Identifying models of care to improve outcomes for older people with urgent care needs: a mixed methods approach to develop a system dynamics model

Simon Conroy,[1,2*] Sally Brailsford,[3] Christopher Burton,[4] Tracey England,[5] Jagruti Lalseta,[6] Graham Martin,[7] Suzanne Mason,[8] Laia Maynou-Pujolras,[9] Kay Phelps,[10] Louise Preston,[11] Emma Regen,[12] Peter Riley,[13] Andrew Street[14] and James van Oppen[15]

[1]Geriatrician, George Davies Centre, University of Leicester, Leichester, UK
[2]MRC Unit for Lifelong Health and Ageing, UCL, Leichester, UK
[3]Southampton Business School, University of Southampton, Southampton, UK
[4]Academic Unit of Medical Education, University of Sheffield, Sheffield, UK
[5]Health Sciences, University of Southampton, Southampton, UK
[6]Leicester Older Peoples' Research Forum, University of Leicester, Leicester, UK
[7]Healthcare Improvement Studies Institute, University of Cambridge, Cambridge, UK
[8]School of Health and Related Research, University of Sheffield, Sheffield, UK
[9]Department of Health Policy, London School of Economics, London, UK
[10]Department of Health Sciences, University of Leicester, Leicester, UK
[11]School of Health and Related Research, University of Sheffield, Sheffield, UK
[12]Department of Health Sciences, University of Leicester, Leicester, UK
[13]Leicester older peoples' research forum, University of Leicester, Leicester, UK
[14]Department of Health Policy, London School of Economics, London, UK
[15]Department of Health Sciences, University of Leicester, Leicester, UK

[*]Corresponding author simon.conroy@ucl.ac.uk

Disclosure of interests of authors

Full disclosure of interests: Completed ICMJE forms for all authors, including all related interests, or available in the tool kit on the NIHR Journals Library report publication page at https://doi.org/10.3310/NLCT5104.

Primary conflict of interest: Simon Conroy reports membership of HTA Prioritisation Committee (2019–23); editorial royalties for a textbook on geriatric emergency medicine; consulting fees from NHS Elect. Christopher Burton reports membership fo the following committees: HTA Prioritisation Committee A (2015–20), and HTA MPOH Panel (2015–18). Tracey England reports grant paid to employer funded by Higher Education Innovation Funding. Graham Martin reports consulting fees from the Health Foundation and Forte. Membership of the following groups: international expert advisory group (COVID-19), Agency for Clinical Innovation, New South Wales Government, Australia; National Institute for Health and Care Excellence Implementation Strategy Group; Evaluation of Flow Coaching

Academy, Health Foundation; Centre for Healthcare Innovation Research, City University; Advisory group chair for NIHR HSDR study (17/99/85); Steering group chair for 2 NIHR HSDR studies (16/04/06 and 16/116/25); member of HTA National Stakeholder Advisory Group (2017–20). James van Oppen reports grant funding from Royal College of Emergency Medicine; travel support from European Society for Emergency Medicine (2021). Suzanne Mason reports membership of HS&DR Commissioned Panel (2013–18).

Published September 2023
DOI: 10.3310/NLCT5104

Scientific summary

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Health and Social Care Delivery Research 2023; Vol. 11: No. 14
DOI: 10.3310/NLCT5104

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Scientific summary

Background

This study addressed emergency care for people aged 75 years or older, from the point of an ambulance being called through to admission, and/or transfer out from hospital, focusing on emergency department (ED) interventions. We aimed to identify promising care models and guidance derived from best practice and produce guidance on implementation that address the needs of older people accessing urgent and emergency care (UEC) services.

Objectives and research questions

Work package (WP) 1 – identifying best practice

- WP 1.1 – review of reviews of UEC interventions for older people, their outcomes and costs and any implementation factors identified
    - Research question (RQ) 1.1.1 – what is the evidence base for UEC interventions for older people, the outcomes of these interventions and the costs associated with these interventions?
    - RQ 1.1.2 – what factors have been described in the evidence base to date that influence implementation of UEC interventions for older people?
- WP 1.2 – patient and carer preferences
    - RQ 1.2.1 – what elements of care are most important to older people and their carers with UEC needs?
    - RQ 1.2.2 – how could UEC interventions be configured to best meet the needs of older people?
- WP 1.3 – staff perspectives
    - RQ 1.3.1 – what other interventions, not yet reported in the literature, offer promising models for improving outcomes for older people in the UEC pathway?

WP2 – qualitative study of delivery of exemplar UEC pathways

- RQ 2.1 what aspects of interventions, context and approaches to implementation facilitate and hinder delivery of UEC interventions for older people?

WP3 – routine patient level data analysis

- RQ 3.1 Are some UEC pathways associated with better patient outcomes than others?
- RQ 3.2 Have UEC pathways improved or got worse over time?
- RQ 3.3 Over and above the UEC pathway, what patient characteristics, demand and supply factors explain differences in outcomes from place to place and over time?
- RQ 3.4 What is the relationship between outcomes and the costs of the UEC pathway and are some pathways more cost-effective than others?

WP4 – improving emergency care pathways

- WP 4.1 – baseline simulation model development
    - RQ 4.1 what is the best way to build an 'archetypal' or baseline model of patient flow into and out of one specific UEC pathway, ensuring that the model is valid and captures all the relevant factors?
- WP 4.2 – 'what if' analyses
    - RQ 4.2 what changes can be made to existing UEC pathways that will lead to greatest improvements, and what might the consequences of such changes be for the wider health-care system?

Methods

WP1 – identifying best practice

WP 1.1 review of reviews of UEC interventions for older people, their outcomes and costs and any implementation factors identified.

WP 1.2 interviews of older people and their carers with recent experience of UEC, using the findings to ensure that the patient's voice is at the centre of this study.

WP 1.3 clinician interviews and focus groups about emerging interventions and key elements of high-quality care.

WP2 – qualitative study of delivery of exemplar UEC pathways

Qualitative fieldwork (interviews, ethnography, documentary analysis) in sites exemplifying promising pathways, to identify aspects relevant to transfer and adaptation of these models to other settings.

WP3 – routine patient level data analysis to describe UEC pathways, outcomes and costs

Analysis of linked databases to describe UEC pathways experienced by people aged 75+ years across the Yorkshire and Humber region, 2011–17, to assess which pathways deliver better patient outcomes than others, how pathways have changed over time, and what patient characteristics, demand factors and supply factors explain differences in outcomes and costs between patients, from place to place, and over time.

WP4 – modelling improvements to UEC pathways

We developed a family of system dynamics computer simulation models representing patient flow through the entire care process for different UEC pathways. We used these models to evaluate UEC interventions in different settings, in terms of their impact on patient outcomes and their knock-on effects in the wider care system.

Results

WP1 – identifying best practice

WP 1.1 review of reviews

In total, 806 articles were retrieved; 18 eligible reviews were identified, published between 2005 and 2019. These reviewed 128 unique primary studies (published 1994–2018); 25 were included in more than one review.

Most reviews defined 65 years as their age threshold for 'older people', although some included papers with populations aged 60 years and older, few stratified by condition or severity.

Reviews of ED interventions were organised into four evidence clusters:

- discharge-focused interventions
- staff-focused interventions
- population focused interventions
- intervention component focused reviews.

Discharge interventions vary in their components but tend to employ improved linkages between the ED and the community, either through direct linkage or referral interventions. Comprehensive geriatric assessment (CGA) was frequently used. There was limited evidence for its effectiveness – two meta-analyses found no benefit from this intervention, and narrative synthesis reported an increase in ED readmissions in the short term among patients who had received these interventions.

Staff-focused interventions described conflicting evidence around the benefits of nurse-led interventions for older people in the ED. Some reported reduced service use and reduced functional decline, but others increased service use. The meta-analysis found no effect from nurse-led interventions. There was evidence of lowered admission rates following geriatrician-led CGA interventions.

There was limited evidence for population-focused interventions, such as the identification and management of older people with cognitive impairment in the ED.

There was considerable agreement for the components of successful interventions. Effective interventions:

1. integrate social and medical care involvement
2. include screening and assessment
3. initiate care in the ED and bridge this with follow-up
4. monitor and evidence successful practices.

WP 1.2 patient and carer interviews

In total, 40 participants were interviewed: 24 patients and 16 carers who, between them, described ED attendances for 28 patients across the 3 sites. The majority were white British and were living with mild-moderate frailty.

Most participants reported a reluctance to attend ED and emphasised the importance of being treated with respect and dignity, the provision of timely and accurate information, involvement in decision-making and the need for clear communication. Receiving care in a calm ED environment with attention to personal comfort, basic physical needs and being supported by family members were also key, as were shorter waiting times.

The goals of care for participants accessing emergency care were that their medical problem be diagnosed and resolved; information about tests and treatment be given to them and their relatives; they receive an appropriate well-planned discharge to their own home with support where needed and without readmission or reattendance at ED; and that they retain mobility, function and normal activities. Participants perceived that many of these goals of care were not attained.

WP 1.3 clinician interviews

A total of 21 professional participants were interviewed and a further 23 participated in focus groups largely confirming the review evidence. Implementation challenges identified included the UEC environment, organisational approaches to service development, staff skills and resource allocation.

WP2 – qualitative study of delivery of exemplar UEC pathways

Work package 2 involved 45 interviews and 30 hours of observation in four contrasting EDs. Key themes relating to implementation included:

- intervention-related implementation influences
    - staff: frailty mindset and behaviours
    - resources: workforce, space, and physical environment
    - operational influences: referral criteria, frailty assessment, operating hours, transport.
- context-related implementation influences
    - links with community, social and primary care
    - organisation and management support
    - COVID-19 pandemic.
- approaches to implementation
    - service/quality improvement networks
    - engaging staff and building relationships
    - education about frailty
    - evidence.

WP3 – routine patient level data analysis to describe UEC pathways, outcomes, and costs

The dataset comprises a total of 1,035,045 observations, of which 867,902 were ED attendances and 167,143 were emergency admissions to hospital; 256,215 (29.5%) of the 867,902 ED attendances lasted more than four hours. Following receipt of care, 363,526 (41.9%) were discharged from the ED (of whom 3901, 0.5%, died), while the remaining 504,376 (58.1%) were admitted to hospital; 178,553 (20.6%) reattended the ED within 30 days of discharge. Of the 671,519 patients admitted to hospital, 199,506 (29.7%) had a short length of stay (LoS), 233,600 (34.8%) stayed more than 7 days and 73,665 (11%) stayed more than 21 days; 51,323 (7.6%) patients died in hospital; 129,971 (19.4%) had an emergency readmission within 30 days of being discharged, with 21,579 (3.2%) having three subsequent emergency admissions within 90 days and 90,639 (13.5%) within 365 days. For the 671,519 patients admitted to hospital, the average cost of their hospital care was £2760. For the full sample of 1,034,956 patients, the average cost of the entire UEC pathway amounted to £2,007.

Patients in older age categories were more likely to experience poor outcomes. For example, compared with those aged 75–79 years, those aged 95+ years were more likely to stay more than four hours in the ED [odds ratios (OR) 1.146], to be admitted to hospital (OR 1.345) and to reattend the ED within 30 days (OR 1.091). The call handler designation of urgency for those conveyed by ambulance was associated with all three outcomes. Compared with those who made their own way to the ED, the probability of waiting more than four hours was higher for those designated as less urgent (OR 1.238), urgent (OR 1.359), emergency (OR 1.35) and with a life-threatening condition (OR 1.448). There is also clear gradient across urgency categories in the likelihood of hospital admission, increasing from OR 2.155 for those designated less urgent to OR 3.603 for those with life-threatening conditions.

For those admitted, frailty risk was more important at explaining LoS than any other patient or pathway characteristic. Those with intermediate and high frailty risk were significantly less likely have a short LoS (OR 0.476 and OR 0.293, respectively) and significantly more likely to have a long LoS (OR 2.909 and OR 5.872, respectively) and excessive LoS (OR 4.25 and OR 11.78, respectively). Frailty risk was also associated with greater likelihood of death [hazard ratio (HR) 1.872 for intermediate risk and HR 2.042 for high risk].

For hospital readmission, the number of admissions in the previous year stand out as by far the most important explanatory variables. For example, those who had three or more admissions in the past year are 15% more likely to be readmitted within 30 days and to have more than three admissions within 90 days (OR 7.525) and 365 days (OR 5.156).

The most important factor influencing the costs of the overall UEC pathway is whether there is a hospital admission, costs being £4,262 higher for those admitted to hospital compared to those who were not.

WP4 – modelling improvements to UEC pathways

Drawing upon all the previous WPs, we developed whole system decision support tool focusing upon urgent care for older people. The tool allows users to run one of five evidence-based scenarios to answer the 'what if' or 'so what' question – what might happen if we implemented this service in our ED? It is configurable to allow users to input their own data or chose from a range of archetypes that reflect their own setting. It takes account not only of the hours of provision, but the population targeted. It should support decisions about which model of urgent care might best suit the setting in question, according to the outcomes (LoS, readmissions, institutionalisation, mortality) that the system wants to address.

Conclusions

Call handler designation was the most powerful predictor of a four-hour wait and of transfer to hospital. We confirmed that frailty risk was a strong, independent predictor of LoS and in-hospital death, but not 30-day readmission. Changes at the levels of clinical practice and service design are required to deliver person-centred care for older people living with frailty in the ED environment. Holistic interventions initiated in the ED and continued elsewhere can improve outcomes. The evidence-based, clinically validated decision support tool for use by clinicians, service managers and commissioners is available at FutureNHS, which is open to anyone working in or for health and care (https://future.nhs.uk/ECOPDecisionSupportTool).

For future service changes, call handler designation of urgency could be relatively easily embedded in EDs, which alongside frailty risk, could identify those at the highest risk of adverse events upon arrival at ED. It might be that frailty expertise in combination with emergency medicine expertise could be usefully deployed to support these individuals.

In summary, we have reaffirmed the poor outcomes frequently experienced by older people with urgent care needs. We have identified interventions that could improve patient and service outcomes, as well as implementation tools and strategies to transform emergency care for older people.

Future work

Future work will focus on refining the system dynamics model, specifically including patient-reported outcome measures and prehospital services for older people living with frailty who have urgent care needs.

Study registrations

This study is registered as PROSPERO CRD42018111461. WP 1.2: University of Leicester ethics: 17525-spc3-ls:healthsciences, WP 2: IRAS 262143, CAG 19/CAG/0194, WP 3: IRAS 215818, REC 17/YH/0024, CAG 17/CAG/0024.

Funding

This project was funded by the National Institute for Health and Care Research (NIHR) Health and Social Care Delivery Research programme and will be published in full in *Health and Social Care Delivery Research*; Vol. 11, No. 14. See the NIHR Journals Library website for further project information.

Health and Social Care Delivery Research

ISSN 2755-0060 (Print)

ISSN 2755-0079 (Online)

Health and Social Care Delivery Research (HSDR) was launched in 2013 and is indexed by Europe PMC, DOAJ, INAHTA, Ulrichsweb™ (ProQuest LLC, Ann Arbor, MI, USA), NCBI Bookshelf and MEDLINE.

This journal is a member of and subscribes to the principles of the Committee on Publication Ethics (COPE) (www.publicationethics.org/).

Editorial contact: journals.library@nihr.ac.uk

This journal was previously published as Health Services and Delivery Research (Volumes 1–9); ISSN 2050-4349 (print), ISSN 2050-4357 (online)

The full HSDR archive is freely available to view online at www.journalslibrary.nihr.ac.uk/hsdr.

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This report

The research reported in this issue of the journal was funded by the HSDR programme or one of its preceding programmes as project number 17/05/96. The contractual start date was in September 2018. The final report began editorial review in June 2022 and was accepted for publication in October 2022. The authors have been wholly responsible for all data collection, analysis and interpretation, and for writing up their work. The HSDR editors and production house have tried to ensure the accuracy of the authors' report and would like to thank the reviewers for their constructive comments on the final report document. However, they do not accept liability for damages or losses arising from material published in this report.

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