Institution: University of Glasgow

Unit of Assessment: Unit 1; Clinical Medicine

Title of case study: Specialist stroke services become the national standard of care

1. Summary of the impact

Worldwide, around 5 million stroke-related deaths occur annually, while another 5 million people are left with chronic disabilities following strokes. University of Glasgow research demonstrated that admission to a specialist stroke unit significantly improves patients' chances of survival and recovery. This discovery transformed the culture of stroke service delivery in the UK. These studies drove the development of new advice in national and international clinical practice guidelines and promoted the implementation of NHS healthcare targets and audit activities to standardise and evaluate the quality of stroke care. In the UK, the early death rate after stroke has fallen from over 45% to under 30% in the past 20 years; at least one-fifth of that decline is attributed to the introduction of stroke units.

2. Underpinning research

Stroke is an acute medical emergency with potentially lifelong effects. This condition occurs when a clot blocks the blood supply to the brain (ischaemic stroke) or when a blood vessel in the brain bursts (haemorrhagic stroke). Global estimates from the World Health Organization (WHO) suggest that one in six people will experience a stroke in their lifetime and approximately 15 million people will have a stroke each year. Research led by University of Glasgow researcher Prof Peter Langhorne has a long-standing and distinguished reputation in the field of clinical stroke care.

Proof-of-concept for specialist stroke units

Up until the early 1990s, cohesive clinical approaches to the management of stroke patients were not routinely adopted. In 1993, clinical researchers at the University of Glasgow (Profs Brian Williams and William Gilchrist) published a meta-analysis championing the role for specialist stroke units.[1] A stroke unit is a system of organised hospital care that allows patients to be managed in a dedicated ward by a specialist multidisciplinary team. This integrated approach provides access to emergency care; diagnostic and imaging tests; clot-busting therapy; rehabilitation; supported discharge; and a programme of aftercare. The meta-analysis evaluated 1,586 patients enrolled in 10 different studies; treatment in a stroke unit rather than a general ward led to a 28% reduction in mortality. This proof-of-concept study paved the way for grant funding from Chest, Heart & Stroke Scotland and was used as a framework to campaign for change in stroke care.

Stroke Unit Trialists' Collaboration establishes benefits of organised stroke unit care

Based on the results of this initial study, Langhorne established the Stroke Unit Trialists' Collaboration (SUTC) in 1994 to take this work forward in an international setting. This forward-thinking and innovative initiative comprises the co-ordinators of all stroke unit trials conducted worldwide. Under Langhorne's direction and coordinated by the University of Glasgow, the SUTC conducts extensive meta-analysis and systematic review of clinical outcomes from multiple studies to provide reliable estimates of the content, effectiveness and health economic impact of stroke unit-based care. The first phase of this work was carried out between 1994 and 1997 and led to several publications, including a Cochrane Systematic Review. These reviews evaluate primary clinical research, and are recognised internationally as the gold standard in evidence-based health care. First published in 1995, the SUTC Cochrane Systematic Review has been regularly revised to provide the most up-to-date information on stroke care; the most recent edition was published in September 2013.[2]

Taken together, the University of Glasgow-led SUTC publications established that:

- Stroke units have characteristic features, such as multidisciplinary team-based care and defined management pathways, which can be quantified and replicated[3,4]
- Patients cared for in a stroke unit are more likely to survive, return home and regain independence than those placed on a general medical ward; for every 100 patients treated

in a stroke unit, there are 4 extra survivors and 6 additional patients who return home and regain independence[2,3]
- The observed benefits are widely applicable since they are independent of the clinical specialty or patient age, sex, stroke type and severity[2,3]
- The benefits of stroke unit care are partly explained through a reduction in common complications of stroke[5]
- Stroke units are likely to be cost effective[2]

Ongoing research at the University of Glasgow has demonstrated the successful implementation of the SUTC evidence in terms of the impact of stroke unit care among patients in Scotland during the period 1986–2005.[6] Admissions to a stroke unit increased from 0% to 87%; mortality decreased from 45% to 29%; and discharges home increased from 46% to 59%.

Key University of Glasgow researchers: Peter Langhorne (Professor of Stroke Care, 1994–present); Brian Williams (Honorary Lecturer in Geriatric Medicine, 1976–2010); William Gilchrist (Honorary Lecturer in Geriatric Medicine, 1988–present).
Key external SUTC collaborators: Martin Dennis (Western General Hospital, Edinburgh) and Graeme Hankey (University of Western Australia, Australia).

3. References to the research

1. Langhorne P, Williams BO, Gilchrist W, Howie K Do stroke units save lives? *Lancet,* 1993; **342:** 395–398 doi:10.1016/0140-6736(93)92813-9.
2. Stroke Unit Trialists' Collaboration. Organised inpatient (stroke unit) care for stroke. *Cochrane Database of Systematic Reviews* 2013, Issue 9. Art. No.: CD000197 doi:10.1002/14651858.CD000197.pub3. [Langhorne is the corresponding author]
3. Stroke Unit Trialists' Collaboration. Collaborative systematic review of the randomised trials of organised inpatient (stroke unit) care after stroke. *BMJ*, 1997; **314:** 1151–1159 doi: 10.1136/bmj.314.7088.1151. [Langhorne is the corresponding author]
4. Langhorne P, in conjunction with the Stroke Unit Trialists' Collaboration. What are the components of effective stroke unit care? *Age Ageing*, 2002; **31:** 365–371 doi: 10.1093/ageing/31.5.365.
5. Govan L, for the Stroke Unit Trialists' Collaboration. Does the prevention of complications explain the survival benefit of organised inpatient (stroke unit) care? Further analysis of a systematic review. *Stroke*, 2007; **38:** 2536–2540 doi:10.1161/STROKEAHA.106.478842. [Langhorne is the corresponding author]
6. Langhorne P *et al.* Estimating the impact of stroke unit care in a whole population: an epidemiological study using routine data. *J Neurol Neurosurg Psychiatry*, 2010; 81: 1301–1305 doi:10.1136/jnnp.2009.195131.

4. Details of the impact

The concept of stroke units was first put forward in the 1960s; however, they were not widely implemented owing to lack of robust evaluation of the benefits and costs. University of Glasgow research demonstrated conclusively that implementation of specialist stroke units can reduce the chances of death or serious disability after experiencing a stroke. This work also identified key factors required for optimum patient care.

The body of research produced by the University of Glasgow on specialist stroke units has influenced healthcare provision and policy on an international scale, benefiting end-users such as clinical and social care staff involved in stroke management, as well as patients with stroke. This work has raised awareness about the advantages of coherent stroke care and driven development of clinical guidelines that have been translated into national standards.

International and national clinical guidelines

Langhorne was co-chair of the Stroke Units and General Treatments subcommittees of the ESO from 2006 to 2008. The ESO developed guidelines for management of ischaemic stroke and

transient ischaemic attack that recommended all stroke patients should be treated in a stroke unit.[a] These guidelines (published in 2008) directly reference the 2007 edition of the Cochrane Systematic Review,[2] stating "*All types of patients, irrespective of gender, age, stroke subtype and stroke severity, appear to benefit from treatment in stroke units*." In addition, the 2002 *Age and Ageing* paper[4] is cited in the evidence base for components of care. The ESO guidelines have been translated into 14 languages, including Spanish, Russian and Chinese, reflecting the authority they possess for improving healthcare standards internationally. University of Glasgow findings have also helped shape clinical guidelines outside Europe. For example, the Australian National Stroke Foundation published clinical guidelines in 2010,[b] which explicitly recommend improving access to stroke units across the country (Chapter 1 recommendations, "organisation of services"), citing research conducted at the University of Glasgow as evidence for this approach.[2,4]

Since 2004, Langhorne has been a member of the UK Royal College of Physicians (RCP) Intercollegiate Stroke Working Party tasked with developing the *National Clinical Guideline for Stroke* (3rd edition published 2008; revised 2012), which was refined in response to the ESO guidelines.[c] The RCP guidelines advocate on-going inpatient rehabilitation (recommendation 3.2.1F), citing the 2007 Cochrane Systematic Review[2] in support of this recommendation. The National Institute for Health and Care Excellence (NICE) guidelines, published in 2008, acknowledge the contribution of the Cochrane Systematic Review[2] as a "*catalyst for marked change in stroke service organisation across the NHS*" (section 7.1.1).[d] These guidelines recognise specialist care as a key priority for implementation among patients with stroke. The Scottish Intercollegiate Guidelines Network (SIGN) develops evidence-based clinical guidelines for NHS Scotland. From 2006 to 2009, Langhorne was vice-chair of the SIGN stroke guidelines; these guidelines (published in 2008) highlight the need for multidisciplinary hospital care (recommendation 2.2).[e]

National standards and audit

In order for guidelines to make meaningful changes to clinical practice, it is essential that clear standards and targets are established and outcomes audited. Langhorne is President of the British Association of Stroke Physicians (BASP), a UK-wide professional organisation that has been active in lobbying for national standards of stroke care. BASP has worked with both NICE and SIGN to achieve this goal.

The UK government launched a 10-year *National Strategy for Stroke* in 2007 that specifically highlighted the requirement for immediate referral of suspected cases for specialist assessment.[f] University of Glasgow research, particularly the Cochrane Systematic Review, provided the evidence base and rationale for specialist stroke units, including rehabilitation and leadership in stroke care. In 2010, NICE published a stroke quality standard covering all phases of the integrated care process for adult stroke patients.[g] This document set out "*aspirational but achievable*" standards and outcome measures for healthcare professionals. These include the need to provide evidence of local arrangements to ensure patients with suspected stroke are admitted directly to a specialist stroke unit (quality statement 3).

Langhorne is a member of the RCP Intercollegiate Stroke Working Party that established and oversaw the Sentinel audit of stroke services in NHS England, Wales and Northern Ireland.[h] Sentinel evaluated nine key indicators of stroke care among 11,353 patients and was published in 2010. Improvements were recorded in 2010 for stroke-related death (17% vs. 24% in 2004), admission to a specialist stroke unit (88% vs. 46% in 2004), length of hospital stay (10 days vs. 18 days in 2004) and institutionalisation (10% vs. 13% in 2006). In all, 88% of patients were admitted to a stroke unit at some point during their hospital stay (vs. 74% in 2008) and 60% of patients spent the majority of their stay in a stroke unit (vs. 51% in 2006). High-quality care (defined as an average score of at least 80%) was more likely to be delivered in a stroke unit than a general ward. In 2010, the National Audit Office reported that all hospitals in England now have a stroke unit and that they are working to standardise care across these units. The Sentinel audit data for NHS England showed that the average score for the nine key indicators of stroke care had improved from 60% in 2006 to 83% in 2010.[h] The intellectual underpinning of these changes has been the SUTC Cochrane Systematic Review.[2]

Within NHS Scotland, the number of stroke units now exceeds 30 across all 14 health boards. Langhorne and colleagues on the National Advisory Committee for Stroke successfully lobbied the Scottish Government to establish and implement national standards for stroke services. This effort culminated in the establishment of 'HEAT' targets for rapid access to a stroke unit (April 2011). Current HEAT targets require local NHS Scotland authorities to achieve a rate of 90% of stroke patients to be admitted to a stroke unit within 1 day. By March 2013, 80% of all Scottish stroke patients were admitted within this timeframe, compared with just 49% in 2005. In all, five NHS Scotland health boards exceeded the 2012/2013 HEAT target.[i,j] Langhorne is also a member of the Scottish Stroke Care Audit report writing team, an exercise endorsed by the Scottish Cabinet Secretary for Health and Wellbeing. The 2013 audit of stroke services across Scotland revealed that patients admitted quickly to a stroke unit were more likely to be treated in line with other quality standards (e.g. diagnostic tests, administration of aspirin and brain imaging).[j]

Accreditation

Inconsistencies in infrastructure and excellence of stroke care have been identified among various European countries following conduct of hospital surveys. Langhorne was a founding member of the ESO Stroke Unit Committee that from 2010 to 2013 worked to establish standards and accreditations that categorise stroke services into two tiers (unit and centre) reflecting the level of care available.[k] The ESO used the SUTC definition of a stroke unit – namely, a discrete ward or area with specialist stroke staff working as part of a multidisciplinary team. By contrast, a stroke centre was characterised by a wider infrastructure that also involved stroke prevention (raising public awareness), emergency services and subsequent rehabilitation. Under the ESO scheme, which was published in 2013,[k] hospitals are encouraged to apply for certification that ensures defined evidence-based organisation and procedural benchmarks are met. The aim of these accreditations is to help governments recognise differences in stroke care between hospitals and assist in the standardisation of treatment. The accreditation process is currently being piloted across Europe.

Global awareness raising

Highlighting the benefits of organised stroke care continues to be an important goal. In contrast to high-income countries, the incidence of stroke is rapidly rising in the developing world. Estimates suggest that stroke burden in low-income and middle-income countries is likely to exceed that of malaria and tuberculosis by 2030. The World Stroke Organization (WSO) is an umbrella organisation of more than 60 societies across 85 countries providing "*one world voice*" for stroke care. WSO initiatives include the World Stroke Academy (WSA), an online educational resource for continuing professional development (CPD). In May 2013, Langhorne was commissioned by the WSA as the sole UK representative on a panel of three experts who created the "Essential stroke services" CPD module to support the international initiative to widen access to stroke unit care (available online May 2013).[l] To date, more than 400 individuals have read the module content, and 35 have completed the accompanying CPD assessment.

5. Sources to corroborate the impact

a. ESO guidelines, 2008 (ref 61: p463, 464 and 484; ref 119: p464, 477 and 478)
b. National Stroke Foundation - Australia guidelines, 2010 (ref 5: p4, 5 and 7; ref 41: p4 and 8)
c. RCP guidelines, 2012 (p21)
d. NICE CG68 guidelines, 2008 (ref 51: p51, 52, 56 and Table 7.1)
e. SIGN 108 guidelines, 2008 (p4).
f. UK Department of Health National Stroke Strategy, 2007 (p30, 36, 52 and 56)
g. NICE QS2 quality standard, 2010 (p14–16 and 42)
h. National Sentinel Stroke Audit, 2010 (p16–52)
i. NHS Scotland HEAT targets for stroke, 2012–2013
j. Scottish Stroke Care Audit, 2013 (p1–11)
k. ESO accreditation scheme, 2013 doi:10.1161/STROKEAHA.112.670430
l. WSA "Essential stroke services" module, 2013, and usage metrics (available on request)