

Institution: University of Lincoln
Unit of Assessment: Allied Health
Title of case study: Improving the quality and outcomes of prehospital care for emergencies
<p>1. Summary of the impact</p> <p>Research by Community and Health Research Unit (CaHRU) broadly impacted on healthcare provision and care received by patients from ambulance services. The research directly informed policy and was a key factor in improving prehospital care for emergencies by directly influencing care systems, regulators, ambulance services, paramedics, and service users, initially in the East Midlands and subsequently throughout England from 2008 onwards.</p> <p>The research which aimed to improve quality of ambulance care led to: development of new clinical quality indicators for ambulance services in England; benchmarking of service quality; initiatives to address gaps in care; measurable improvements in managing pain, heart attack, stroke, asthma and diabetes across all English ambulance services. Regulators now use these quality indicators to assess ambulance trusts in England.</p>
<p>2. Underpinning research</p> <p>Context</p> <p>Partly because of escalating pressure on hospital and emergency services, current UK policy, as articulated in <i>Taking Healthcare to the Patient</i> (DH 2005), has emphasised the importance of clinical care provided by ambulance services rather than the previously narrower focus on time taken for ambulance services to respond and transport people to hospital. Studies, including those from our group, which have shown significant variations in prehospital ambulance service care for urgent and non-urgent conditions, have led to an increasing need to measure the care provided in more meaningful ways.</p> <p>This research programme focussed on new ways of measuring the impact of prehospital care provided by ambulance services, an NHS research priority, and will provide better information about the effectiveness and quality of different types of ambulance care to large populations, to support quality improvement, audit and evaluation of future service changes. A central theme of the research activity within this group is translational research relating to quality improvement in health and social care. We have investigated aspects of health and social care quality, determining how to improve care through innovation, quality improvement, service redesign and evaluation of the effects of interventions designed to bring about improvement.</p> <p>Aims:</p> <p>The research programme aimed to develop new process and outcome measures of prehospital care for assessment and improvement of care for injuries and emergencies.</p> <p>Staffing:</p> <p>The research is conducted by members of The Prehospital and Emergency Care Outcomes (PEQO) Group, part of CaHRU, led by Prof Siriwardena (2005 -) and including postdoctoral staff (Karen Windle 2012 -, Zowie Davy 2009 -), research assistants (Fiona Togher 2010 -, Viet-Hai Phung 2011 -) and NHS-based visiting fellows based at East Midlands Ambulance Service NHS Trust (EMAS), Mohammad Iqbal, Nadya Essam (who are also PhD students with the group), Anne Spaight and Deborah Shaw. We work closely with the research team at EMAS, the East Midlands Ambulance Research Alliance (EMARA) and the National Ambulance Research Steering Group (NARSG), chaired by Prof Siriwardena.</p> <p>Research design and methods include:</p> <ul style="list-style-type: none"> ▪ Cross-sectional^{1,2} and qualitative studies^{3,4} identifying current practice and problems. ▪ Quasi-experimental⁵ and randomised controlled studies⁶ evaluating innovations, improvements, and complex (educational) interventions. ▪ Systematic reviews and consensus methods identifying potential outcome measures relevant to the NHS and patients; we have created an information dataset linking routine prehospital, hospital (episode statistics), primary care, and mortality data to build risk adjustment models predicting mortality and non-mortality outcomes: the models are being tested to determine how

Impact case study (REF3b)

well they measure effectiveness and quality of ambulance service care and their practical use for quality improvement.

- Development of national clinical indicators measuring processes and intermediate outcomes of ambulance service care.⁷. We were funded (Ambulance Service Cardiovascular Quality Initiative [ASCQI]: Health Foundation £475k), building on this work, to develop *care bundles* of indicators for heart attack and stroke working with ambulance services in England to measure and improve clinical care for these conditions. We have researched pain management,^{1,3} overdose and poisoning,² stroke and heart attack,^{4,6} cannulation,⁵ and falls in the emergency and prehospital setting including the first trial world-wide with paramedics randomising, consenting and treating patients in an ambulance with nitroglycerin for ultra-acute treatment of stroke.

Key findings to date:

Studies on prehospital pain management have revealed poor assessment and treatment of pain,¹ increased understanding of why this is and how to improve.³ Studies on inappropriate cannulation (insertion of a plastic tube in a vein to administer drugs with risk of pain and infection) led to us conducting a complex educational intervention study which resulted in reductions in inappropriate cannulation and improved cannulation technique.⁵ We collaborated in the first ambulance randomised controlled trial of stroke worldwide.⁶ This study showed a significant reduction in blood pressure with a drug named glyceryl trinitrate (GTN) applied in the ambulance which led to a significant improvement in function and a (non-significant) reduction in stroke deaths at 90 days.⁶ We lead an NIHR Programme for Applied Health Research (£2m), Pre-hospital Outcomes for Evidence Based Evaluation (PhOEBE) to develop new ambulance outcome measures, in collaboration with ambulance services (East Midlands and Yorkshire Ambulance Services) and higher education institutions (Sheffield and Swansea Universities).

3. References to the research

All peer reviewed international journals [team members highlighted]:

1. **Siriwardena AN, Shaw D**, Bouliotis G. Exploratory cross-sectional study of factors associated with pre-hospital management of pain. *J Eval Clin Pract* 2010.
2. Gwini SM, **Shaw D, Iqbal M, Spaight A, Siriwardena AN**. Exploratory study of factors associated with adverse clinical features in patients presenting with non-fatal drug overdose/self-poisoning to the ambulance service. *Emerg Med J* 2011.
3. **Iqbal M, Spaight A, Siriwardena AN**. Patients' and emergency clinicians' perceptions of improving prehospital pain management: a qualitative study. *Emerg Med J* 2012: doi:10.1136/emered-2012-201111
4. **Togher FJ, Davy Z, Siriwardena AN**. Patients' and ambulance service clinicians' experiences of prehospital care for acute myocardial infarction and stroke: a qualitative study. *Emerg Med J* 2012.
5. **Siriwardena AN, Iqbal M**, Banerjee S, **Spaight A**, Stephenson J. An evaluation of an educational intervention to reduce inappropriate cannulation and improve cannulation technique by paramedics. *Emerg Med J* 2009;**26**: 831-836.
6. Ankolekar S, Fuller M, Cross I, Renton C, Cox P, Sprigg N, **Siriwardena AN**, Bath P. Feasibility of an ambulance-based trial, and safety of glyceryl trinitrate, in patients with ultra-acute stroke: the 'Rapid Intervention with Glyceryl trinitrate in Hypertensive stroke Trial' (RIGHT, ISRCTN66434824). *Stroke* 2013 early online doi: 10.1161/STROKEAHA.113.001301.

Funding sources

The funding sources for this research programme are all high quality, peer reviewed competitive awards from National Institute for Health Research (NIHR) or partner organisations (The Health Foundation) including a 5-year NIHR Programme Grant for Applied Health Research led by Siriwardena:

Siriwardena AN, Turner J, Nicholl J, Goodacre, S, Lyons R, Booth A, Snooks H, Brazier J, Gray J, Walker A, Campbell M, Coster J, O'Cathain A. Developing new ways of measuring the impact of ambulance service care. NIHR Programme Grant for Applied Health Research, December 2010.

Impact case study (REF3b)

RP-PG-0609-10195, £2,008,746.

O'Hara R, Mason S, Turner J, **Siriwardena AN**, Quinn T, Weymann A, Shewan J, Hirst E. Decision making and safety in emergency care transitions. SDO 10/1007/53, April 2011, £168,690.

Pickering A, Mason S, Campbell F, Harper R, Holmes M, **Siriwardena AN**, Stevenson M. A systematic review of clinical outcome and cost effectiveness comparing a policy of triage and direct transfer to specialist care centres with delivery to the nearest local hospital. NIHR SDO 09/1001/37, September 2010, £135,928.

Siriwardena AN, Spaight A, Stephenson J, Phillips P, Mackway-Jones K. Ambulance Services Cardiovascular Quality Improvement Initiative. The Health Foundation Closing the Gap in Clinical Communities Award Scheme. October 2009, £475,000.

Snooks H, Nicholl J, Dale J, Halter M, Phillips J, Phillips C, Mushtaq W, Lyons R, Russell I, Mason S, Cheung W, **Siriwardena AN**, Rees E, Whitfield R, Donohoe R, Gaze S. Care of older people who fall: evaluation of the clinical and cost effectiveness of new protocols for emergency ambulance paramedics to assess and refer to appropriate community based care. NIHR HTA Programme 07/01/21, October 2008, £1,139,038.

4. Details of the impact

The research has led to changes in national policy and benefits to national practice between 2008 and 2013, by contributing to a better understanding of deficiencies in care and both developing and testing methods which have improved delivery of prehospital care. It has improved working practices of ambulance services leading to better care for patients and increased performance measurement tools for commissioners of ambulance services and regulators. Service users, the public and health practitioners have been involved in the conception, design and dissemination of the work which has been undertaken in collaboration with East Midlands Ambulance Service (EMAS) NHS Trust and all ambulance services in England.

- Internationally, we have been co-investigators in the first randomised controlled trial worldwide published in 2013 examining the feasibility and safety of ultra-acute treatment of stroke in an ambulance, with paramedics assessing, randomising, consenting and treating patients with nitroglycerin prior to admission to a stroke unit for definitive treatment.⁶ Our work² has also been recognised by the research councils of Australia and New Zealand.
- The initial impact of our work was nationally in England with the our published work to develop and pilot national prehospital clinical quality indicators for ambulance services for the first time.⁷ This was undertaken with the wider support of stakeholders including chief executives, clinical directors and clinical governance (quality) leads of National Health Service (NHS) ambulance services throughout England.⁸ The quality indicators have been informed by our research on primary care indicators (the Quality and Outcomes Framework) and our research showing specific deficiencies in care, for example in pain assessment and treatment.¹
- We directly influenced the introduction of clinical quality indicators for ambulance services⁷ into national regulatory frameworks for the NHS under the auspices of the health regulator, the Care Quality Commission.⁹ We have published our research which shows the method of development and presentation of indicators. This is the first national clinical indicator set for ambulance services which has enabled national benchmarking, better regulation of ambulance services and has raised the quality of performance of ambulance services as evidenced in the latest report of National Clinical Indicators.¹⁰
- A key benefit for patients, practitioners and services nationally has been our data showing demonstrable improvement in clinical care delivered by paramedics for heart attack (measured as an improvement in national performance in the care bundle for heart attack comprising provision of critical-to-quality measures including aspirin, nitrate, pain assessment and pain relief to every patient with heart attack from 43% to 79%), stroke (care bundle comprising Face-Arm-Speech-Time, blood pressure and blood glucose from 83% to 96%), asthma (care bundle comprising respiratory rate, peak flow, oxygen saturation and bronchodilator treatment from 28% to 72%) and diabetes (care bundle comprising blood glucose before treatment, glucose administration and direct referral to an appropriate health professional from 92% to 96%) across all English ambulance services.¹⁰ As a result of this work more patients receive a high standard

Impact case study (REF3b)

of care from ambulance services across England. The significance of this work was recognised in a national report published on behalf of the Association of Ambulance Chief Executives, "Taking Healthcare to the Patient 2" which directly cited our work as an exemplar of good practice.¹¹

- Our work has also had impact regionally with direct and demonstrable effects on the quality of care delivered to and received by patients. This has been achieved by raising awareness of deficiencies in care and improving care for heart disease, stroke, prehospital cannulation and pain management through quality improvement initiatives.¹² The work has been recognised by the National Institute for Health Research (NIHR) through the NIHR East Midlands Research Design Service newsletter.¹³
- We have also delivered and demonstrated significant improvements in care of heart attack and stroke nationally as part of the Ambulance Services Clinical Quality Initiative.¹⁴ We achieved statistically significant improvements in nine (of 12) participating trusts in England for the stroke care bundle (a measure of care) and in nine (of 12) trusts for the AMI care bundle. Ten (of 12) trusts have shown a significant improvement in either the stroke or AMI care bundle, and seven (of 12) have shown significant improvements for both AMI and stroke. Overall performance for the care bundle for AMI has increased nationally in England from 43 to 79 per cent and for stroke from 83 to 96 per cent during the first 18 months of the project.¹⁵ This achievement has received national recognition by the Department of Health¹⁶ as well as being shortlisted for a Health Service Journal award under the category, 'Enhancing care with data and information management.'
- This work has also led to changes in the culture (attitudes and behaviours) of ambulance clinicians nationally where they have adopted quality improvement methods and staff as a means of improving care.¹⁵

5. Sources to corroborate the impact

7. Siriwardena AN, Shaw D, Donohoe R, Black S, Stephenson J. Development and pilot of clinical performance indicators for English ambulance services. *Emerg Med J* 2010; **27**:327e331.
8. Siriwardena AN, Donohoe R, Stephenson J, Phillips P. Supporting research and development in ambulance services: research for better health care in prehospital settings. *Emerg Med J* 2010;**27**: 324-326.
9. Care Quality Commission. Performance assessment 2009/10: indicators for ambulance trusts. Care Quality Commission. 28-10-2010.
http://archive.cqc.org.uk/db/documents/Download_existing_commitment_and_national_priority_indicators_for_ambulance_trusts.pdf [accessed 09-04-2011].
10. Shaw D, Siriwardena AN. Report on National Ambulance Service Clinical Performance Indicators: Cycle 8 November 2011 – February 2012. Nottingham 2012.
<http://eprints.lincoln.ac.uk/10679/> [accessed 25-11-2013].
11. Ambulance Leadership Forum. Taking healthcare to the patient 2: A review of 6 years' progress and recommendations for the future. Ambulance Leadership Forum, 2011.
http://www.ambulanceleadershipforum.org/site_content_files/files/taking_healthcare_to_the_patient_2_12jul11.pdf [accessed 16-10-2011].
12. EMAS Research <http://www.emas.nhs.uk/about-us/researchresearch/>
13. NIHR East Midlands Research Design Service Newsletter, Nottingham January 2011. <http://www.rds-eastmidlands.nihr.ac.uk/latest-news/newsletter.html?task=view&id=11> [accessed 25-11-2013].
14. Ambulance Services Clinical Quality Initiative. East Midlands Ambulance Service NHS Trust. Nottingham 2011 <http://www.emas.nhs.uk/insite/clinical-issues/clinical-audit-and-research/research-and-development/ascqi/ascqi-results/> [accessed 25-11-2013].
15. Improving the quality of cardiovascular care by ambulance services, The Health Foundation. <http://tinyurl.com/nqds62e> [accessed 25-11-2013].
16. Letter from National Clinical Director for Urgent and Emergency Care, DH 2012.