

# BMJ Open Community paramedicine – cost-benefit analysis and safety with paramedical emergency services in rural areas: scoping review protocol

Odd Eirik Elden ,<sup>1,2,3</sup> Oddvar Uleberg,<sup>2,4</sup> Marianne Lysne,<sup>3</sup> Hege Selnes Haugdahl<sup>3,5</sup>

**To cite:** Elden OE, Uleberg O, Lysne M, *et al.* Community paramedicine—cost-benefit analysis and safety with paramedical emergency services in rural areas: scoping review protocol. *BMJ Open* 2020;**10**:e038651. doi:10.1136/bmjopen-2020-038651

► Prepublication history for this paper is available online. To view these files, please visit the journal online (<http://dx.doi.org/10.1136/bmjopen-2020-038651>).

Received 18 March 2020  
Revised 17 August 2020  
Accepted 18 August 2020



© Author(s) (or their employer(s)) 2020. Re-use permitted under CC BY-NC. No commercial re-use. See rights and permissions. Published by BMJ.

<sup>1</sup>Department of Pre-Hospital Services, Nord-Trøndelag Hospital Trust, Levanger, Norway

<sup>2</sup>Department of Emergency Medicine and Pre-Hospital Services, St Olavs University Hospital, Trondheim, Norway

<sup>3</sup>Levanger Hospital, Nord-Trøndelag Hospital Trust, Levanger, Norway

<sup>4</sup>Department of Research and Development, Norwegian Air Ambulance Foundation, Oslo, Norway

<sup>5</sup>Department of Public Health and Nursing, Norwegian University of Science and Technology, Trondheim, Norway

## Correspondence to

Dr Odd Eirik Elden; [oddeirik.elden@hnt.no](mailto:oddeirik.elden@hnt.no)

## ABSTRACT

**Introduction** Community paramedicine models have been developed around the world in response to demographic changes, healthcare system needs and reforms. The traditional role of the paramedic has primarily been to provide emergency medical response and transportation of patients to nearby medical facilities. As a response to healthcare service gaps in underserved communities and the growing professionalisation of the workforce, the role of community paramedicine has evolved as a new model of care. A community paramedicine model in one region might address other healthcare needs than a model in another region. Various terms are also in use for community paramedicine providers, with no consensus on the definition for community paramedics, although the definition used by the International Roundtable on Community Paramedicine has been widely accepted. We aimed to examine the current knowledge and possibly identify gaps in the research/knowledge base for cost-benefit analysis and safety concerning community paramedicine in rural areas using a scoping review methodology.

**Methods and analysis** This scoping review will follow the methodology developed by Arksey and O'Malley and the Preferred Reporting Items for Systematic Reviews and Meta-Analyses Extension for Scoping Reviews. In October 2020, we will search electronic databases (MEDLINE via PubMed, CINAHL, Cochrane and Embase) and the reference lists of key studies to identify studies for inclusion. The selection process is in two steps. First, two reviewers will independently screen identified articles for title and abstracts and, second, perform a full-text review of eligible studies for inclusion. Studies focusing on community paramedicine in rural areas, which include cost-benefit analysis or safety evaluation, will be included. **Ethics and dissemination** The data used are available from publicly secondary sources, therefore this study will not require ethical review. The results will be disseminated through peer-reviewed publication.

## INTRODUCTION

Community paramedicine has developed in response to changing needs and conditions for healthcare in several countries, for example, Australia, Canada, USA and UK.<sup>1</sup>

## Strengths and limitations of this study

- There are limited studies that link cost-benefit analysis and safety concerning community paramedicine in rural areas.
- Through a wide overview, which includes a search on published literature on the topic, gaps in our knowledge base can be revealed.
- A study of safety within a healthcare service is complex due to many variables, and therefore there is a need for a multidimensional approach to evaluate safety.
- Interpreting the findings in a scoping review can be challenging without a quality appraisal of the included articles.

The traditional tasks of paramedics were primarily to provide emergency medical response and transportation of patients to nearby medical facilities.<sup>2</sup> Today the tasks, education and healthcare organisations for community paramedics incorporate substantially more and varies widely between countries and even within some countries, for example, USA and Canada.<sup>3</sup> Although, there is currently no consensus on the definition, role and tasks for community paramedics, the following definition proposed by the International Roundtable on Community Paramedicine has been widely cited: 'Community paramedicine is a model of care whereby paramedics apply their training and skills in 'non-traditional' community-based environments, often outside the usual emergency response and transportation model'.<sup>4</sup> The core areas for community paramedicine can be summarised into four main areas: emergency medical response, multiagency collaboration, patient-centred prevention and establishment of education and development programmes.<sup>5</sup>

The need for change has evolved through a combination of healthcare service gaps in underserved communities and the growing professionalisation of the workforce. This has led to new models of community paramedicine.<sup>6–8</sup> Established gaps in healthcare delivery can have various causes, of which two identified major factors are the global increase of an ageing population, together with an increased urbanisation. The population aged 65 years and over is growing faster than all other age groups.<sup>9</sup> Increased urbanisation is also a worldwide phenomenon, where today more than half of the global population live in urbanised areas.<sup>10</sup> The definition for rural versus urban areas varies widely between nations, and the definition by the United Nations emphasises that due to distinct nationwide characteristics, a single definition applicable to all countries is not amenable.<sup>11</sup>

The combination of an ageing population and urbanisation leaves health services in rural areas more vulnerable, where the number of relatively fewer health workers left has led to new models for community paramedicine. Rural parts of Norway are experiencing difficulties with recruiting skilled health personnel, and the forecast is increased challenges due to an older population, urbanisation and centralisation of healthcare services towards larger communities.<sup>12</sup> By allowing paramedics to work in expanded roles in cooperation with primary healthcare services, the goal is to improve access to care in rural areas and increased use of existing resources.<sup>6</sup> We aimed to conduct a scoping review to examine existing literature concerning safety and cost–benefit analysis for community paramedicine in rural areas, identify knowledge gaps and develop recommendations for future research surrounding community paramedicine.

### Study rationale

Community paramedicine is a relatively new model of healthcare delivery in the interface between primary healthcare and emergency medical services.<sup>1</sup> Community paramedics work in expanded roles and increase medical access in underserved communities.<sup>13</sup> Rising expectations from patients and next of kin are seen in many countries with public health systems.<sup>14</sup> Public policy debates concerning the health service can often relate more to quantity than quality, for example, more services, more general practitioners, more high-cost pharmaceuticals and more hospital beds. It is normal to consider the quality of the healthcare as one of the most fundamental expectations.<sup>14</sup> Safety and subsequent evaluations are regarded as one of six quality dimensions as defined by the Institute of Medicine, where the safety aspect incorporates the task of avoiding injuries from healthcare services that are intended to help the patient.<sup>15</sup>

To decide on the worth of a project involving public expenditure, it is necessary to compare advantages and disadvantages. Cost–benefit analysis is a way of deciding what society prefers. Where only one option can be chosen from a series of options, the cost–benefit analyses

should inform the decision maker as to which option is socially most preferred.<sup>16</sup>

By searching for all relevant studies concerning community paramedicine in rural areas for cost–benefit analysis and safety, we intend to identify gaps in the research/knowledge base.

### Study objectives

The objective of this scoping review was to identify, categorise, summarise and synthesise knowledge about cost–benefit analysis and safety for community paramedicine in rural areas.

### METHODS AND ANALYSIS

This scoping review will follow the methodology developed by Arksey and O'Malley.<sup>17</sup> They described the following five-stage approach: (1) identifying the research questions; (2) identifying potentially relevant studies; (3) selecting eligible studies; (4) charting the data; and (5) collating, summarising and reporting the results. In addition, a consultation exercise is an optional step available. With consultation exercise, the authors of included studies will be contacted to confirm the components of their respective studies. The Preferred Reporting Items for Systematic Reviews and Meta-Analyses Extension for Scoping Reviews: Checklist and Explanation will be followed.<sup>18</sup> The study was registered with the Open Science Framework (<https://osf.io/nt2gw>).

#### Stage 1: identifying the research questions

Arksey and O'Malley recommend repeated attempts (iterative process) to formulate the research questions, and by doing so, the researchers will familiarise themselves with the literature.<sup>17</sup> Our research questions were developed and refined through consultations held by the research team and to establish the potential to introduce community paramedicine in rural areas in Norway. This review has four research questions:

- ▶ Are there cost–benefit analyses for community paramedicine in rural areas?
- ▶ What are the characteristics of cost–benefit analyses in rural areas?
- ▶ Are there safety studies for community paramedicine in rural areas?
- ▶ What are the characteristics of safety studies of community paramedicine in rural areas?

#### Stage 2: identifying relevant studies—search terms and inclusion/exclusion criteria

A combination of the three-step search plan previously described by Peters *et al* and search strategies for articles related to paramedic practice by Olausen *et al* will be applied to identify all relevant studies published.<sup>19 20</sup> The first step is an initial limited search in PubMed using a participants–concept–context grid using predefined Medical Subject Heading (MeSH) terms ([table 1](#)). Our PubMed search on 28 January 2020 gave 341 article

**Table 1** Participants, concept and context grid showing identified search terms and MeSH terms for PubMed

	Participants	Concept	Context
Definition	Community paramedic	Cost–benefit analysis Safety	Rural area
MeSH terms	Emergency medical technician	Analysis, cost–benefit	Rural health
	Allied health personnel	Cost savings	Rural health services
	Community health workers	Healthcare cost	Rural population
	Emergency medical services	Healthcare cost/statistics and numerical data Costs and cost analysis Safety	
Text words in T/A	Emergency medical technician	Analysis, cost–benefit	Rural health
	Allied health personnel	Cost savings	Rural population
	Community health workers	Healthcare cost	Rural health services
	Emergency medical services	Healthcare cost/statistics and numerical data	
	Paramedic	Costs and cost analysis	
	Paramedics	Safety	

MeSH, Medical Subject Heading; T/A, title/abstract.

matches (see online supplemental file 1). There were no relevant systematic articles or scoping review articles concerning cost–benefit analysis or safety in this search result, even though the authors are aware of articles covering the subject, for example, by Guy and O’Meara.<sup>8,21</sup>

In the second step, we will perform an analysis of text words contained in the title or abstract from articles to explore possible additional new keywords and index terms. Thereafter, a second search will be performed in October 2020 with all search terms and MeSH terms combined on the following databases: MEDLINE via PubMed, CINAHL, Cochrane and Embase. In the third step, the reference lists of all identified studies will be read to identify additional studies.

### Stage 3: study selection

All identified articles will be collected and uploaded into our citation management system (Endnote V.X9; Clarivate Analytics, Pennsylvania, USA). A two-part study selection process will be used: (1) title and abstract review and (2) full-text review. In the first stage, two independent reviewers (OEE and OU) will independently evaluate the article matches according to defined inclusion criteria for the review using the web-based citation management system Rayyan (Qatar Computing Research Institute, Doha, Qatar). All the articles evaluated as being relevant will be included in the full-text evaluation, if at least one reviewer agrees to include or consider the abstract or title to be inconclusive, after which the study will be moved to the second level of screening. In the second stage, the two reviewers will independently evaluate the full-text articles to decide if they meet the inclusion criteria. Any disagreements between the reviewers will be resolved through discussion or with a third reviewer (HSH). The process of selecting studies will be reported in a Preferred

Reporting Items for Systematic Reviews and Meta-analyses flow diagram.<sup>18</sup>

### Inclusion criteria

All articles concerning health personnel working as community paramedics are included regardless of model for community paramedicine studied and as long as they fulfil the following inclusion criteria:

1. Empirical studies from rural areas.
2. Cost–benefit analysis or safety evaluation undertaken in the study.
3. English language.

Articles without abstract, textbooks, comments, letters to the editor, guidelines, opinion and policy documents will be excluded.

### Stage 4: charting the data

The fourth stage of Arksey and O’Malley scoping review methodology is the charting of the data of the selected articles.<sup>17</sup> We will develop an extraction tool to help the reviewers in deciding the relevance of the studies included. Key information about the selected articles will be collected, for example, authors, year of publication, country, objectives of the study, study population, methods and findings relating to safety, and cost–benefit analysis. The extraction tool will be refined through trial by the two reviewers on three studies or more to ensure we extract all relevant results.

### Stage 5: collating, summarising and reporting the results

The purpose of this study was to collect the findings for cost–benefit analysis and safety for community paramedics in rural areas. The findings will be presented in an overview of the research without evaluation of the quality of the different studies. Our overall assessment



of strength of the evidence will be narrative rather than quantitative, since this is a scoping review article to map possible knowledge gaps. The findings after a complete review will dictate the final presentation, but our intention was to present the results diagrammatically with four main categories for rural community paramedicine:

1. Number of cost–benefit studies.
2. Characteristics of cost–benefit analysis.
3. Number of safety studies.
4. Characteristics of safety studies.

The anticipated end date for our study is 1 January 2021.

## PUBLIC AND PATIENT INVOLVEMENT

This study is based on a literature search without public or patient involvement according to the Guidance for Reporting Involvement of Patients and the Public 2 short form.<sup>22</sup>

## ETHICS AND DISSEMINATION

The data used are available from publicly secondary sources, therefore this study will not require ethical review. The results will be disseminated through peer-reviewed publication as an open access article.

## LIMITATIONS

The study of safety within a healthcare service is complex due to many variables, for example, education, equipment, workload, funding, morbidity, mortality, numbers treated, admissions to hospital or recontact. Therefore, there is a need for a multidimensional approach to evaluate safety. However, safety is of paramount importance in any health service and is incorporated in many systems as a quality indicator.<sup>15</sup> Interpreting the findings in a scoping review can be challenging without a quality appraisal of the included articles.

## DISCUSSION

An evidence-based approach to community paramedicine uses previously documented scientific evidence and experiences from other countries to provide useful insights for design and implementation of community paramedicine in rural areas. The subsequent scoping review aimed to contribute to the knowledge base by consolidating knowledge about cost–benefit analysis and safety for community paramedicine in rural areas.

**Twitter** Oddvar Uleberg @uleodd

**Acknowledgements** We thank the clinicians and other employees at Nord-Trøndelag Hospital Trust in Norway for their support in this research project.

**Contributors** HSH conceived the idea behind this study. OEE, ML and HSH jointly developed the research questions. ML and OEE conducted the PubMed search. ML constructed the search map in the supplemental file. OEE and OU outlined and wrote the protocol. All authors further revised the paper and approved the final text.

**Funding** OEE received funding from Nord-Trøndelag Hospital Trust (reference 2019/1311 - 36027/2019) to conduct this scoping review protocol. The funders did not participate in defining the scope of the review.

**Competing interests** None declared.

**Patient and public involvement** Patients and/or the public were not involved in the design, conduct, reporting or dissemination plans of this research.

**Patient consent for publication** Not required.

**Provenance and peer review** Not commissioned; externally peer reviewed.

**Open access** This is an open access article distributed in accordance with the Creative Commons Attribution Non Commercial (CC BY-NC 4.0) license, which permits others to distribute, remix, adapt, build upon this work non-commercially, and license their derivative works on different terms, provided the original work is properly cited, appropriate credit is given, any changes made indicated, and the use is non-commercial. See: <http://creativecommons.org/licenses/by-nc/4.0/>.

## ORCID iD

Odd Eirik Elden <http://orcid.org/0000-0002-7707-6180>

## REFERENCES

- 1 O'Meara P, Stirling C, Ruest M, *et al*. Community paramedicine model of care: an observational, ethnographic case study. *BMC Health Serv Res* 2016;16:39.
- 2 Objectives LWJ. Taxonomies and competencies of community oriented and community based education applied to community paramedicine. *J Contemp Med Edu* 2014;2:192–8.
- 3 Guo B, Corabian P, Yan C, *et al*. Community paramedicine: program characteristics and evaluation. In: *Institute of health economics report Edmonton*. 91. Canada: Institute of Health Economics, 2017.
- 4 Long DN, Clark M, Lim D, *et al*. What's in a name? The confusion in nomenclature of low-acuity specialist roles in paramedicine. *Australasian J Paramed* 2016;13.
- 5 Rasku T, Kaunonen M, Thyer E, *et al*. The core components of community paramedicine - integrated care in primary care setting: a scoping review. *Scand J Caring Sci* 2019;33:508–21.
- 6 Martin-Misener R, Downe-Wamboldt B, Cain E, *et al*. Cost effectiveness and outcomes of a nurse practitioner–paramedic–family physician model of care: the long and Brier islands study. *Prim Health Care Res Dev* 2009;10:14–25.
- 7 van der Gaag A, Donaghy J. Paramedics and professionalism: looking back and looking forwards. *J Paramed Pract* 2013;5:8–10.
- 8 Guy A. Community paramedicine: a preventive adjunct to traditional primary care. *UBCMJ* 2014;6:17–18.
- 9 United Nations (Department of economic and social Affairs population division). World population ageing. New York, USA, 2015. Available: [www.un.org/en/development/desa/population/publications/pdf/ageing/WPA2015\\_Report.pdf](http://www.un.org/en/development/desa/population/publications/pdf/ageing/WPA2015_Report.pdf) [Accessed 16 Mar 2020].
- 10 United Nations (Department of economic and social Affairs population division). World urbanization prospects: the 2018 revision. 2019. New York, USA. Available: <https://population.un.org/wup/Publications/Files/WUP2018-Report.pdf> [Accessed 16 Mar 2020].
- 11 United Nations (Department of economic and social Affairs population division). Population density and urbanization. New York, USA, 2017. Available: <https://unstats.un.org/unsd/demographic/sconcerns/densurb/densurbmethods.htm> [Accessed 16 Mar 2020].
- 12 Syse A, Leknes S, Løkken S, *et al*. Norway's 2018 population projections - main results, methods and assumptions. Statistics Norway. Kongsvinger, Norway, 2018. Available: [https://www.ssb.no/en/befolkning/artikler-og-publikasjoner/\\_attachment/354133?\\_ts=1643ab3eaf8](https://www.ssb.no/en/befolkning/artikler-og-publikasjoner/_attachment/354133?_ts=1643ab3eaf8) [Accessed 16 Mar 2020].
- 13 Mason S, Coleman P, O'Keeffe C, *et al*. The evolution of the emergency care practitioner role in England: experiences and impact. *Emerg Med J* 2006;23:435–9.
- 14 Taylor M. Consumer expectations and healthcare in Australia. Australian healthcare and hospital association, 2014. Available: [https://ahha.asn.au/system/files/docs/publications/deeble\\_issues\\_brief\\_nlcg-3\\_consumer\\_expectations\\_and\\_healthcare\\_in\\_australia.pdf](https://ahha.asn.au/system/files/docs/publications/deeble_issues_brief_nlcg-3_consumer_expectations_and_healthcare_in_australia.pdf) [Accessed 16 Mar 2020].
- 15 Institute of Medicine (US) Committee on Quality of Health Care in America. *Crossing the quality chasm: a new health system for the 21st century*. Washington, DC: National Academies Press, 2001.
- 16 McIntosh EFE, Louviere J. *Applied methods of cost-benefit analysis in health care*. Oxford University Press: Oxford, 2010.

- 17 Arksey H, O'Malley L. Scoping studies: towards a methodological framework. *Int J Soc Res Methodol* 2005;8:19–32.
- 18 Tricco AC, Lillie E, Zarin W, *et al*. PRISMA extension for scoping reviews (PRISMA-ScR): checklist and explanation. *Ann Intern Med* 2018;169:467–73.
- 19 Peters MDJ, Godfrey CM, Khalil H, *et al*. Guidance for conducting systematic scoping reviews. *Int J Evid Based Healthc* 2015;13:141–6.
- 20 Olausson A, Semple W, Oteir A, *et al*. Paramedic literature search filters: optimised for clinicians and academics. *BMC Med Inform Decis Mak* 2017;17:146.
- 21 O'Meara P. Community paramedics: a scoping review of their emergence and potential impact. *Int Paramed Pract* 2014;4:5–12.
- 22 Staniszewska S, Brett J, Simera I, *et al*. GRIPP2 reporting checklists: tools to improve reporting of patient and public involvement in research. *BMJ* 2017;358:j3453.