

Modelling Phases of Care

Stroke disease places a heavy burden on society, incurring long periods of hospital and community care, with all of the associated costs. Stroke is also highly complex with diverse outcomes and multiple strategies for therapy and care. Professor Sally McClean and co-researchers in the Computer Science Research Institute (CSRI) at Ulster have tackled this problem by developing a mathematical modelling framework that can be used by hospitals to predict how long patients requiring stroke care are likely to stay in hospital. Using this information, hospitals can better plan their capacity for treating patients and the next stage in their treatment, such as discharge to home or nursing home.

Research on modelling stroke patient pathways through hospital, social and community services carried out in CSRI has helped the Belfast Health and Social Care Trust to reorganise its acute stroke services. By suitably administering thrombolysis (clot-busting drugs), a stroke patient's time in hospital, community rehabilitation and nursing homes can be reduced, so that although the treatment costs money up front, it saves in the long-term and also improves quality-of-life for patients. The research has contributed to changing stroke patient policy in the Belfast Trust as well as enhancing patient quality-of-life, and it could be applied more widely in the future throughout the UK and beyond.

Professor McClean began this research in the 1990's, in collaboration with Professor Peter Millard (formerly Professor and now Emeritus Professor of Geriatric Medicine, St. George's, London, and former President of the British Geriatric Society). Their early work in statistical modelling led to the development of software that could be used by hospital managers to plan bed occupancy. The methods were later incorporated into a modelling tool, initially for the London Merton Borough Social Services to cost and plan care provision and later also used by other Social Services in England. Since 2007 the model has been extended for use with stroke services in collaboration with Dr Ken Fullerton and colleagues in the Belfast Health and Social Care Trust, and a software tool for capacity planning has been developed.

The approach has used data on nearly 10,000 patients, collected from hospital databases and matched to social services databases to form a view of patient behaviour across the integrated care system. The methodology has a strong mathematical underpinning, and the research has been supported by a number of prestigious collaborative grants, including the UK Engineering and Physical Sciences Research Council.

The model developed at Ulster for patient flow through care pathways, including phases in hospital, social services and community care, and extended in collaboration with Dr Ken Fullerton and colleagues from the Belfast City Hospital Stroke Unit, has pioneered an integrated probabilistic model of patient flow that enables associated costs and quality-of-life metrics to be measured. Based on stroke patients' data from the Belfast City Hospital, various scenarios have been explored to compare the costs and patient quality-of-life for thrombolysis (clot-busting) under different regimes. Our results have shown that increasing thrombolysis participation from 10% to 50% of eligible patients can reduce cost as well as improving overall patient quality-of-life.