Institution:
University of Central Lancashire

Unit of Assessment:
UoA 3 – Allied Health Professions, Dentistry, Nursing and Pharmacy

Title of case study:
Transforming emergency and hyperacute response to stroke in order to save lives and reduce disability

Period when the underpinning research was undertaken:
August 2007 to March 2017

Details of staff conducting the underpinning research from the submitting unit:

Name(s):	Role(s) (e.g. job title):	Period(s) employed by submitting HEI:
Caroline Watkins	Professor of Stroke and Older People's Care, Faculty of Health and Care and Director of Research and Innovation	1st January 2002-to date
Liz Lightbody	Professor of Stroke Care and Improvement	1st April 2002-to date
Jo Gibson	Reader in Health Services Research	1st December 2008-to date
Stephanie Jones	Senior Research Fellow	1st October 2002-to date
Denise Forshaw	Principal Clinical Trials Manager	7th January 2004-to date

Period when the claimed impact occurred:
August 2013 to December 2020

Is this case study continued from a case study submitted in 2014? Y/N
N

1. Summary of the impact (indicative maximum 100 words)

In transforming national and international emergency and acute care for stroke, we have simultaneously improved public/call handler communication around 'conscious level,' enabling the targeted use of ambulances for real emergencies. Changes to the 999-call triage system mean more people with stroke are identified earlier, and transported to hospital with the highest priority level, enabling access to emergency care, increasing chances of disability-free survival. The Stroke Research Team initiated the inclusion of pre-hospital stroke care in UK national guidelines, impacting on 100,000 patients per year. Work demonstrating stroke patients can safely be nursed lying flat or sitting up allows patients worldwide to choose their preferred position, increasing patient comfort.

2. Underpinning research (indicative maximum 500 words)

Preventing death and disability from stroke depends on swift recognition of the symptoms, accurate and early identification, and emergency transportation to specialist stroke centres for treatment. Worldwide, each year approximately 20 million people experience a stroke; of them, 5 million will die and 5 million will be disabled by their stroke. There are more than 100,000 strokes in the UK every year; around one stroke every five minutes. 'Time is brain': stroke is recognised as a time-dependent medical emergency and for every minute in which stroke is left untreated 1.9 million brain cells die, increasing the risk of serious disability and death. To save lives and reduce disability from stroke it is vital that patients are recognised quickly and are transported to specialist hospitals to receive specialist stroke unit care and, if appropriate, clot busting drugs (thrombolysis) or thrombectomy (surgical removal of a blood clot in the brain). These treatments are proven to save lives and reduce disability but are highly time dependent. In the UK alone, stroke costs society GBP 26 billion every year.

Research by the Stroke Research Team at the University of Central Lancashire has improved public awareness and pre-hospital recognition of stroke, increased speed of arrival at hospital and influenced head positioning in acute stroke.

1. ***Improving public awareness and pre-hospital recognition of stroke***

An integrative review found there was little correlation between public awareness of stroke symptoms and recommended behaviour, especially among older members of the population, ethnic minority groups and those with lower levels of education, who are the groups at greatest risk.

Emergency Stroke Calls: Obtaining Rapid Telephone Triage (ESCORTT [2006-2011]), the largest pre-hospital stroke study in the field, aimed to improve the recognition of stroke by 999 call handlers. This study, involving over 1,900 patients, explored interactions between the public and 999 call handlers during emergency calls for stroke [1]. During this study it was identified that conscious level was often difficult for callers to determine and/or communicate [2].

2. ***Telemedicine***

Telemedicine is vital when access to specialist staff is limited. In acute stroke, telemedicine is used to assess and treat patients when stroke consultants are unavailable, such as out-of-hours. The Stroke Research Team led research on the development and evaluation of training in a telemedicine system for acute stroke in emergency departments [3, 4]. This underpinned the standardisation of procedures and training to facilitate the use of telemedicine in stroke, enabling early diagnosis and improved access to specialist acute stroke care. From this research, the Stroke Research Team developed a Standardised Telemedicine Toolkit to support individuals or organisations in setting up telemedicine systems for any condition. The toolkit includes implementation guidelines and example documentation.

3. ***Acute stroke care***

The potential benefit of supine positioning after acute stroke in improving blood flow to the brain, versus the risk of aspiration pneumonia, have led to global variations in head positioning in clinical practice. This variability in practice across the world led to the Head Position in Stroke Trial (HeadPoST) [5, 6]. This pragmatic, cluster-randomized, crossover trial conducted in nine countries, with over 11,000 patients with acute stroke, found that patient outcomes did not differ significantly between groups allocated to a supine or semi-recumbent position.

3. References to the research (indicative maximum of six references)

1. **Watkins CL**, Leathley MJ **Jones SP,** Ford GA, Quinn T, Sutton CJ. Training Emergency Services' Dispatchers to recognise stroke: An interrupted time-series analysis. BMC Health Services Research. 2013;13:38: doi:10.1186/1472-6963-13-318.
2. **Gibson JME**, Bullock M, Ford GA, et al. on behalf of the ESCORTT group (2012) 'Is he awake?': dialogues between callers and call handlers about consciousness during emergency calls for suspected acute stroke. EMJ. 30:414-418.
3. French B, Day E, **Watkins C, Lightbody CE** et al. The challenges of implementing a telestroke network: a systematic review and case study. BMC Medical Informatics and Decision Making 2013,13:125
4. **Gibson J**, **Lightbody E**, **McLoughlin A**, et al. 'It was like he was in the room with us': patients' and carers' perspectives of telemedicine in acute stroke. Health Expectations. 2015: doi: 10.1111/hex.12333).
5. Anderson CS, Arima H, Lavados P, et al. for the HeadPoST Investigators and Coordinators. Cluster-Randomized, Crossover Trial of Head Positioning in Acute Stroke. The New England Journal of Medicine. 2017:376(25):2437-2447. doi: 10.1056/NEJMoa1615715.
6. Muñoz-Venturelli P, Robinson T, Lavados PM, et al. for the HeadPoST Investigators (2016) Regional variation in acute stroke care organisation. Journal of the Neurological Sciences. 2016:371:126-130. doi: 10.1016/j.jns.2016.10.026.

All papers published in peer-reviewed journals.

4. Details of the impact (indicative maximum 750 words)

Research by the Stroke Research Team has influenced national and international policy, service delivery, education and training and practice, consequently improving survival and reduced disability from stroke. This has been achieved via improved public awareness and pre-hospital recognition of stroke, increased speed of arrival at hospital, increased numbers receiving stroke specialist assessment and treatment, and influence on head positioning in acute stroke.

Improving pre-hospital recognition of stroke

The integrative review (**Jones, Watkins**) was cited as evidence to recommend that public awareness campaigns of the symptoms of stroke should be recurrent, targeted at those most at risk of stroke, and formally evaluated, by the 5th edition of the National Clinical Guideline for Stroke [A]. Watkins and Jones then developed, with Public Heath England, [B] the content of the Face Arm Speech Time to dial 999 (FAST) campaign in 2019, building on previous work with the Stroke Association in 2005 [C]. Following the FAST campaign an additional 38,600 people have reached hospital and received the treatment they needed [D].

Between 2013 and 2018, Watkins and Jones worked with NHS Pathways to amend NHS 111 and 999 call handler algorithms and ambulance response categories to improve recognition of stroke patients, including those with less common stroke symptoms (confirmed in a letter of support from Dr Ken Hall, Clinical Author, NHS Pathways). The inclusion of balance and visual problems and grip strength in the updated algorithm has identified an additional 82,998 stroke patients in England [E].

The improvement in the number of stroke patients correctly dispatched by Emergency Medical Services during Emergency Stroke Calls: Obtaining Rapid Telephone Triage (ESCORTT) [2] has resulted in recommendations in international guidelines including: the Canadian Stroke Best Practice Recommendations for Acute Stroke 2018 [F] and Global Utstein recommendations for emergency stroke care 2020 [G] (case study in Appendices 4.2).

During ESCORTT, an analysis of 999 calls found that the level of consciousness was often difficult for callers to determine and/or communicate [2]. This finding influenced a change of wording used within 999 call handler algorithms for all conditions in MPDS Version 13.0, September 2013, from 'Is the patient conscious?' to the simpler 'Are they awake?' [H]. MPDS is used in 42 countries and is available in 23 languages. This change affects over 8 million 999 calls in the UK alone, each year.

Stroke telemedicine

Telemedicine is the use of digital technology to enable health professionals to provide virtual assessment. The Acute Stroke Telemedicine: Utility, Training and Evaluation (ASTUTE) programme was developed in close collaboration with the introduction in 2011 of a Telestroke service throughout nine NHS Trusts across Cumbria and Lancashire. A Standardised Telemedicine Toolkit was developed to support individuals or organisations in setting up a telemedicine system. Between September 2013 and December 2021, the Telemedicine Toolkit was accessed 11,038 times from 141 countries [I]. In Lancashire and Cumbria alone, Telestroke now enables patients to have 24/7 access to expert diagnosis and treatment wherever they are, benefitting over 520 patients each year, over 4500 since 2011 [J].

Patients have benefited from being able to access specialised care that would have otherwise required travel to other locations. Feedback from patients during the trial has been positive, one patient's family member commented **"he (doctor) couldn't have done any more I don't think, because he asked all the questions...he looked in his eyes and he checked his weight, he asked what height and everything... so if he'd have been there I don't think it could have been much different"**

Head Position in Acute Stroke

Cited in International guidelines, the Head Position in Stroke Trial (HeadPoST) study reported that levels of disability after stroke did not differ significantly between patients assigned to a lying-flat position and patients assigned to a sitting-up position [5]. This research has informed the positioning of patients in the acute phase by showing that it is equally safe to nurse patients lying flat or sitting up in bed, without detriment to their recovery or pneumonia risk. This has improved individualised care, choice and comfort for stroke patients worldwide. [K] Feedback from a Senior Advanced Nurse Practitioner highlights the impact of the trial results in practice. **"The Headpost Trial has shown us that our stroke patients have the choice to be nursed in the position that is most comfortable to them be it flat in bed or sat up without compromising them, this is so important when delivering holistic care."**

5. Sources to corroborate the impact (indicative maximum of 10 references)

A. Intercollegiate Stroke Working Party, 2016. 2.1 Public Awareness of Stroke. *National Clinical Guideline for Stroke*. 5th Edition. Royal College of Physicians, London. P12.

B. **Watkins and Jones** have worked with Public Health England to inform the content of the National Face Arm Speech Time to dial 999 (FAST) campaign in 2019.

B1. Act FAST – Stroke, Public Health England campaign web page https://campaignresources.phe.gov.uk/resources/campaigns/9-act-fast---stroke/overview
B2. Email from Freuds regarding inclusion of clinical data in advertising campaign

C. E-mail evidence from the Stroke Association and Public Health England.

D. https://www.bbc.co.uk/news/health-31057650 (between 2009 and 2015 PHE said an extra 38,600 people reached hospital within this window and received the immediate medical treatment they needed).

E. Testimonial evidence from NHS Pathways and NHS Pathways Data.

E1. Testimonial from NHS Digital Stroke Review Lead
E2. NHS Pathways data showing the number of additional suspected stroke patients identified after contacting 999 or 111 based on the inclusion of additional stroke symptoms.

F. Boulanger J, Lindsay P, Stotts G, Foley NC. Section 3: Emergency Medical Services management of acute stroke patients. Canadian Stroke Best Practice Recommendations for Acute Stroke Management: Prehospital, Emergency Department, and Acute Inpatient Stroke Care, 6th Edition. *International Journal of Stroke 2018;* 0(0) 1-36. DOI: 10.1177/1747493018786616.

G. Rudd, A., Bladin, C., Carli, P., De Silva, D., Field, T., Jauch, E., Lippert, F. (2020). Utstein recommendation for emergency stroke care. *International Journal of Stroke.* https://doi.org/10.1177/1747493020915135 (case study in Appendices,4.2).

H. Changes to Advanced Medical Priority Dispatch System (AMPDS) algorithms

H1 AMPDS version 11.1 prior to research. Is he/she conscious?
H2 NHS England and NHS Improvement Ambulance (2019) Response Programme, Mandated Pre-Triage Sieve Question/ Key Words and Nature of Call Category 1 Predict types for AMPDS and NHS Pathways, P3. Is the patient awake (conscious)?

I. Google analytics for ASTUTE telemedicine toolkit.

J. **Gibson J**, Lightbody E, McLoughlin A, McAdam J, Gibson A, Dey E, Fitzgerald J, May C, Price C, Emsley H, Ford G, **Watkins C**. 'It was like he was in the room with us': patients' and carers' perspectives of telemedicine in acute stroke. *Health Expectations*. 2015: doi: 10.1111/hex.12333).

K. Guidelines for the Early Management of Patients With Acute Ischemic Stroke: 2019 Update to the 2018 Guidelines for the Early Management of Acute Ischemic Stroke: A Guideline for Healthcare Professionals From the American Heart Association/American Stroke Association. Stroke: 2019: 50:12: e344-e418. doi.org/10.1161/STR.0000000000000211.