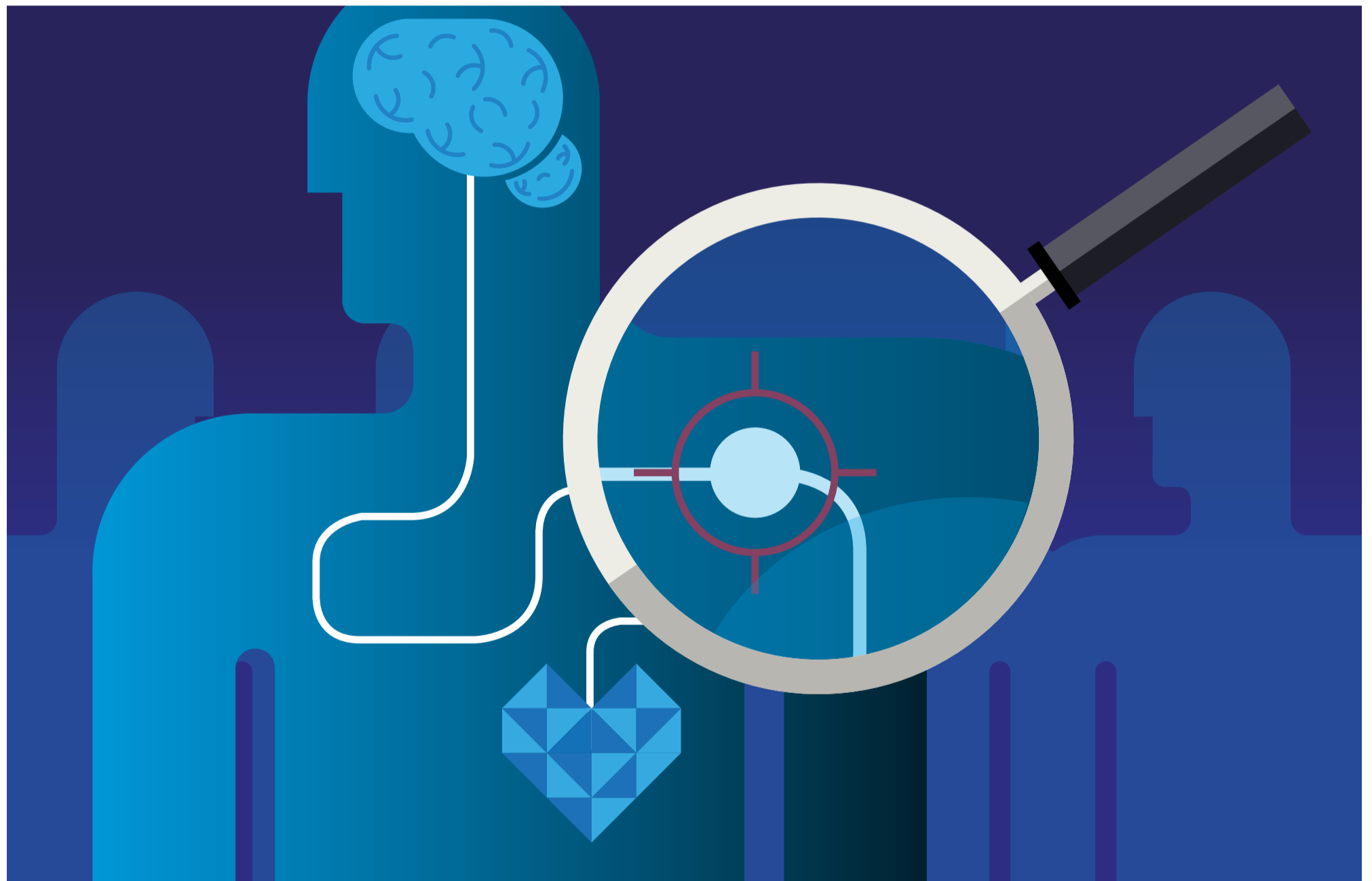
Backed by the latest research, technology is transforming outcomes for stroke patients

## 04 Care pathway: 11 steps from onset to recovery

A step-by-step guide to best-practice care enables a better understanding of stroke

## 07 Making recovery a fun-to-play virtual 'game'

Mental stimulation and physical movement makes computer gaming a game-changer




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# Stroke care in UK is getting better but needs more cash

*The chances of survival and avoiding disability after a stroke are improving, but worrying regional variations remain and research funding is poor*

◆ **OVERVIEW**  
● **NIGEL HAWKES**

**F**or too long neglected by the NHS, stroke care in the UK has made big advances in recent years. Traditionally seen as a consequence of ageing that led inevitably to disability or death, it was often treated fatalistically. Now that has changed.

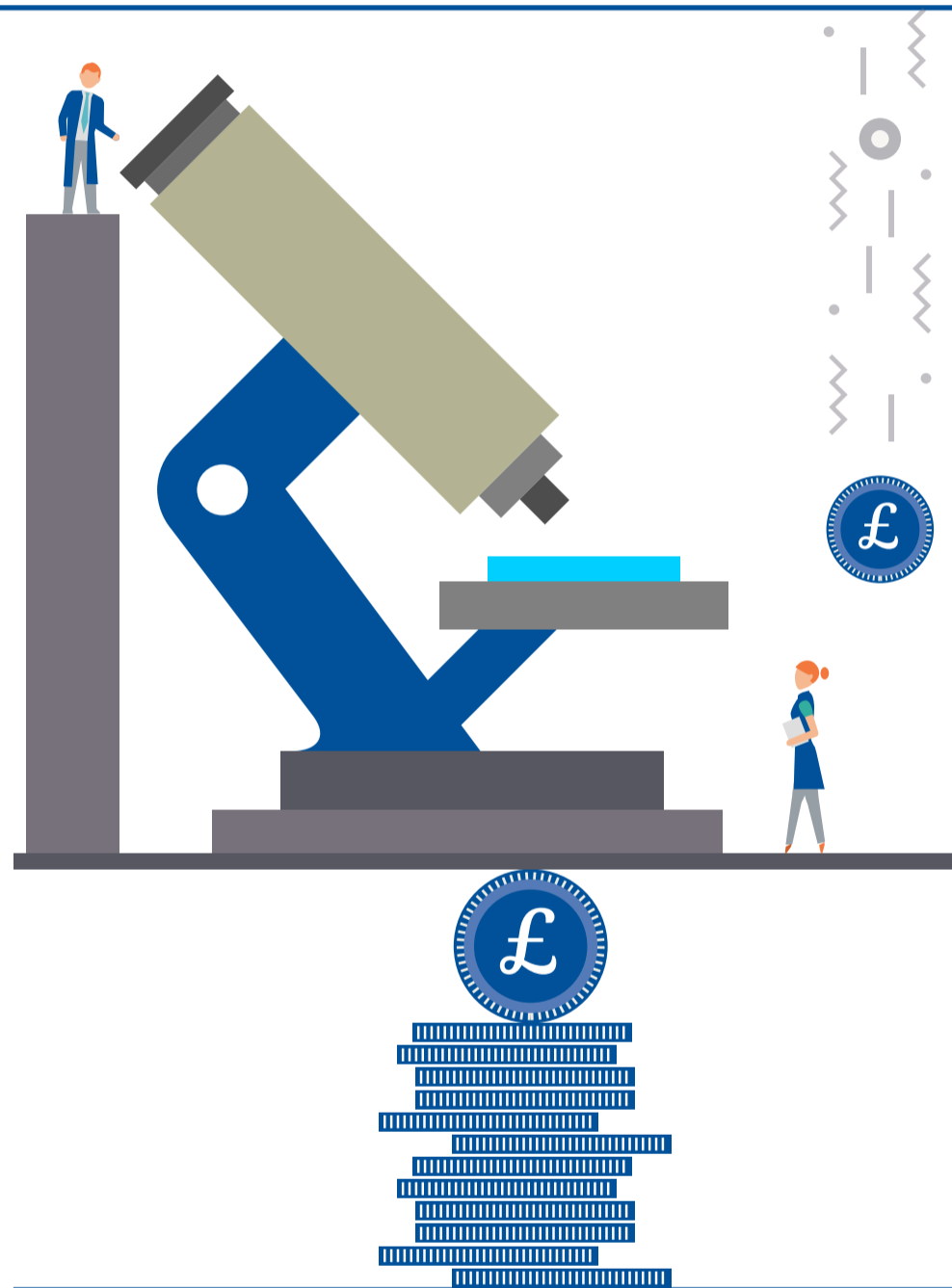
“We’ve come a long way in reframing stroke as a condition people can survive and that is not an incurable part of ageing” says Patrick Olszowski, campaigns director of the Stroke Association. “The reorganisation of acute stroke care in London and Manchester has been wildly successful and more patients nationally are being treated in stroke units, where results are better. The issue now is improving rehabilitation so we don’t let patients languish. How do we make sure that a good life after stroke is possible?”

Few conditions have had their care monitored as carefully as stroke, thanks to the Royal College of Physicians’ Sentinel Stroke National Audit Programme (SSNAP), which has been running for 15 years. “SSNAP is the most ambitious

“  
**There are serious concerns about shortage of doctors and nurses, with only 50 out of 183 hospitals having the recommended level of three qualified nurses per ten stroke beds at weekends**

and sophisticated platform for collecting and reporting data on the quality of stroke care in any healthcare system in the world,” says Professor Tony Rudd, who chairs the body responsible for it and is also National Director for Stroke for NHS England. “It is providing hospitals, commissioners, patients and the public with an unprecedented level of insight into the performance of stroke services.”

The data shows that 85 per cent of patients are scanned within the target time of 12 hours – “one of the main successes of stroke care over recent years,” Professor Rudd says – but there is a lower chance of prompt scanning at the weekend and relatively few patients are scanned at night. Scanning aids diagnosis and identifies patients who will benefit from clot-busting (thrombolytic) drugs. The median “door to needle time” for this stands at 56 minutes, but big



**33%+**  
of stroke survivors in the UK are dependent on others  
**Source:** Stroke Association 2015

variations between units remain – there is plenty of room for improvement, in Professor Rudd’s view. Of patients suitable for thrombolysis, 80 per cent are getting it.

Patients in London are more likely than others to get prompt care, thanks to a bold policy of concentrating stroke care into just eight specialised units rather than the previous 32. This was controversial but has proved itself, saving an estimated 100 lives a year. Professor Naomi Fulop of University College London, whose research came up with the figure, says: “It may seem counterintuitive for an ambulance to drive a critical patient straight past the nearest hospital, but it saves lives. While an individual may feel that losing their local hospital’s stroke unit is bad for them, going to a specialised centre further away actually increases their chance of surviving a stroke. Patients and the public

should be jumping up and down in other urban areas and saying, ‘why haven’t we got what London has?’”

Another success story is the Act FAST campaign to improve recognition of stroke symptoms and speed the calling of an ambulance. “FAST has been an incredibly effective way of spending public-health money with every £1 spent saving £2-3 in care and disability costs,” says Mr Olszowski. Public Health England estimates that an additional 38,600 people have reached hospital within the vital three-hour window of experiencing symptoms and more than 4,000 people have avoided disability as a result of a stroke since the campaign was launched in 2009.

Not every statistic is so positive, however. The SSNAP data shows that only 70 per cent of patients get the amount of physi-

**CASE STUDY: STRIKING DOWN THE YOUNG**

Not all strokes occur in the elderly. Sarah Scott was a sixth former reading aloud in an English lesson when she had a stroke six years ago. An undetected heart defect had caused a blood clot that travelled to her brain.

Thrombolysis probably saved her life, but she was severely affected. She spent five months in hospital and had to give up hope of university. "I couldn't read or write, and my speech and numbers were affected," she says.

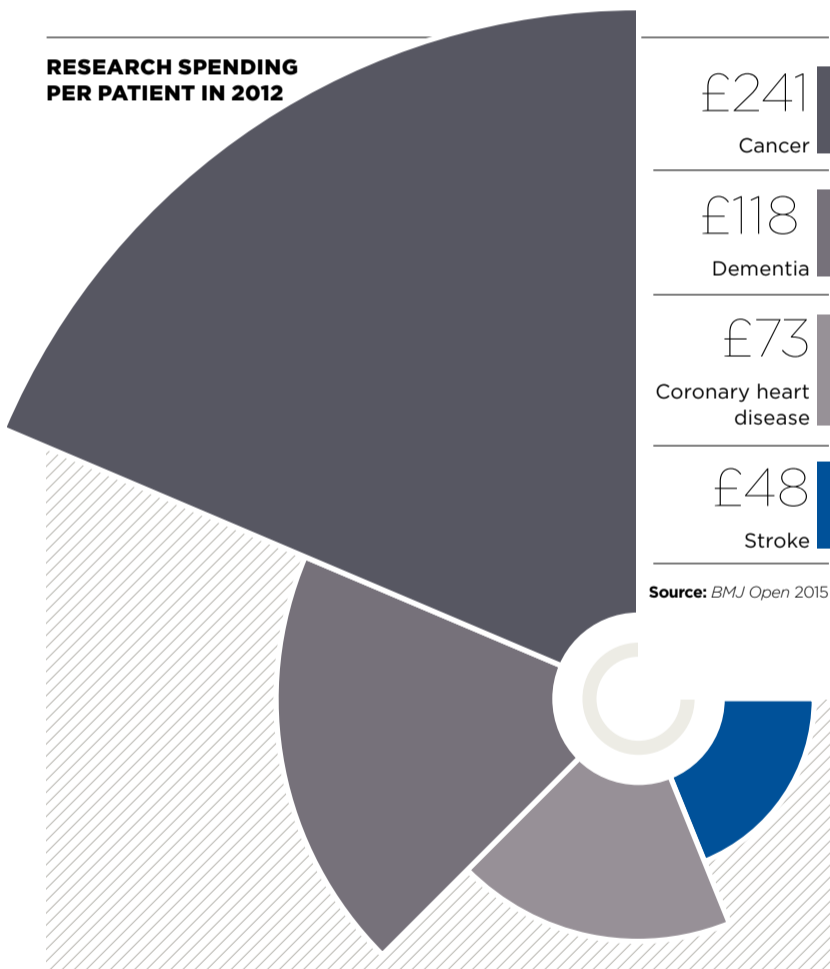
Recovery has been slow, but determination to lead a normal life and intensive speech therapy in the United States have enabled her to get a part-time job as a science technician at Richard Hales School

in Hertford – the same school she was attending when she had her stroke. "For me it's good, it's practical stuff so it doesn't really matter that I can't read," she says.

Sarah and her mother Joanie praise the government's Access to Work scheme, which provided a £3,000 grant for specialist equipment and a job coach. Intensive language therapy led to a 40 per cent improvement, enabling her to remember her mobile phone number, vital for anybody seeking work. But it cost £20,000, raised by crowdfunding.

"I would love a full-time job," she says. "But there's so much competition."

**RESEARCH SPENDING PER PATIENT IN 2012**



otherapy recommended by the National Institute for Health and Care Excellence (NICE), and even fewer (36 per cent) receive the appropriate amounts of speech and language therapy. The Stroke Association's own surveys agree. For example, student Sarah Scott made big gains in recovering her speech as a result of six weeks of speech therapy in the United

States, but had to raise £20,000 through crowdfunding to pay for it.

There are also serious concerns about shortage of doctors and nurses, with the SSNAP showing that only 50 out of 183 hospitals had the recommended level of three qualified nurses per ten stroke beds at weekends, while a quarter of hospitals have unfilled vacancies for stroke con-

sultants. "Nursing levels can make a big difference to whether or not you survive after a stroke," says Professor Rudd. A study found the risk of dying within 30 days was 11.2 per cent in units that met the nursing target, but rose to 15.2 per cent in units with half as many nurses.

Increasing staff levels means more spending, though international compar-

isons show that the UK spends roughly the same proportion of health care costs (4 per cent) as other comparable countries on stroke. Where stroke does lose out is in research spending, with £48 a year spent per patient compared to £241 for every cancer patient. This is disproportionately low, according to the Oxford team that calculated the figures.



# Delivering change when it counts

*New technology, treatments and techniques, backed by the latest research around the world, are boosting survival rates and delivering improved outcomes for stroke patients*

◆ **TECHNOLOGY**

● **VICTORIA LAMBERT**

Few medical conditions require such acute treatment as stroke – "time is brain", say doctors, as every minute lost may lead to permanent neurological damage.

Moreover the breakthrough therapies of the past two decades such as thrombolysis, known as clot-busting drugs, are only effective if used within a four-and-a-half-hour window of the incident. Any delay in assessment or treatment can risk allowing damage in the brain to spread, leading to a poor initial prognosis and a much greater risk of permanent physical disability.

No wonder then that stroke specialists are exploring faster and better ways to improve initial diagnosis, care and treatment.

Probably the best-known newer intervention is a clot-grabbing device. These are effectively retrievable stents, inserted through the artery in the groin and directed all the way up through the neck to the clot which caused the stroke. Surgeons use the stent like a basket to collect the clot, which may already have been weakened using thrombolysis, and pull it out.

Sanjeev Nayak, consultant neuroradiologist at University Hospitals of North Staffordshire NHS Trust, explains: "In patients with large occlusions of the major vessel in the brain, which causes serious strokes, if you don't get the clot out, there is a 50 per cent chance of death or destruction of brain tissue."

Dr Nayak is encouraged by new results that show the clot-grabbing devices to be good value for money as well as efficacious. Data presented at the International Stroke Congress in Nashville, Tennessee, in February demonstrated that use of one particular device nearly doubled the rate of good neurological outcomes (71 per cent as opposed to 40 per cent) compared with standard-of-care treatment alone, within its study.

Looking into the future, Keith Muir, SNAPSE professor of clinical imaging and consultant neurologist at the University of Glasgow, confirms there is promising work underway, much of it in radiography.

"For example, brain perfusion imaging looks at the blood-flow patterns in the brain," he explains. "We see where the blood is moving in the brain and use that information to decide on how to tackle the clot. We're asking do you simply inject the drug into everyone or do we gain more by scanning first and seeing if some people don't require treatment?"

A Stanford University, California team are exploring if embryonic stem cells could carry out repair work. Initial research using these cells in mice and rats one week after a stroke resulted in the animals regaining strength in their limbs.

Meanwhile, British researchers have been looking into brain cooling. A paper pub-

lished in the journal *Stroke* last October, by a team from the Institute for Women's Health, University College London, showed that cooling to 35C (an absolute drop of 3.5C) provided protection in most brain regions after a stroke, although overcooling (an 8.5C drop) was detrimental.

Other therapies under study include the use of ultrasound and microscopic air bubbles introduced intravenously to break up clots, plus work in Melbourne, Australia on the intravenous introduction of magnetic particles as a way of targeting the clot's location to improve delivery of thrombolysis.

In Glasgow, Professor Muir is involved in trials delivering a special oxygen-carrying chemical, a perfluorocarbon or PFC, at the same time as a scan to see which parts of brain tissue are still able to absorb the oxygen. Moreover, it's a way of delivering oxygen straight to tissue where there blood supply has been interrupted and keeping it alive.

However, not all strokes are caused by clotting. Professor Muir says: "In the case of a stroke caused by a bleed – an intra-cerebral haemorrhage – we sometimes carry out brain surgery which can cause trauma to otherwise healthy tissue. Now there's a promising new method where a small tube is inserted into the clotted area of fresh blood to allow thrombolysing drugs to be administered directly, allowing the blood to be sucked out with less trauma to surrounding tissue."

Pharmaceutical research is still focusing on improving clot-busting drugs and trying them in different combinations. Meanwhile, some hospitals are using telemedicine and remote diagnosis with success. But, Professor Muir warns, access to a video camera in a remote location "doesn't mean you have a stroke service – you still need to get patients to hospital to begin treatment".

In south London, St George's Hospital, Tooting has begun using the Kent, Surrey and Sussex Air Ambulance to speed up patient admittance by up to an hour.

But perhaps the most interesting work underway is the WAKEUP trial, funded by the European Union, which is trying to determine most precisely when the stroke took place. "One in four strokes happen at night and we can't tell when the acute episode occurred, so we can't use thrombolysing drugs," says Professor Muir. "This trial could mean opening the doors to treat many more patients."

“  
Initial research using embryonic stem cells in mice and rats one week after a stroke resulted in the animals regaining strength in their limbs



Source: Stroke Association 2015

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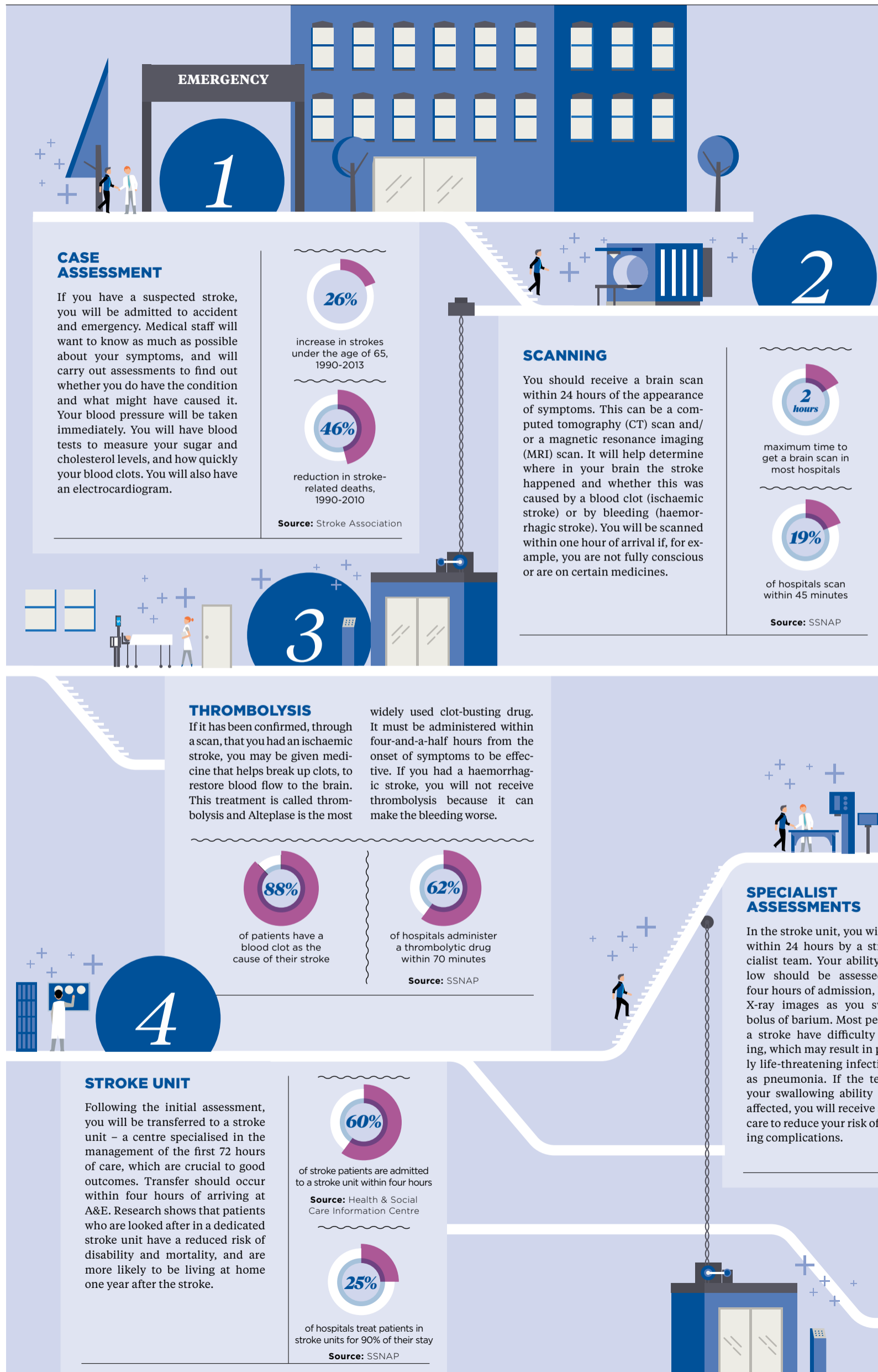
# Care path from emergency to recovery in 11 steps

Looking at a stroke pathway continuum or pathway to understand the care and rehabilitation

◆ **PATHWAY**  
● **LORENA TONARELLI**

Some 150,000 strokes affect people in the UK every year. Stroke remains the largest cause of complex disability and the fourth most common cause of death.

However, developments in stroke recognition, brain imaging and medications, as well as the introduction of structured rehabilitation programmes, have made a significant contribution to the standard of care in hospitals and the community.



# Pathway onset every steps...

patient's journey as a  
way enables a better  
condition from onset to  
and recovery

This in turn is having a positive impact on patient survival. The number of stroke-related deaths has decreased by more than 40 per cent in 20 years.

Today, the patient's journey from diagnosis to treatment and after-care is significantly more complex than it was in the 1990s. It includes a number of distinct steps, each one of which aims to optimise both treatment and patient experience.

An important advantage is that the quality of care delivered can be monitored and evaluated at each step so changes can be made to achieve best practice where they are most needed.

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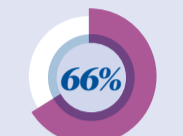
## DISCHARGE PROCESS

Before you leave hospital, the stroke team, together with social care services, will prepare a discharge plan for you. This aims to ensure you continue to receive the treatment and support you need. It may include home visits to arrange for any practical help you may require. Depending on where you live, you may be assigned to an early supported discharge (ESD) team, who will treat you at home, enabling you to leave hospital earlier.



of all stroke patients are eligible for early supported discharge

Source: SSNAP



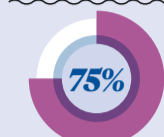
of UK hospitals have access to ESD services

Source: Stroke Association

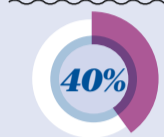
11

## THERAPY AND RECOVERY

The recovery process from a stroke is rarely complete when it's time to leave hospital. It usually continues for several months, either at home or in a long-term care facility after discharge. It is likely you will need to see a physiotherapist, dietician and other healthcare professionals. Support, including psychological therapy and stroke counselling, is also available. If you have financial worries, certain charity organisations may be able to help. You may also be eligible to apply for state benefits.



of social services provide community-based help for patients with mobility problems



provide community-based help for patients with speech and language impairment

Source: Stroke Association

9

## MULTIDISCIPLINARY TEAM WORKING

There is overwhelming evidence, from studies and real-life experience, that a multi-disciplinary team approach to care yields the best results, in terms of patient outcomes. For this reason, stroke units have co-ordinated teams of medical, nursing and therapy staff, who have specialist expertise in stroke rehabilitation. Compared with conventional care, multidisciplinary team working for stroke which starts in the hospital and continues in the community, increases the likelihood of regaining independence, reducing the need for institutional care.



recommended time to physiotherapy assessment



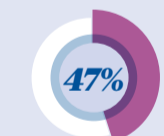
to get physiotherapy assessment by a multidisciplinary team in 97.26% of UK hospitals

Source: SSNAP

8

## SPEECH AND LANGUAGE THERAPY

About half of the people who have a stroke experience difficulties with speech and language, for which they require specialist care. You may be unable to speak clearly (dysarthria) or to form and understand words (aphasia). Therapy may involve performing exercises that address the type of impairment you have to improve your ability to speak over time. A therapist can also teach you alternative ways to communicate, such as writing, drawing and using gestures.



of stroke patients need speech and language therapy



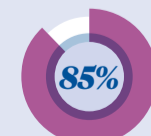
of speech and language therapy received per session

Source: SSNAP

7

## PHYSIOTHERAPY

Physiotherapy is an essential component of stroke rehabilitation. A stroke can damage brain regions that control movement, causing weakness or paralysis, usually on one side of the body. If you have limited mobility, a physiotherapist may help you regain the ability to move, through exercise and other interventions. As part of your physiotherapy care plan, you will be encouraged to practise walking as soon as possible. Physiotherapy starts in the hospital and often needs to continue at home.



of stroke patients need physiotherapy



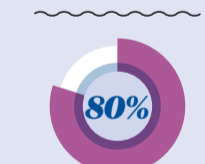
of physiotherapy received on most weekdays

Source: SSNAP

6

## OCCUPATIONAL THERAPY

You will be seen by an occupational therapist within four days of admission to the stroke unit. Occupational therapy improves the chances of returning to independent living. It does so by helping relearn or compensate for abilities that may have been lost as a result of the stroke. In addition, an occupational therapist can show you strategies to make everyday activities such as dressing or washing yourself easier, and can advise on special equipment and adaptations you may need.



of stroke patients require occupational therapy



of occupational therapy received on most weekdays

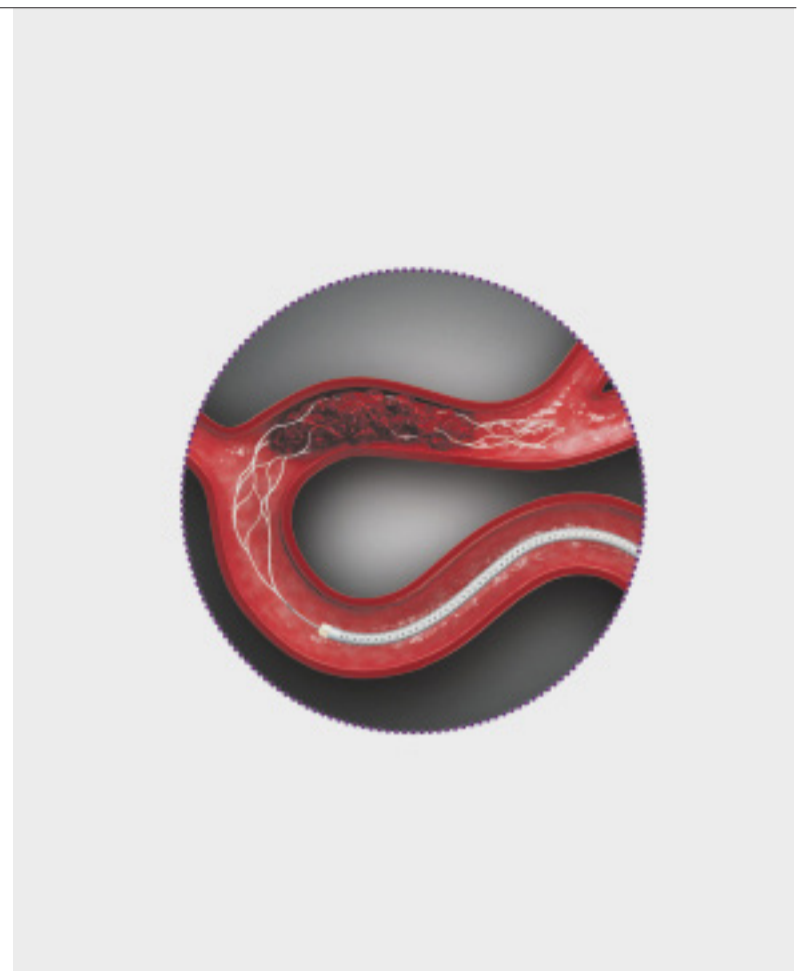
Source: SSNAP

# CLEVER STENT RETRIEVER CAPTURES CLOTS

*A life-saving technology to remove blood clots which cause stroke is winning plaudits around the world*



**Dr Ian Rennie**  
Consultant neuroradiologist  
Royal Victoria Hospital  
Belfast Trust Hospitals Group



Trevo® XP ProVue Retriever in vivo. Image courtesy of Stryker neurovascular

Doctors can now remove potentially debilitating and lethal blood clots in under an hour with technology that has just won the backing from five separate clinical trials.

The MR CLEAN study – Multicenter Randomised Clinical trial of Endovascular treatment for Acute ischemic stroke in the Netherlands – published in the *New England Journal of Medicine*, demonstrated brain tissue can be saved by directly removing the clots blocking major blood vessels to the brain which cause acute ischemic stroke.

The ability to target these clots with minimally invasive techniques means doctors can provide a safe and effective treatment in the time-critical moments after a patient is admitted with a suspected stroke.

The results for patients are significant. While one in five who had standard tPA (tissue plasminogen activator) drug therapy were able to return to independent living, the figure rose to one in three with direct clot removal in the trial conducted with 500 patients in the Netherlands.

The treatment system uses a stent retriever – a cleverly designed wire mesh cage – delivered by a catheter that is inserted at the groin and directed up the femoral artery and through the blocked vessel where it expands to snare or capture the clot which is then drawn back out allowing normal blood supply to return.

Devices such as the Stryker Trevo® XP ProVue Retriever, which was approved by the US Food and Drug Administration in 2012, and the Covidien Solitaire™ FR Revascularisation Device are changing lives every day around the world.

In about one third to half of stroke patients, a clot lodges and occludes flow in one of the four large vessels feeding the brain with potentially devastating consequences.

People with smaller clots can be helped by tPA medication, delivered in the first three hours post stroke, which works to dissolve the clots. But it often does not help with big clots and no other treatments have been shown to work until now.

The success rate has been confirmed by the five trials, including MR CLEAN and ESCAPE in Canada, which included patients enrolled in Northern Ireland under the acute stroke care team and Dr Ian Rennie, consultant neuroradiologist at the Royal Victoria Hospital in the Belfast Trust Hospitals Group. This was the only hospital from the UK that participated in any of the five recently published trials.

“We have been carrying out this treatment for four to five years and have been doing increasing numbers recently,” says Dr Rennie. “We were part of the Canadian study which showed a huge positive benefit if we can get the patients for treatment quickly enough and well enough.

“By taking out the clots successfully, we can virtually halve their chances of dying and double their chances of a good outcome which is significant compared to the best medical treatment in terms of intravenous drugs.

“We have shifted the balance of probability of a good outcome from a big brain

“**The ability to target clots with minimally invasive techniques means doctors can provide a safe and effective treatment in the time-critical moments after a patient is admitted with a suspected stroke**

clot to 50-50 which, given the fact that without the treatment the patients may end up severely disabled or dead, is a major improvement.”

He says the devices have evolved to become so technically sophisticated that an interventional neuroradiologist could regularly remove clots within an hour, with the best treatment time of just under 20 minutes from the initial CT scan.

“Time is a critical factor with stroke,” says Dr Rennie, who believes the endovascular procedure system is destined to become commonplace in key hospitals, with other clinicians now achieving impressive and consistent clinical results.

“We had a patient in her early 40s who had a stroke. Because it is generally not thought about at that age, she came to us at six hours. She had a stroke scale that made us sufficiently concerned she would either die or be profoundly disabled and require nursing home care,” says Dr Rennie. “But she went home independently three or four days later. She and her family were delighted. We do get successes like that and the technology helps us achieve it.

“One of our early successes was a young patient, who fell asleep with the neck in an awkward position, on the way back from A-level exams and suffered a major blood clot at the back of the brain. It was a complex procedure with the earlier technology, but we were able to remove the clot. The patient was initially unwell, but improved greatly over time and we’re told the patient passed a driving test a year later.

“That young patient is back to work, and will pay taxes and hopefully have a good life contributing to society. The operation at our end cost around £5,000 in devices, with the entire acute treatment costing about £10,000, whereas the patient could have ended up requiring long-term nursing home care at about £50,000 a year, every year.

“You can see how much that saves the NHS financially, but there is the ability to relieve the human suffering of a patient to endure the effects of a stroke for the rest of their life, so the costs are modest. The implications are significant.”

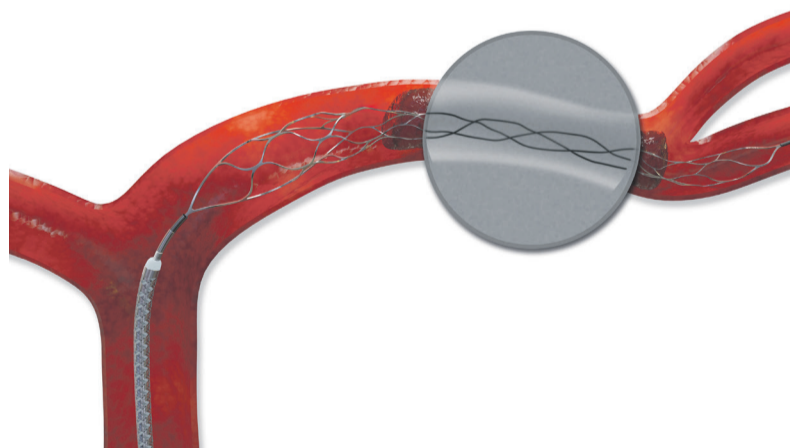
The system also synchronises with the ordered efficiency of an angiography room with stroke physicians or stroke neurologists where the staff and nurses work with slick calmness. “It is a bit like changing the wheels on an F1 car; once you’ve done the procedure a few times, it becomes very quick with everyone knowing their role,” says Dr Rennie. “We have now developed a very slick service.”

Patients can be receiving a local anaesthetic in preparation for the procedure just minutes after having their diagnosis confirmed by a CT scan. The ESCAPE trial target time was 90 minutes from CT to finish.

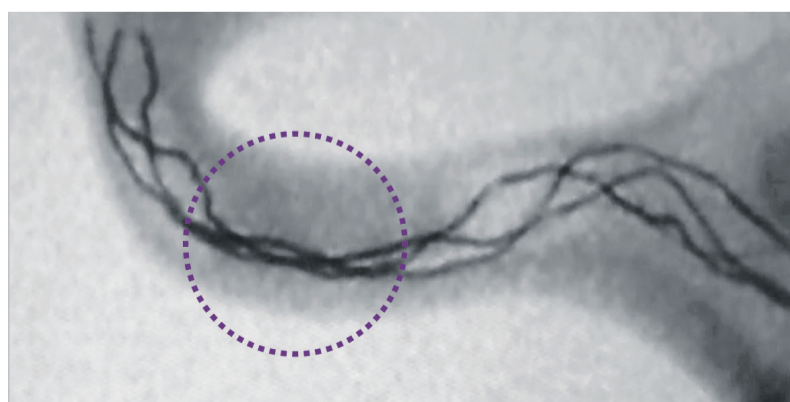
“It is a relatively simple procedure when carried out by an experienced team, and the design, technology and engineering has come on so much that we can quickly restore the blood supply to the brain and remove the clot efficiently,” says Dr Rennie, who with the local stroke team and colleagues treated 50 patients with the system during 2014 and has already reached this number five months into 2015.

“The potential is vast and I can see this becoming much more common around the UK,” he concludes.

The trial data has been welcomed around the world.



Stryker Trevo® XP ProVue Retriever. Image courtesy of Stryker neurovascular by Concentric medical



Trevo® XP ProVue Retriever visible under fluoroscopy. Image courtesy of Stryker neurovascular

# Making recovery a fun-to-play 'game'

*Mental stimulation and physical movement involved in computer gaming could be a game-changer for recovering stroke patients*

◆ **GAMING THERAPY**

● **DANNY BUCKLAND**

The last place you might expect to find a former Disney imagineer and an artist is in a university's neuroscience laboratory, especially when they are playing around with a computer-simulated dolphin named Bandit.

But they are part of a unique line-up of professional disciplines that are combining to galvanise brain repair after a stroke through the use of computer gaming.

Animation and gaming have begun to be used in neurology, but never before have they been pitched at the pivotal time-window after stroke with such panache and potential.

The unlikely team, known as the KATA project and headed by Omar Ahmad, was drawn together by Cambridge-educated neurologist and neuroscientist John Krakauer at the US Brain, Learning, Animation and Movement lab he runs at the Johns Hopkins University in Baltimore.

Its BLAM acronym and bold comic-style logo demonstrates a radical approach to human biology, and it could be heading towards one of the biggest breakthroughs in the history of stroke treatment.

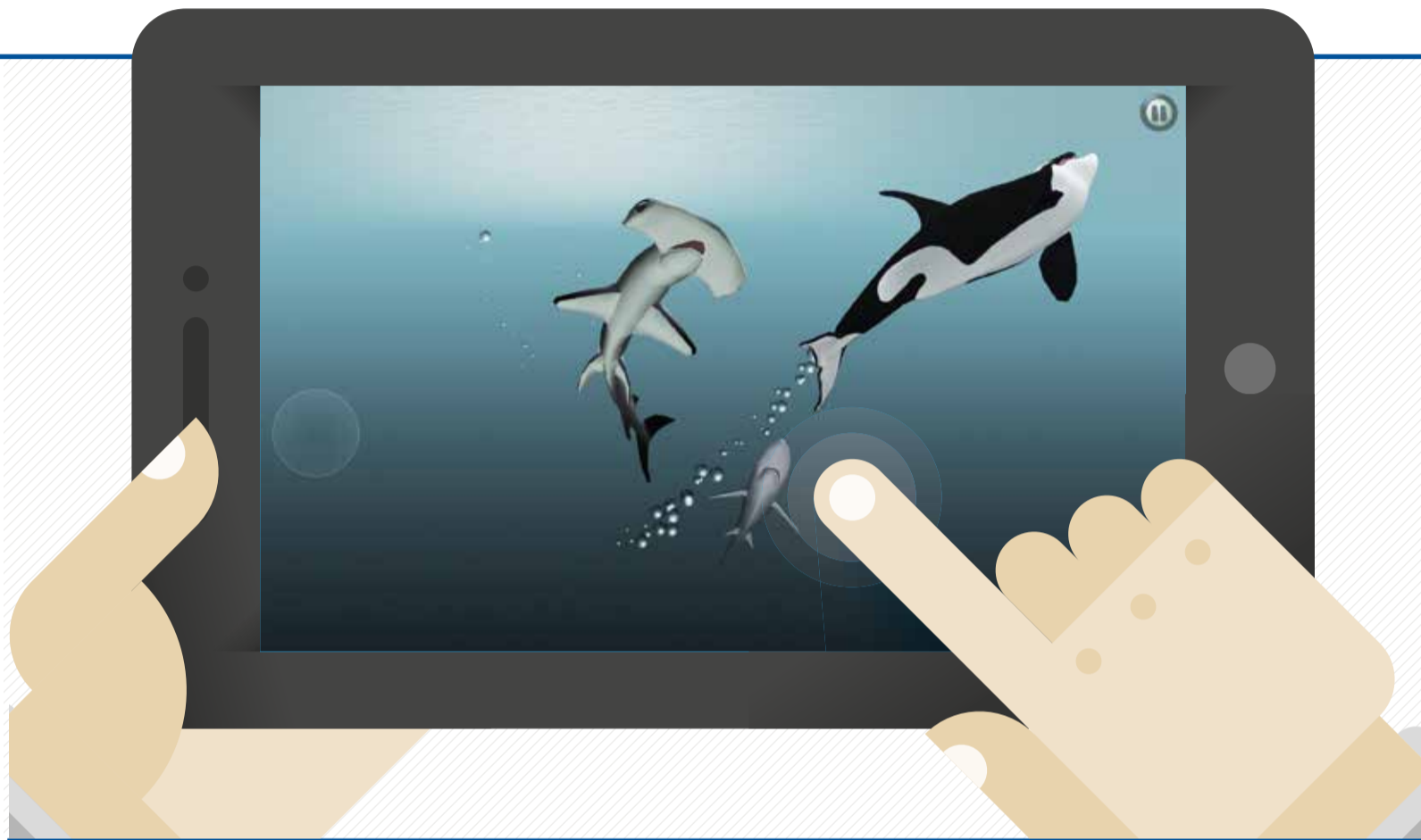
His belief is that insufficient stimulation is available for stroke victims in the crucial early weeks post-stroke when the brain has heightened plasticity and, therefore, an enhanced ability to reorganise in response to training. It is a narrow window, lasting maybe weeks and rarely beyond three months.

"And what do we do? We know that patients spend around 60 per cent of the first two weeks alone in their room and 85 per cent of the time not moving. Hospitals can be the most sterile and drab places," he says. "We know that people watch sport, animated movies and love car chases. We are obsessed with movement and entertainment, yet we suck all of that out of the hospital environment."

Laboratory research has shown that the brain has a responsive period after a stroke and that is where Bandit leaps into action.

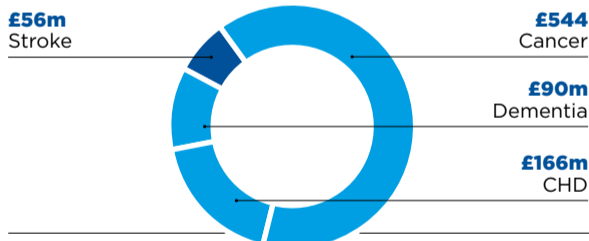
With the support of an exoskeletal arm, patients control its exquisite movements – fashioned after hours of observing real dolphins in Baltimore's National Aquarium – on a large screen and Dr Krakauer believes that joyful immersion in the game could lead to a reversal of impairment.

"We know that dose and intensity of practice matters, but you get perhaps less than an hour a day of arm movement in hospital. This game provides intense motivated play at a time when it is most crucial," he adds.



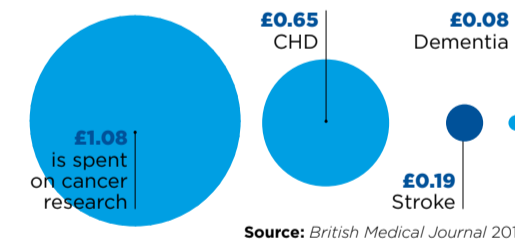
**£856m**

in combined government and charity research funding in 2012 to cancer, coronary heart disease (CHD), dementia and stroke



**For every £10**

of health and social care costs attributable to each condition...



Source: British Medical Journal 2014

“

Animation and gaming have begun to be used in neurology, but never before have they been pitched at the pivotal time-window after stroke with such panache and potential

"Why should the patients have something less stimulating than a first-class Disney-quality movie?"

BLAM and KATA are now using the animal simulation in a two-year clinical trial that could present ground-breaking results.

"We don't know yet if we can get patients to recover more than with conventional rehabilitation, but in the first three months the brain has a heightened degree of plasticity, meaning it responds more to training than it will later. We hope we can make a difference with gaming as a therapeutic tool after stroke," says Dr Krakauer.

Bandit can leap 20 feet high in its virtual world and its pirouettes are balletic, while it also needs sharp movements to

evade predators. Stroke patients, using an exoskeleton arm sling to aid control, enjoy its high gaming quality so they do not feel like they are labouring at a rehabilitation chore.

"We have run it with a dozen patients and they are like children again, laughing, playing, completely engrossed," says Dr Krakauer. "The research is compelling and the early phases have been inspiring so we are entering and exciting period now."

BLAM and KATA have already moved on to its next game – a half-ant, half-car creature that is controlled on increasingly difficult courses used to track longitudinal skill learning. Dr Krakauer and Dr Ahmad remain committed to PIXAR-quality productions that could make gaming the

game-changer in stroke recovery and potentially a host of other diseases.

Their research will pile up on the growing evidence of the benefits of computer stimulation as a therapy.

The Stroke Association is harnessing technology in an innovative social networking project called My Stroke Guide which knits strands of recovery by encouraging users to search for information, link up with others and set goals.

It is running as a pilot project for 200 patients, but is already helping recovering patients to build confidence, achieve physical targets and avoid isolation.

"The feedback has been very positive and it is working well with goal-setting which is an important part of recovery," says Kristina Barrick, business manager for My Stroke Guide.

"There is a real information gap for stroke survivors and this allows them to find the material they need rather than having lots of leaflets dished out when they leave hospital.

"We have lots of people at different stages of their recovery using it and even have a former IT guy using it as a route to get back to work."

Technology has a huge role to play in stroke recovery and many will be waiting to see if a dolphin called Bandit can pilot the way to a new era of therapy.

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STROKE STRIKES



**152,000**  
cases of stroke in the UK every year



**Every 2 seconds**  
someone in the world will have a stroke for the first time



**25-33%**  
of all strokes are recurrent



**30 days**  
is the critical period when there is the greatest risk of recurrent stroke

Source: Stroke Association 2015

Stroke  
strikes  
every  
3½  
minutes

**Stroke strikes in an instant but its effects can last a lifetime. Today, more than half of the 1.2 million stroke survivors are living with a life-shattering disability.**

The Stroke Association is the UK's leading charity dedicated to conquering stroke. We provide vital services, campaign for better stroke care and fund research into better treatments and prevention. With your support we can prevent, treat and beat stroke. Together we can conquer stroke.

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