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Can digital innovation transform rural primary health care? A systematic review protocol

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ABSTRACT

Introduction Digital technology is increasingly being adopted within primary healthcare services to improve service delivery and health outcomes; however, the scope for digital innovation within primary care services in rural areas is currently unknown. This systematic review aims to synthesise existing research on the use and integration of digital health technology within primary care services for rural populations across the world.

Methods and analysis A systematic approach to the search strategy will be conducted. Relevant medical and healthcare-focused electronic databases will be searched using key search terms between January 2013 and December 2023. Searches will be conducted using specific inclusion and exclusion criteria. A systematic study selection and data extraction process will be implemented, using standardised templates. Outcomes will be reported using the Preferred Reporting Items for Systematic Reviews and Meta-analyses- Protocol statement guidelines. Quality assessment and risk of bias appraisal will be conducted using the Mixed Methods Appraisal Tool.

Ethics and dissemination Ethical approval will not be required because there is no individual patient data collected or reviewed. The finding of this review will be disseminated through peer-reviewed publications and conference presentations. Outcomes will help to understand existing knowledge and identify gaps in delivering digital healthcare services, while also providing potential future practice and policy recommendations.

PROSPERO registration number CRD42023477233.

STRENGTHS AND LIMITATIONS OF THIS STUDY

⇒ This systematic review will use a strategic and structured methodology to adopt a comprehensive approach to describe the current evidence regarding digital innovations within rural primary healthcare.
⇒ This systematic review will identify valuable insights into the existing knowledge gaps and potential solutions for improving healthcare access and primary healthcare service provision in rural settings.
⇒ While the review aims to provide a comprehensive understanding of evidence, it will only focus on publications from the past 10 years to ensure currency. While this is a strength, it could potentially exclude relevant studies published prior to this period. The review will also be limited by inclusion of English studies only.

INTRODUCTION

There is a growing consensus among the global health community that the strategic and innovative use of digital technology is essential to strengthen and improve equitable provision of and access to healthcare. In 2020, recognising this need to strengthen digital innovation, the WHO developed a global strategy on digital health.[1] Their strategy aims to revolutionise a vision of improving health by enabling the development and adoption of appropriate, acceptable, affordable and sustainable digital health solutions for improved health and well-being. Digital health technology has the potential to revolutionise the delivery of health services, particularly through more efficient interventions and prevention options manageable within primary healthcare settings.[2 3] Enabling tracking and monitoring of patient health, timely intervention to prevent disease progression, and real-time disease treatment and management through digital solutions provide unique opportunities for improved health outcomes.[4 5]

The Australian Institute of Health and Welfare defines digital health as an umbrella term, referring to a broad range of technologies used in healthcare with the primary objective of treating patients, while also accumulating or disseminating health information.[4] This technology can include mobile health applications, telehealth, telemedicine, wearable devices, robotics and artificial intelligence. The digital transformation of healthcare can include the use of technologies such as the Internet of Things, virtual care, remote monitoring, artificial intelligence and machine learning, big data analytics and smart wearable devices. It also relates to platforms that enable remote data capture and the exchange of data as well as the

dissemination of relevant information across the health ecosystem. These data-driven technologies can create a continuum of care and standardisation with the potential to enhance health outcomes by improving medical diagnosis, personalised treatment decision-making, self-management of care and person-centred care, and digital therapeutics and imaging.

Although the use of innovative digital technologies to increase access and enhance the quality of primary healthcare is increasing, the extent to which these technologies are being adopted and utilised by rural populations is not yet known. Over 46% of the global population resides in rural areas, predominantly in less-developed countries.[6] Rural populations often have worse health outcomes and experience unique challenges and barriers accessing appropriate health services.[7] Although these disparities are attributable to a wide range of factors including health workforce shortages and socioeconomic disadvantages, reduced access to health services is arguably a key factor that creates significant barriers.[8 9] The last 10 years has seen urban primary healthcare services increasingly using innovative digital technology to bridge healthcare access gaps, streamline efficient service delivery and optimise patient outcomes. In contrast, there is currently a paucity of evidence from rural settings that demonstrates the impact of digital technology on health systems and health outcomes. Although strategies to optimise the digital health system have been developed in several countries, including Australia,[10 11] evidence demonstrating the specific implementation of these strategies to rural regions remains limited. In a rural setting, timely access to relevant data for clinical decision-making is equally crucial as for urban settings. By overcoming the tyranny of distance, a digitally innovative approach can significantly improve access for rural populations, and thus has the potential to improve health outcomes, reduce costs through avoidable hospitalisations and reduced travel, enhance patients' quality of life with continuity of care as well as address healthcare system workflow inefficiencies.[12]

The next frontier of primary healthcare innovation relies on the broader use of digital technologies, with a focus on prevention, personalisation and long-term outcomes.[13 14] Improving health outcomes by providing digital healthcare access regardless of a person's location can ensure equitable access to appropriate primary healthcare services using digitally empowered health transformations. Despite the potential for innovative disruption, there may be unforeseen risks to future healthcare systems. However, increased continuity of care provided through digital health can improve effectiveness, efficiency and delivery of healthcare in rural locations, possibly outweighing any potential risks. Understanding existing evidence and identifying knowledge gaps to further promote and progress digital innovation within rural primary healthcare is therefore necessary. This systematic review aims to synthesise evidence regarding the use and integration of digital health technology within primary healthcare services for rural populations across the world.

METHODS

This systematic review protocol has been registered with PROSPERO database (CRD42023477233). It will be reported using the Preferred Reporting Items for Systematic Reviews and Meta-Analyses[15] protocol for systematic reviews. The systematic review commenced on the 2 October 2023 and is anticipated to be completed by 30 November 2024. Any amendments to the protocol will be documented and updated in PROSPERO.

Study design

For the purposes of this review, the term '*rural*' will be used to define studies from any regional, rural or remote populations. The wide variety of diverse global geographical characteristics means that there is no consistently used classification system that can be applied.[16] Thus, when the term rural is used in this protocol, it refers to a non-metropolitan area, as defined by authors of the relevant studies. Similarly, definitions of digital health innovation or technology will be used as described by authors of the relevant studies and based on the inclusion criteria.

Search strategy

The medical and healthcare focused electronic databases of PubMed, PsycINFO, Cochrane Central, SCOPUS, Web of Science, EMBASE and CINAHL will be used to conduct searches. Search terms and specific search strategies for each database will be determined before searches are conducted. Snowballing techniques using the forward or backward citation of searches will also be conducted. Grey literature will be excluded from this review.

Eligibility criteria

The searches will be conducted using specific inclusion and exclusion criteria using the patient, intervention, comparison, outcome model, as described in table 1. Any study design (ie, cross-sectional, longitudinal, survey, experimental, programme evaluation, qualitative or mixed methods) that intentionally includes commentary or analysis of the outcomes will be eligible for inclusion. Empirical research includes any qualitative, quantitative or mixed-methods research studies. Qualitative studies include interviews, open-ended surveys, participants' observations or focus groups. Mixed-method studies will only be considered if data from the quantitative or qualitative components can be clearly extracted. Inclusion of studies is contingent on the independent analysis, reporting or discussion of their findings. No literature or systematic reviews will be included in the results of this systematic review. Similarly, commentaries, perspectives, letters, reviews, editorials or opinion pieces or grey literature will be excluded. Only the last 10 years of the literature will be searched to ensure currency as much of the digital

Table 1 Eligibility criteria

PICO	Inclusion criteria	Exclusion criteria
Population	Any study conducted with rural populations, including studies where rural populations form only a part of the full study	Any studies without any rural populations
Investigated phenomena	Studies conducted within the primary healthcare sector and describing digital health technology aimed at disease treatment or management. This includes studies such as telehealth, remote patient monitoring, virtual healthcare, wearable devices, point of care testing.	Studies not focused within the primary healthcare sector or not using digital health technologies aimed at patient treatment or management. This includes studies describing any health information sharing systems/platforms for example, patient record systems or electronic health records.
Context	Studies demonstrating the scope and impact of digital health technology within rural primary healthcare in improving patient healthcare access and outcomes.	Studies outside the included context, such as hospital settings and metropolitan healthcare services.
Outcome	Improved rural primary healthcare outcomes	No rural primary healthcare outcomes
Study design	Primary research studies including both quantitative studies(randomised controlled trials, cohort studies, case-control studies, survey studies)and qualitative studies(mixed methods studies, focus groups, interviews).	Secondary research including systematic reviews, editorials, opinion pieces, commentaries, position papers, conference abstracts or posters, protocols or theses.
Time frame	1 January 2013 until 31 December 2023	Studies prior to 2012
Other	English language studies Peer-reviewed studies	Non-English studies Not peer-reviewed studies

innovation in the rural primary healthcare space has occurred within the last 10 years.

Study selection

Citations will be transferred to EndNote V.20 and uploaded into Covidence for deduplication, screening and data management. Using the inclusion and exclusion criteria, two or more reviewers will independently conduct title and abstract screening. Any discrepancies will be discussed, and an additional reviewer will be consulted to reach a consensus. All full-text articles will be screened independently by two reviewers using Covidence. A third reviewer will screen all excluded full-text articles and resolve any conflicts. A cross-check will be conducted by an independent reviewer of the final list of selected studies that will be included in this review to determine reliability and assess the articles for final inclusion.

Data extraction

Using a standardised data extraction template in Covidence, a single reviewer will extract data from the final list of articles screened. A second reviewer will examine the extracted data for accuracy and completeness. Data extraction will be limited to the following data items: Citation, Title, Country, Population, Sample Size, Study Aim, Study Design, Intervention Type, Limitations, Key Outcomes, Quality Assessment and Additional Notes.

Quality assessment and risk of bias analyses

Two reviewers will independently assess the quality of studies using questions adapted from published criteria on the quality assessment of interview, focus group and survey studies using the Mixed Methods Appraisal Tool (MMAT).[17] Designed with systematic appraisal efforts in mind, this tool facilitates assessments of systematic mixed studies, including qualitative, quantitative and mixed methods research. Scoring will be based on 12 criteria distributed across the following domains: (1) description of aims and objectives, (2) description of methods, (3) participant selection, (4) data collection, (5) data analysis, (6) reporting and (7) engagement. Based on these criteria, studies will be identified as being of good or poor quality. The quality of evidence will be evaluated and gaps in the literature will be identified in consultation with experts and consumers. The MMAT has shown to have high validity[18] and reliability,[19] making it a useful tool for appraising literature reviews.[20]

Data synthesis

The outcomes of this systematic review will be presented using a descriptive approach as well as using graphs, tables and other informative visuals as needed. The results will aim to provide a comprehensive understanding of the currently available evidence regarding digital innovations within rural primary healthcare. Enablers of and barriers to the availability of digital connectivity, affordability and usability reported in included studies will also be summarised and reported. Furthermore, gaps in current research and knowledge will be identified as potential avenues for future research as well as determine potential implications for future policy and practice. The results of this systematic review will be disseminated through local, national and international scientific conference proceedings and presentations, stakeholder and community and/or consumer meetings, and through publications in a peer-reviewed journal.

Patient and public involvement

None.

DISCUSSION

Ultimately, this systematic review will identity innovative use of digital technologies being used within rural primary healthcare globally. Understanding the scope of digital health technologies and their potential impact on improving rural health outcomes is both novel and necessary to identity knowledge gaps and areas that require further research. Although primary healthcare sector experienced a rapid growth of implementation and adoption of digital health technologies such as telehealth services as a direct result of the COVID-19 pandemic,[21] the existing inequitable distribution and service provision highlight the need of improving digital connectivity and uptake, and implementing targeted interventions to enhance healthcare services for rural populations. Rural populations experience diverse challenges, geographical barriers and workforce supply problems; evidence-based digital technology has the potential to revolutionise primary healthcare in rural regions by mitigating these barriers.

Ethics and dissemination

This review does not require ethical clearance from any institutional level committees, as any data or information being collected have already been made available for use through published peer-review literature. No other identifying information or data will be used in this study. Outcomes of the study will be disseminated as journal manuscripts and conference presentations.

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Contributors BFN contributed to the conception, design, data acquisition, analysis and interpretation, drafting and critically reviewing the manuscript, and providing final approval for dissemination. FL contributed to the conception, interpretation, critical review of the manuscript and providing final approval for dissemination. JF contributed to the design, data acquisition, critically reviewing the manuscript, and providing final approval for dissemination. PM and KA contributed to the design, critically reviewing the manuscript, and providing final approval for dissemination. KW, MRM and SK-C contributed to the conception, design, critically reviewing the manuscript, and providing final approval for dissemination.

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