Institution: King's College London	

Unit of Assessment: UoA2

Title of case study: Driving Transformation in Stroke Care

Period when the underpinning research was undertaken: 2000 - 2020

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:**
Charles Wolfe	Professor of Public Health	1988 – present
Christopher McKevitt	Professor of Social Science and Health	1994 - present

Period when the claimed impact occurred: 2014 - 2020

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

1. Summary of the impact

Stroke is the leading cause of disability and the fourth largest cause of death in the UK, remaining a major public health priority. King's research has impacted NHS England and NHS organisations/stroke teams with:

1. analyses of future need and evidence gaps for planning/commissioning the NHS Long Term Plan;

2. evidence demonstrating that centralisation of services in urban conurbations is sustainable and cost-effective;

3. evidence from national quality improvement programme data of patterns and predictors of care leading to clinical improvements.

Internationally, King's research has evidenced reports on future impact and requirements to improve care, with action in European clinical societies, and has contributed to the Global Burden of Disease (GBD) estimates for stroke. Beneficiaries of this research include stroke survivors, care planners and providers, policy makers and politicians.

2. Underpinning research

Stroke is a serious life-threatening medical condition that occurs when the blood supply to part of the brain is cut off. This can affect the body in many ways, both mentally and physically that have an impact on the person's life. There are 100,000 new cases of stroke per year and 1,200,000 survivors living with stroke in the UK, more than half of whom have a disability resulting from it.

King's research estimates and predicts the epidemiology of stroke effects in patients. King's have identified inequalities in care and evaluated interventions to improve outcomes through two different pathways. In 1995, King's researchers set up The South London Stroke Register (SLSR), a population-based register recording all first-ever strokes in patients of all ages living in Lambeth and Southwark, inner city South London. King's have collected incidence, care and outcome data in a multi-ethnic population of 25 years incidence with follow up annually (7,000 patients). In 2018, King's began hosting The Sentinel Stroke National Audit Programme (SSNAP), a major national healthcare quality improvement programme based, with embedded research projects, in the School of Population Health and Environmental Studies (500,000 cases). SLSR is led by Wolfe and McKevitt while SSNAP is led by Rudd, Emeritus Professor and James, Visiting Professor. Since 2014, GBP6,000,000 in funding from various bodies such as European Commission and Department of Health and Social care have underpinned the impacts recorded in this case study.

King's analyses derive long-term estimates of stroke risk and recovery. Using SLSR data King's researchers have shown that since 2000, there have been significant declines in incidence of ischaemic stroke (based on 3,088 patients, 43% reduction, 137 to 78/100,000 population) in all age groups but non-significant reductions in the black population **(1)**. Analyses of outcomes (2625 survivors) demonstrate that 20% are alive at 15 years post first stroke, 10% have moderate/severe disability, 30% have cognitive impairment, and 39% have depression **(2)**. The data collected through SLSR and SSNAP have contributed to the Global Burden of Disease Study (GBD), that has estimated the burden of premature mortality and disability in stroke **(3)**.

King's provides cost-effective 'cross city transformation' options for stroke care. King's was instrumental in implementing the transformation of stroke services in London (REF 2014). With UCL and Manchester University, King's has subsequently demonstrated in urban areas (London and Manchester) sustained or further improvements in care with improved outcomes **(4)**. In London there was a significant decline in risk adjusted mortality at 90 days (absolute risk reduction of -1.1% (95% CI -2.1 to -0.1; relative risk reduction 5%), indicating 168 fewer deaths during the 21-month period after reconfiguration in a population of 8,200,000. There were significant declines in risk adjusted length of hospital stay in both areas (-2.0 days Manchester and -1.4 London) **(4)**.

King's provides explanatory insights into patterns of care delivery. SSNAP research analyses have shown four distinct patterns of variation of receipt of effective stroke interventions: 1. diurnal pattern (receipt of thrombolysis, brain scan times, dysphagia screening); 2. day of the week pattern (multidisciplinary team assessments); 3. an off-hours pattern (thrombolysis door-to-needle time); 4. a flow pattern (quality changed sequentially across days) (timely stroke-unit admission) **(5)**. Mortality after stroke is associated with the intensity of weekend staffing by nurses but not 7 day a week ward rounds by stroke physicians **(6)**.

3. References to the research

1. Wafa H, **Wolfe C**, Rudd A, Wang Y. Long-term trends in incidence and risk factors for ischaemic stroke subtypes: The South London Stroke Register (SLSR). *PLoS Medicine* (2018) https://doi.org/10.1371/journal.pmed.1002669

2. Crichton S, Bray B, **McKevitt C**, Rudd A, **Wolfe C**. Patient outcomes up to 15 years after stroke: Survival, disability, quality of life, cognition and mental health. *J Neurol Neurosurg Psychiatry* (2016) http://dx.doi.org/10.1136/jnnp-2016-313361.

3. GBD 2016 Lifetime Risk of Stroke Collaborators, Global, Regional, and Country-Specific Lifetime Risks of Stroke, 1990 and 2016. *New England J Med* (2018) http://dx.doi.org/10.1056/NEJMoa1804492

4. Morris S, Ramsay A, Boaden R, Hunter R, **McKevitt C**, Paley L, Perry C, Rudd A, Turner S, Tyrrell P, **Wolfe C**, Fulop N. Impact and sustainability of centralising acute stroke services in English metropolitan areas: Retrospective analysis of hospital episode statistics and stroke national audit data. *BMJ* (2019) http://dx.doi.org/10.1136/bmj.l1

5. Bray B, Cloud G, James M, Hemingway H, Paley L, Stewart K, Tyrrell P, **Wolfe C**, Rudd A, on behalf of the SSNAP collaboration. Weekly variation in healthcare quality across day and time: nationwide registry based prospective cohort study of acute stroke care. *Lancet* (2016) http://dx.doi.org/10.1016/S0140-6736(16)30443-3

6. Bray B, Ayis S, Campbell J, Cloud G, James M, Hoffman A, Tyrrell P, **Wolfe C**, Rudd A. Associations between Stroke Mortality and Weekend Working by Stroke Specialist Physicians and Registered Nurses: Prospective Multicentre Cohort Study. *PLoS Med* (2014) http://dx.doi.org/10.1371/journal.pmed.1001705

4. Details of the impact

The ultimate beneficiaries of King's research are stroke survivors in the UK and internationally who benefit from improved evidence-based services, less disability and longer lives. These impacts using King's research are delivered through many beneficiaries including EU, governments, clinical organisations, NHSE, and NHS Trusts/Teams.

King's research leads to EU policy change and clinical professional organisational action. In collaboration with the Stroke Alliance for Europe (SAFE), which includes 34 national patient organisations, King's analysed SLSR and GBD data and produced the **EU Burden of Stroke** reports in 2017 **(A.1)**. These estimated the future impact of stroke, identified inequalities in stroke risk, shortcomings in prevention and acute care, and the lack of longer-term care and outcome data. The significance of these reports was summarised: *"As more people survive stroke, the burden of care and support is great and increasing. However, the implementation of guidelines, interventions and organised stroke care varies across Europe, contributing to variation in outcomes for stroke survivors* **(A.2)**.*"*

Key findings were presented by SAFE and the European Stroke Organisation (ESO) of clinicians and researchers (20,000 members) to the EU Parliament, May 2017, after several years' lobbying by SAFE for an EU action plan. Subsequently the research was highlighted by ESO's Vice President at the 2017 ESO Conference special session (clinicians, public, industry and researchers) as "*very important background information on the current state of stroke services and the burden of stroke* **(A.3)**.*"*

The reported uptake of evidence-based interventions fuelled debate amongst EU clinical leaders at their main conference (2017) and an invited expert workshop **(A.4)**. This has led to two EU and country specific guidelines: The Stroke Action Plan for Europe 2018-2030 **(A.5)** and the Economic Impact of Stroke **(A.6)**. ESO's Vice President has said that: "*This is academia and experts coming together, along with the input from the patient organisations to give the advice that should be used for political purposes* **(A.3)***."*

King's research plays a key role in NHS England policy. King's estimated the future impact of stroke and identified evidence gaps requiring research to enable successful implementation of the NHS Long Term Plan (LTP), the blueprint for the future NHS. King's work **(4)** was cited for epidemiological estimates and service reconfiguration **(B.1)**. It's stated in the LTP that *"The existing national stroke audit (SSNAP) provides high quality information on the acute and inpatient rehabilitation care of stroke patients to improve stroke services"* **(B.1)**. Specifically, in the Stroke Association's State of the Nation Statistics that contributed to initially shaping the stroke LTP, King's research is cited with 9 references **(B.2)**.

Additionally, findings from the EU stroke study informed King's researchers in developing a stroke care pathway framework **(B.3)** against which they identified evidence gaps and research priorities for the NHSE Stroke LTP. This gap analysis was published in the Future NHS Collaboration Platform in December 2020 **(B.4)** and will later be embellished through a series of seminars and prioritisation meetings with senior staff from NHSE and the Stroke Association. The platform supports practitioners and commissioners to access and exchange knowledge and information on transformation, across health and social care.

Research by King's positively impacts NHS Organisations and Clinical Teams. The design of the SSNAP questionnaires has been shaped from inception by the SLSR data collection

methods and tools **(3,5,6)**. SSNAP has been voted the most effective national clinical quality improvement programme in the UK for the last ten consecutive years by healthcare professionals involved in audit **(C)**. It produces annual reports and academic analyses in collaboration with King's for all hospitals in England, Wales and Northern Ireland, showing demonstrable change in the stroke care structure and processes linked to improved survival.

Longitudinal SSNAP data on care structure and processes have already informed ongoing NHSE stroke LTP 'delivery plan' developments by identifying inequalities in care and comprehensive dataset requirements to meet the needs of clinicians, commissioners and patients by describing quality of care provided for stroke patients throughout the care pathway **(D)**.

Health economics analyses using SLSR and SSNAP data have informed the development of tools for planning and commissioning specific components of care on the pathway, such as templates to estimate costs of implementing thrombolysis and early supported discharge under different scenarios used by NHSE, commissioners and NHS Trusts **(E)**.

A NICE Impact report (2019) reviewed the implementation of NICE recommendations in priority areas of stroke care, utilising SSNAP analyses to compile the report regarding 3 NICE guidelines, 2 quality standards, 6 technology appraisals and 7 interventional procedures **(F)**. Such reports are used by care commissioners and planners country-wide to assess local implementation successes and how to improve standards.

SSNAP data have been further used to identify service issues requiring improvement, prompting change in at least 12 local quality improvement projects across the stroke care pathway (acute care; assessments and rehabilitation; longer term care) **(G.1)**. For example, one team used SSNAP data to identify an unmet need for psychological support, which prompted them to improve their goal setting processes with patients. Impact included increased self-management, freeing clinician time, and reduced patient anxiety prior to discharge from the team **(G.2)**.

Data generated by King's have also been used for Care Quality Commission's (CQC) Insight Dashboards that summarise quality of care data, and by their inspectors, as exemplified by a report from 2017 **(H)**.

Service transformation in London and Manchester was also informed partly by SLSR data via King's research (4). This led to declined mortality rates, indicating 168 fewer deaths per year with significant reductions in lengths of stay in hospital equivalent to 6750 fewer bed days a year **(I)**. In this REF period, reductions in mortality and length of stay were maintained in London. In both cities provision of evidence-based interventions improved **(I)**. This evaluation is cited by the Stroke Association and the NHSE LTP **(D, J)**.

The media widely reported Professor Stephen Powis, NHS England's Medical Director, citing the research at the 2019 NHS Confederation conference (NHS Chief Executives) and announcing plans to centralise specialist services for stroke patients across England. He stated: "*Introducing quicker access to better treatment for stroke in London and here in Manchester has saved hundreds of lives and we now want to see them rolled out across the whole of the country*" **(K)**.

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

(A) Sources that corroborate King's having produced EU Burden of Stroke reports with SAFE: A.1 The Burden of Stroke in Europe: 2017 Report for Stroke Alliance for Europe (SAFE);

A.2 SAFE website Burden of Stroke page; **A.3** Youtube: Video Interview with Markus Wagner and Bo Norrving about the Burden of Stroke Report ESOC 2017 (666 views as of 8 March 2021), May 17, 2017 [minute 4:00-5:13]; **A.4** SAFE website article: 'A challenge for policy makers and a framework for tackling the rising burden of stroke in Europe' - March 23, 2018; **A.5** Stroke Action Plan for Europe 2018-2030 - SAFE, 2018; **A.6** The Economic Impact of Stroke - SAFE, 2017

(B) Sources that corroborates King's influence on NHS LTP: B.1 The NHS Long Term Plan (2019) [output 4 can be found in page 129, item 127 / SSNAP in page 64]; **B.2** Stroke Association's State of the Nation Statistics 2016 [references 12, 13, 14, 17, 33, 34, 49,51, 134-137] [PDF]; **B.3** Stroke pathway – Evidence Base Commissioning, an Evidence Review. Wolfe CDA, Rudd AG, Rodger H, McKevitt C. December 2020 [PDF]; **B.4** Stroke pathway – Evidence Base Commissioning Review – Document by King's published in the FutureNHS Collaboration Platform

(C) Clinical Audit Support Centre (CASC) Annual Survey 2019 Results [PDF]

(D) Online version of the NHS Long Term Plan: Stroke care, chapter 3 [item 3.77 (SSNAP) and reference 127 (output 4)]

(E) Health economics research and tools: E.1 Xu XM, Vestesson E, Paley L, Desikan A, Wonderling D, Hoffman A, Wolfe CD, Rudd AG, Bray BD. The economic burden of stroke care in England, Wales and Northern Ireland. Eur Stroke J. 2018 3:82-91 (https://journals.sagepub.com/doi/full/10.1177/2396987317746516); **E.2** Health Economics Tools

(F) NICE impact Stroke Report (2019) [pages 5, 7-10 and 12-15]

(G) Case studies from SSNAP users and teams describing how SSNAP has been used for quality improvement: G1. Quality Improvement Case Studies Homepage; **G.2** Longer term care case studies - Meaningful Goal Setting

(H) Example from Care Quality Commission's (CQC) inspection report - 2017

(I) NIHR Dissemination Centre Themed Review: NIHR research on organising stroke services and the pathway of care – Roads to Recovery, Organisation and Quality of Stroke Services, March 2017 [page 45]

(J) Stroke Association: What we think about: Reorganising acute stroke services, 2017. [reference 4 and 19, page 10 and 11 respectively]

(K) Sources corroborating NHS England's Medical Director citing King's research: **K.1** Article from NHSE website "Thousands more to 'survive and thrive' after stroke thanks to NHS specialist teams" - 2019; **K.2** Article from The Telegraph "NHS plans for faster treatment of stroke 'will save thousands of lives'" – 2019; **K.3** Article from the Daily Mail "NHS bosses are to roll out new specialist stroke units that could save thousands of lives" – 2019