Relationship between distance/travel time to emergency care and patient outcomes: systematic review protocol

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Summary

- This work has been commissioned to provide an independent review of existing research in this area to inform strategic decision-making and service re-design, and to identify research gaps to inform the commissioning of future primary research.
- The aim is to identify, appraise and synthesise existing research evidence regarding the outcomes and impacts of service reconfigurations which have the effect of increasing the time and/or distance for patients to reach an urgent and emergency facility
- We will include studies carried out in any patient group requiring urgent and emergency care including patients with cardiovascular, trauma, and respiratory conditions, and patients requiring urgent or emergency services during pregnancy or the neonatal period.
- We will limit inclusion to studies which provide data on travelling times/distances and outcomes either, before and after the introduction of a service re-configuration, or compare data for specific groups of patients living in locations with different distances/times to an urgent and emergency care facility. We will also include studies which evaluate new models of service delivery aiming to mitigate the effects of living at distance from an urgent and emergency facility.
- We will synthesise the evidence using appropriate methods for the types of data identified. This may include meta-analysis if heterogeneity permits, narrative synthesis, graphs and tables. We will consider the use of a systems (logic) model if the evidence allows, to explore moderating and mediating factors and the potential outcomes and impacts of reconfigurations across a whole health system.
- We will aim to complete the review by the end of June 2019.

Background

The impact of reconfiguration of health services is important to commissioners, providers, and patients and the public. Currently in the NHS, programmes of service reconfiguration are being proposed at a local level by Sustainability and Transformation Partnerships (STPs), involving collaboration of all relevant stakeholders. Some of the proposed reconfigurations will have the effect of increasing travel time and/or distance for patients to reach their nearest hospital or other urgent and emergency care (UEC) facility.

Many communities value their local UEC services and perceive that planned or proposed changes could worsen outcomes for patients, particularly for those requiring emergency medical or obstetric care. A systematic review of evidence relating to outcomes for patients following service reconfigurations which change the time/distance to the nearest UEC facility is needed, to examine whether the available evidence supports or refutes this belief.

Commissioners and service providers need evidence regarding the impacts of reconfiguration not only patient outcomes, but also for the wider healthcare system. For example, commissioners may have questions about effects on other provision such as ambulance and community-based services. Providers may face difficulties in staffing other services if they are no longer providing emergency care. A systematic review on the broader relationships between distance to an emergency care facility, morbidity/mortality, and health system outcomes is needed, to inform evidence-based decision-making.

The recently completed closED study[1] analysed data from five areas where emergency departments (EDs) were downgraded between 2009 and 2011. While the authors found no evidence of an impact on mortality despite patients having to travel further to access an emergency facility, there was evidence of an effect on the system, with the finding of an increased burden on emergency care providers. The proposed systematic review will set the closED findings in the context of the wider international literature. A review of this area will also contribute to evidence regarding the delivery of services in rural and coastal areas, which is a priority area for the HS&DR programme.

Research questions and aims

The aim of this systematic review is to identify, appraise and synthesise existing research evidence regarding the outcomes and impacts of service reconfigurations which have the effect of increasing the time and/or distance for patients to reach an urgent and emergency care facility.

We will also aim to examine available evidence regarding associations between distance to an UEC facility and outcomes for patients and services, together with factors which may influence (moderate or mediate) these associations.

Research questions will be:

1. What is the evidence regarding associations between time/distance from an UEC facility and outcomes for patients requiring UEC?

2. What is the evidence regarding effects on patients of service reconfigurations which increase the time/distance to an UEC facility?
3. What is the evidence regarding effects on the health system of service reconfigurations which have the effect of increasing the time/distance to an UEC facility?
4. What factors might mediate, moderate or mitigate the effects of increased distance to an UEC facility on patient outcomes and/or the health system?

Methods

The following criteria will be used to set the parameters for evidence to be included in the review.

Inclusion and exclusion criteria

Population: Adults or children with conditions requiring emergency treatment including but not limited to acute myocardial infarction, stroke, major trauma, severe exacerbations of asthma, chronic obstructive pulmonary disease, or complications during pregnancy and the neonatal period. In practice, studies may include data on any patient wishing to access an UEC facility, even if their condition does not require this service.

Intervention: Changes to the delivery of healthcare services (service reconfigurations) which may have an effect on the time or distance for patients to access an UEC facility. We will include reconfigurations which have an effect on access to any urgent and emergency care services including ambulance services, maternity services, and hospital emergency departments. We will also include studies evaluating changes to service delivery which aim to mitigate negative effects of living at a distance from an UEC facility. These include for example new forms of services providing UEC at the scene such as First Responders, or specialist centre retrieval services.

Given the substantial volume of research on telemedicine/telehealth particularly for patients living in rural areas, we are not proposing to carry out a review of this literature. In order to provide contextualisation of evidence identified however, we propose to provide a brief narrative summary of key review-level evidence in this field.

Comparison: Studies which compares outcomes in groups of people travelling different distances/times to receive UEC, or studies which compare outcomes before and after a service reconfiguration which has an effect on time/distance to UEC. Studies with no comparator will be included if they meet the other inclusion criteria.

Outcomes: Any outcomes for patients including mortality/morbidity, travel time by ambulance or private car, or other perceived or measured effects. Also outcomes or impacts on the health system such as non-transportation, emergency admissions, increase or decrease in contacts/service usage. Transportation by helicopter as an outcome is excluded because of its limited applicability in the UK (not funded by the NHS and therefore any findings would not be relevant).

Setting: UK and other developed countries with relevant healthcare systems. Absolute travel distances and density of population (which will affect distribution/density of healthcare facilities) will be taken into account in assessing applicability of findings to the UK. In particular, studies of 'remote' healthcare from countries such as Australia will be fully considered for relevance.

Study design: Our initial scoping work has indicated that we are likely to find two types of relevant studies. Firstly, those that report the relationship between distance and outcome for particular groups of patients in a particular health system/setting[2-5] in the absence of changes to service delivery. These studies are likely to be of cross-sectional design. Secondly, studies of changes to travel distances/times/outcomes following changes to the health system. These studies are likely to be of observational or experimental design including before and after/longitudinal, cohort, case control, or randomised designs. The closED study[1] is an example from the UK, in our scoping we identified other examples from the USA.[6, 7]

During initial scoping we also distinguished a third group of studies, which used population-level data to examine associations between population mortality/morbidity and distance to the nearest hospital (for example Jordan et al. 2004[8]). Given that the topic of interest is immediate access to UEC, studies which provide data only for whole populations rather than particular groups of patients will be excluded.

In addition to quantitative studies we will include any identified mixed method or qualitative studies reporting perceived effects on patients or services of reconfigurations which increase time/distance to UEC. These studies may provide particular insights into factors which moderate or mediate the effects of service reconfiguration.

Other inclusion criteria:

- Literature published since 2000
- Literature published in English
- Grey literature in the form of service evaluations or reports from the UK

Other exclusion criteria:

- Studies that merely describe reconfigurations or initiatives without providing any quantitative or qualitative data
- Conceptual papers and projections of possible future developments
- Studies conducted in low or middle income country health systems
- Theses, conference abstracts, articles in professional magazines, books, and book chapters

Patient and public involvement

We will have input from our Evidence Synthesis Centre Public Advisory Group during all stages of the review. In particular we will seek guidance in regard to identifying key messages for the public from the findings of the review, and methods and avenues for dissemination to a public audience. We will seek their assistance in regard to the content of the Plain English Summary and their involvement in the production of materials such as a webcast providing an accessible summary of the evidence.

Literature search and screening

There will be 2 search iterations to identify relevant evidence for the review. The first iteration, (database search) will search a wide range of databases. The database search will be structured using terms for the population (people requiring emergency care), intervention (service reconfiguration) and the setting (emergency services). The search will comprise subject headings and free-text terms and will be developed on Medline then adapted for the other databases.

We will search the following databases:

- MEDLINE
- EMBASE
- Cochrane Library
- CINAHL (Cumulative Index to Nursing and Allied Health Literature)
- HMIC (Health Management Information Consortium)
- Web of Science (Science Citation Index and Social Science Citation Index)

The search will be restricted to papers in English and from 2000-current.

The second search iteration will include the following search methods:

- Scrutiny of reference lists of included primary studies and relevant systematic reviews

- Scrutiny of recent reviews of services and guidelines documents for relevant, peer reviewed evidence.
- Citation searching of included and highly relevant evidence
- Web search for any relevant UK grey literature

Search results will be downloaded to a reference management system (EndNote) and screened against the inclusion criteria by one reviewer, with a 10% sample screened by a second reviewer. Uncertainties will be resolved by discussion among the review team. We will use EPPI-Reviewer software to facilitate rapid screening and analysis of the included studies.

Data extraction and quality appraisal

We will extract and tabulate key data from the included studies, including study design, population/setting, results and key limitations. Data extraction will be performed by one reviewer, with a 10% sample checked for accuracy and consistency. If possible we will extract data directly into summary tables for the report.

Quality (risk of bias) assessment will be undertaken using appropriate tools for the types of study designs included. Quality assessment will be performed by one reviewer, with a 10% sample checked for accuracy and consistency.

Methods of synthesis

We will provide a narrative synthesis structured around the research questions. Additional forms of analysis and synthesis will depend on the characteristics of the evidence identified. We will seek to characterise key features of the literature including summaries by patient types, conditions, service characteristics, intervention components, setting, and outcomes. Depending on the volume and type of literature available we aim to use a system mapping (logic model) approach[9] to examine outcomes and impacts at both an individual patient and a system-wide level, together with factors that may act as moderators and mediators between service delivery and effects.

Assessment of the overall quality and relevance of evidence for each research question will form part of the narrative synthesis, and may draw on methods including meta-analysis, Harvest Plots, and strength of evidence evaluation. We will identify where there are certainties and uncertainties in the evidence, and where there are gaps requiring future primary research.

Registration and outputs

We will make the protocol available via the HS&DR programme website, the Sheffield HS&DR Evidence Synthesis Centre website and PROSPERO.

Proposed outputs:

- Report for the NIHR HS&DR programme (subsequent publication in the NIHR Journal Library)
- Peer-reviewed journal article
- Evidence briefing for decision-makers
- Summary materials for patients and public

Timeline

The Gantt chart below sets out our proposed timeline for completion of the review. We will hold regular team meetings to monitor progress and will keep the HS&DR programme team informed of progress at regular intervals.

Process	January	February	March	April	May	June
Scoping and protocol development						
Main literature search						
Inclusion screening						
Data extraction/quality assessment						
Analysis and report writing						
Delivery of draft report						

References

1. Knowles E, Shephard N, Stone T, Bishop-Edwards L, Hirst E, Abouzeid L*, et al.* Closing five Emergency Departments in England between 2009 and 2011: the closED controlled interrupted time-series analysis. *Health Services and Delivery Research* 2018;**6**. https://doi.org/10.3310/hsdr06270
2. Berlin C, Panczak R, Hasler R, Zwahlen M, Swiss National Cohort Study G. Do acute myocardial infarction and stroke mortality vary by distance to hospitals in Switzerland? Results from the Swiss National Cohort Study. *BMJ Open* 2016;**6**:e013090. https://doi.org/10.1136/bmjopen-2016-013090
3. Postma S, Dambrink JH, de Boer MJ, Gosselink AT, Ottervanger JP, Koopmans PC*, et al.* The influence of residential distance on time to treatment in ST-elevation myocardial infarction patients. *Neth Heart J* 2014;**22**:513-9. https://doi.org/10.1007/s12471-014-0599-8
4. Wei L, Lang CC, Sullivan FM, Boyle P, Wang J, Pringle SD*, et al.* Impact on mortality following first acute myocardial infarction of distance between home and hospital: cohort study. *Heart* 2008;**94**:1141-6. https://doi.org/10.1136/hrt.2007.123612
5. Nicholl J, West J, Goodacre S, Turner J. The relationship between distance to hospital and patient mortality in emergencies: an observational study. *Emerg Med J* 2007;**24**:665-8. https://doi.org/10.1136/emj.2007.047654
6. El Sayed M, Mitchell PM, White LF, Rubin-Smith JE, Maciejko TM, Obendorfer DT*, et al.* Impact of an emergency department closure on the local emergency medical services system.

Prehospital emergency care : official journal of the National Association of EMS Physicians and the National Association of State EMS Directors 2012;**16**:198-203. https://doi.org/10.3109/10903127.2011.640418
7. Hsia RY, Kanzaria HK, Srebotnjak T, Maselli J, McCulloch C, Auerbach AD. Is emergency department closure resulting in increased distance to the nearest emergency department associated with increased inpatient mortality? *Ann Emerg Med* 2012;**60**:707-15 e4. https://doi.org/10.1016/j.annemergmed.2012.08.025
8. Jordan H, Roderick P, Martin D, Barnett S. Distance, rurality and the need for care: access to health services in South West England. *Int J Health Geogr* 2004;**3**:21. https://doi.org/10.1186/1476-072X-3-21
9. Yampolskaya S, Nesman T, Hernandez M, Koch D. Using Concept Mapping to Develop a Logic Model and Articulate a Program Theory: A Case Example. *Am J Eval* 2004;**25**:191-2007.