Institution: King's College London (KCL)

Unit of Assessment: UoA4 – Psychology, Psychiatry & Neuroscience

Title of case study: 13: Stroke Units: Research driven excellence in quality stroke care

1. Summary of the impact

Stroke affects 15 million people globally and is a leading cause of death and adult physical disability. King's College London (KCL) research has provided the evidence that underpins many of the present day policies, guidelines and clinical practice for stroke care, not only in the UK but also in other countries. KCL research has demonstrated that stroke units are effective and reduce mortality and dependence by 22%. The implementation of these findings in England has increased the number of patients managed on a stroke unit from 18% to 62% between 2000-2012, preventing 550 deaths, enabling 1,700 more patients to make a full recovery and saving £82 million per year.

2. Underpinning research

In England, first or recurrent strokes affect approximately 110,000 people a year and it is the leading cause of adult physical disability in this country. Despite this, prior to 2000, UK stroke care was deemed ineffective and lacking clear policy on planning or implementation. There is a high cost burden associated with stroke and, working with the UK Government, Institute of Psychiatry, King's College London (KCL) researchers, including Prof Lalit Kalra (1995-present, Professor of Stroke Medicine), Prof Martin Knapp (1993-present, Professor of Health Economics) and Dr Anita Patel (2004-present, Reader in Health Economics) found that annual costs include £2.8 billion to the NHS, £2.4 billion for informal care and £1.8 billion of lost productivity (National Audit Office figures, 2005).

KCL research shows the benefit of stroke unit care to patients: For over 20 years, KCL researchers have studied best-case scenarios for stroke care. Stroke units deliver 24-hour care via a specialist multidisciplinary team based on clear guidelines for acute care, prevention of complications, rehabilitation and secondary prevention. A number of KCL-led trials have investigated whether these specialist units have an advantage over general care. One study found that compared to stroke unit care, stroke team-supported management on a general ward was associated with higher mortality (Odds Ratio [OR] 4.9) and higher mortality or institutionalisation at 3 months (OR 3.6) and at 1 year (OR 2.8) in patients with large-vessel infarcts (n = 164) (1). Similar benefits of stroke unit care were seen in stroke patients with a poor prognosis treated either on a stroke unit (n = 34) or a general ward (n = 37). Mortality was 21% versus 46%; discharge home was 47% versus 19% and median length of hospital stay was 43 versus 59 days (2).

In another KCL study, acute patients were randomly assigned to stroke unit care (n = 152), care on a general ward with a stroke team member undertaking assessments and advising staff (n = 152) or domiciliary stroke care managed by a GP and community services with stroke specialist supervision (n = 153). At 1 year, mortality or institutionalisation were significantly lower in stroke unit patients (14%) than on a general ward (30%) or in domiciliary care (24%), mainly due to a reduction in mortality. The proportion of patients without severe disability was significantly higher on the stroke unit (85%) than a general ward (66%) or domiciliary care (71%) (3). KCL researchers also found that compared to general ward care, stroke unit patients were twice as frequently monitored (OR 2.1) and more received oxygen (OR 2.0), antipyretics (OR 6.4), aspiration reduction measures (OR 6.0) and early nutrition (OR 14.4). Complications were less frequent (OR 0.6) in stroke unit patients, with fewer having stroke progression, chest infection or dehydration (4).

KCL researchers discover that stroke unit care is cost-effective: An evaluation of societal costs associated with stroke care found that although stroke units saved lives and reduced dependence, they were associated with higher costs in the first year compared with a stroke team on a general ward or domiciliary care (£11,450, £9,527 and £6,840 respectively). This translated to an extra £496 in health and social care costs in the first year for every 1% reduction in death or institutionalisation avoided, showing that good health outcomes come at a higher but affordable cost (5). This work was integrated into a 2005 Health Technology Assessment which showed that patients managed on the stroke unit had greater improvement on basic activities of daily living and that quality of life at 3 months was significantly better in stroke unit compared to patients managed on general wards with stroke team support. There was also greater dissatisfaction with care on

general wards. Taking into consideration all factors, stroke unit care was deemed the most cost-effective intervention. It was concluded that for acute stroke, KCL findings did not support a role for specialist domiciliary services or care on general medical wards with specialist input (6).

KCL researchers investigate contributory aspects of stroke care: An important aspect of stroke care to be considered is what happens in the first few hours. Using figures from 739 patients with suspected stroke presenting to 22 hospitals, KCL researchers found a median delay between symptom onset and hospital arrival of 6 hours, with only 37% arriving within 3 hours. The median delay for patients using emergency services was just over 2 hours, significantly less than GP referrals which were over 7 hours. Once at the hospital, only 65% of patients were evaluated by a senior doctor within 3 hours of arrival, and while for 22% of patients computed tomography was requested, only 8% received it within 3 hours of arrival. KCL researchers concluded that patient management could be improved by expediting medical evaluation and performing computed tomography early (7). KCL researchers also extended the philosophy of stroke care to include helping caregivers. They found that costs of care over 1 year for patients whose caregivers received training in basic nursing and facilitation of personal care were significantly lower (£10,133 v £13,794) and trained caregivers experienced significantly less burden, anxiety or depression and had a higher quality of life than those without training. Patients reported significantly less anxiety and depression and better quality of life if they were looked after by a carer who had received training (8).

3. References to the research

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Grants

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- 1997-2001. PIs: Kalra L, Knapp M. Evaluation of the impact of carer information and support on patients, carers and service utilisation following hospital discharge after stroke. NHS Research and Development: Primary Secondary Interface, £221,000
- 1998-2000. PI: Kalra L. The Role of Integrated Care Pathways in the Implementation of Effective Practice into Mainstream Care. NHS Research and Development: Service Delivery and Organisation, £36,650
- 2007-2012: Forster A, Young J, Kalra L, Smithard D, Patel A, Farrin A, Nixon J. A cluster randomised controlled trial of a structured training programme for caregivers of in-patients after

stroke. Medical Research Council Clinical Trials, £1,142,694

4. Details of the impact

KCL research affects policy and practice: In 2013, stroke care without stroke units is inconceivable, but this was not always the case. In early 2000, UK health policy favoured the management of acute stroke patients in the community using a Hospital at Home model. Research, including that led by KCL, showed that this strategy was associated with poor outcomes and high costs. In 2005, economic modelling figures provided to the National Audit Office (NAO) by KCL (including Kalra et al. 2004) and colleagues helped to show that deaths could be prevented if more stroke patients spent the majority of their time on a stroke unit. This led to the 2007 National Stroke Strategy which clearly stated that "stroke unit care is the single biggest factor that can improve a person's outcomes following a stroke" (1a). It set out a ten point action plan to improve early access to high quality stroke unit care which is currently being implemented, for example in London from 2009 (1b).

The Stroke Unit Trialists Collaboration (which includes KCL) published a Cochrane Collaboration report, initially in 1997, and updated several times, most recently in 2009. This drew heavily on KCL research including most of the papers discussed above. Their conclusion was that "acute stroke patients are more likely to survive, return home and regain independence if they receive organised stroke unit care" (1c). A 2010 follow-up report by the National Audit Office, with the help of Prof Kalra, cites the findings of the Cochrane report and of Patel et al, 2004 which are used to illustrate different costs for health, social and voluntary services, and specialised accommodation for the first year following a stroke (1d).

The pivotal importance of stroke units in improving survival and disability after stroke is reflected by the fact that all hospitals in England now have a stroke unit. In the UK, the 2013 National Institute of Health and Clinical Excellence (NICE) clinical pathway for stroke recommends direct admission to a stroke unit for all suspected stroke patients (1e) as the preferred strategy for initial investigations and treatment. This recommendation is based on the 2008 NICE guideline which discusses findings from Patel et al. 2004 and Kalra et al. 2005 about the efficacy and cost-effectiveness of stroke unit care above any other (1f). The pathway also cites the NICE guidance on stroke rehabilitation which draws on KCL research to support the recommendations that stroke patients with disability should receive rehabilitation focusing on the relevant functional tasks on a dedicated stroke inpatient unit (1g).

KCL research has international reach and has influenced services and policy: The European Stroke Organisation is a society of stroke researchers, societies and lay organisations that aims to reduce the incidence and impact of stroke by changing how stroke is viewed and treated through professional and public education. Their **2008 guidelines state that "admission to a stroke unit is recommended for acute stroke patients to receive coordinated multidisciplinary rehabilitation**." This is supported by several KCL references, for instance, they use Harraf et al. 2002 when discussing how people seek help in the first instance of stroke and Patel et al. 2004, to help illustrate how "although stroke unit care is more costly than treatment on general neurological or medical wards, it is cost-effective." Further, they use Evans et al. 2001 when discussing how "organisation and quality of care may be more important than absolute hours of therapy" and Kalra et al. 2004 when discussing how "formal training of caregivers in delivery of care reduces personal costs and improves quality of life" (2a).

The Canadian Stroke Network (CSN) is a non-profit collaboration of researchers, government, industry and non-profit sector that supports research and provides high-quality training for scientists and clinicians. They produced a series of guidelines including their 2010 'Best Practice Recommendations for Stroke Care.' **CSN uses a number of KCL references to illustrate best practice**, for example, using Evans et al. 2002 to say that "comprehensive stroke care delivery in the early days and weeks following an acute stroke has been shown to have significant positive impact on stroke outcomes." They use Evans et al. 2001 to show how stroke units can provide better supportive care and monitoring during the first week and Kalra et al. 1995 when discussing how "patients treated on a stroke rehabilitation unit are more likely to be discharged home and less likely to require institutionalization." Additionally, they use Harraf et al. 2002 when discussing

symptom recognition and reaction and Kalra et al. 2005 when discussing stroke rehabilitation unit care (2b). Their report on the 'Fifty most important clinical studies in stroke rehabilitation' includes Kalra et al. 2000 and Kalra et al 2005 (2c).

The CSN website 'Evidence-Based Review of Stroke Rehabilitation' provides reviews and guidelines for clinical use or teaching purposes (2d). Again, these resources make good use of KCL research. For instance, their 2012 guidelines 'The Elements of Stroke Rehabilitation' use Evans et al. 2001 when discussing factors associated with decreased mortality and dependence and Evans et al. 2002 when looking at differences in the processes of care between a stroke unit and a stroke team (2e). Their review on 'The Efficacy of Stroke Rehabilitation' also uses these references, along with Kalra et al. 1995 and 2004 in concluding that "interdisciplinary specialized sub-acute stroke rehabilitation is associated with reduced mortality and combined death or dependency" (2f).

Evidence from KCL research was also used by the American Stroke Association in a statement regarding 'Nursing and Interdisciplinary Rehabilitation Care of the Stroke Patient.' Here, Kalra et al, 2004 was used extensively to provide evidence for the need for family caregiver education and they cite Evans et al. 2002 when saying that "there is strong evidence that organized post-acute, inpatient stroke care delivered within the first 4 weeks by an interdisciplinary healthcare team results in an absolute reduction in the number of deaths" (2g).

5. Sources to corroborate the impact

1) Impact on policy and practice

a. Department of Health. The National Stroke Strategy 2007; HMSO: http://webarchive.nationalarchives.gov.uk/20130107105354/http://www.dh.gov.uk/prod_consum_dh/groups/dh_digitalassets/documents/digitalasset/dh_081059.pdf
b. Healthcare for London (July 2009) The shape of things to come - Developing new, high-quality major trauma and stroke services for London (pg 50-56) http://www.londonhp.nhs.uk/wp-content/uploads/2011/03/Report-of-the-outcomes-of-consultation.pdf
c. Stroke Unit Trialists Collaboration. Organised inpatient (stroke unit) care for stroke (review) (2009). Cochrane Database of Systematic Reviews - CD000197: http://onlinelibrary.wiley.com/doi/10.1002/14651858.CD000197.pub2/pdf
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g. NICE CG 162 (2013) - Long term rehabilitation after stroke. http://guidance.nice.org.uk/CG162

2) International influence

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b. CSN. Canadian Best Practice Recommendations for Stroke Care. 2010: http://www.strokebestpractices.ca/wp-content/uploads/2011/04/2010BPR_ENG.pdf
c. CSN. Fifty of the Most Important Clinical Studies in Stroke Rehabilitation. http://www.ebrsr.com/uploads/SREBR_version_of_50_most_influential.pdf
d. CSN Evidence-Based Review of Stroke Rehabilitation http://www.ebrsr.com/index.php
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f. Website: The Efficacy of Stroke Rehabilitation (2012). http://www.ebrsr.com/uploads/Module-5_efficacy.pdf)
g. Miller EL, Murray L, Richards L, et al. Comprehensive overview of nursing and interdisciplinary rehabilitation care of the stroke patient: a scientific statement from the American Heart Association. Stroke 2010;41:2402-48. http://stroke.ahajournals.org/content/41/10/2402.full.pdf