To study the impact of mHealth interventions on chronic diseases management: A systematic overview of systematic reviews protocol

Wafa Elamin *, Dorothy Hannis, Lawrence Nnyanzi, Louisa Ells

School of Health and Social Care, Centuria Building, Teesside University, Middlesbrough, Tees Valley TS1 3BX United Kingdom

Introduction

Digital health is the convergence of technology with healthcare delivery and is a new field in public health and clinical medicine. It is the use of information and communications technologies to improve human health and healthcare services. There has been increased adoption of health care technologies by the general public in recent years. This was made possible with the advent of mobile technology, fast broadband, 4G internet and the falling price of technology devices. Digital health can be used for point-of-care support, emergency medical responses, reminders for clinical appointments, reporting test results, health promotion, data collection for research, real-time data streaming, disease modelling, personalised care, and public health interventions.

Numerous modalities for digital communication exist such as smartphones and computers with two-way cameras, web-based portals, e-mails, interactive voice response, social media platforms, online forums and personal monitoring devices. These modalities have been adapted to provide different types of digital health technologies that have overlapping roles in delivering healthcare. The major modalities that patients use within their homes include telehealthcare and mHealth. Telehealthcare leverages telecommunication, video imaging, and information technologies. It enables health care practitioners to provide medical services virtually. Telehealthcare can address social, cultural and geographical inequalities in healthcare delivery through non-encounter communication. It has been especially useful for remote monitoring of elderly patients within their homes.

mHealth, on the other hand, is concerned with the role of mobile technology in delivering health services. mHealth uses mobile applications or short message services (SMS) to reach and engage with patients remotely. mHealth interventions are mobile and popular, providing novel long-term disease management solutions for patients. However, they are not without their challenges. Many mHealth technologies require an internet connection to operate fully. While the use of technology has dramatically increased worldwide in recent years, as of 2017, only 64.5% of the global population own a mobile phone while less than 50% have access to internet services. These figures are concerning as disadvantaged groups may not be able to engage with digital health interventions. Health economists have highlighted that access to the internet services and its content depends on five factors: affordability, availability, accessibility, accommodation and acceptability. As with other health care services, mHealth interventions must be readily available and accessible to the patients who need them most and offered at a price they can afford. Without maintaining this balance, health inequalities will arise from mHealth technologies. If widespread access is achieved, digital health interventions may solve critical public health dilemmas such as chronic and non-communicable diseases prevention and management.

Chronic and non-communicable diseases account for the largest group of public health issues in the European region and cost the European Union countries 115 billion euros collectively each year. The most frequently targeted chronic and non-communicable diseases include type 2 diabetes, asthma, chronic obstructive pulmonary disease (COPD), cardiovascular diseases, cancer, and mental health problems. Without adherence to management plans, these diseases and illnesses gravely affect patients' quality of life. Innovative and cost-effective solutions, that allow patients to self-manage illnesses are urgently needed to solve these issues and lessen the financial burden on healthcare systems worldwide.

Evidence suggests that mHealth technologies produce mixed clinical outcomes for patients in the management of chronic and non-communicable diseases. In conclusion, digital health technologies have the potential to improve healthcare delivery and reduce health inequalities. However, careful consideration must be given to the accessibility and affordability of these technologies to ensure they are beneficial to all patients.
non-communicable conditions. A systematic overview of systematic reviews is needed to investigate the benefit of mHealth interventions for chronic disease prevention and management. To the best of our knowledge, this study will be the first to do so.

**Study aim**

The main aim of this overview is to study the impact of mHealth interventions on chronic disease management among patients. It will also explore patients’ engagement with mHealth technologies and highlight barriers that may hinder their use.

**Methods**

The PICOS approach, an abbreviation for participants, interventions, comparators, outcomes, and study design will be used in this review.

### Types of participants

Systematic reviews looking at patients suffering from chronic diseases will be included in the overview. No age limit or geographic location restriction will be imposed. Systematic reviews that only target health care practitioners or families of patients using mHealth technologies will not be included.

### Types of interventions

This overview will target chronic disease interventions that are delivered using mHealth technologies. For this study, mHealth is defined as technological interventions that use smartphone applications or mobile text-messaging services to deliver healthcare. These interventions must be delivered to patients in a home-based setting. Social media interventions will not be included in this review due to the privacy issues associated with these technologies.

### Types of outcomes

The following outcomes will be reported and discussed:

**Primary outcomes**

- a) Sociodemographic of patients
- b) Cost efficiency of using the mHealth intervention
- c) Changes in health outcomes after using the intervention
- d) Patients' adherence to and engagement with the intervention
- e) Adverse events or barriers to using the intervention

**Secondary outcomes**

- a) Patients’ perception of using the intervention
- b) Quality and reliability of the intervention
- c) Patients’ follow-up with healthcare services after using intervention

### Types of studies

Systematic reviews of quantitative studies will be included in this review, including randomised control trials, case-controls, cohort studies and cross-sectional studies. Systematic reviews that explore qualitative studies will be excluded. Reviews must be peer-reviewed and published in English. Only systematic reviews that are published after 2008 will be included. Given the fast-paced nature of technological development, restricting studies to the last decade will ensure that only the most recent knowledge is reported and analysed.

**Data search strategy**

To identify studies for this review, the following electronic databases will be used:

- MEDLINE
- CINAHL
- EMBASE
- Cochrane Database of Systematic Reviews
- Google Scholar (first one-hundred citations)

Searches will be carried out using both indexed terms and free text. Search terms will be adjusted for each electronic database. To identify grey literature, the WHO’s Library Database (WHOLIS) and the Web of Science Conference Proceedings Citation Index will be used. Reference lists of full-text studies that are included in the final review will also be checked for other potentially eligible studies. The proposed terms are as follows

<table>
<thead>
<tr>
<th>Intervention terms</th>
<th>Disease terms</th>
<th>Study design</th>
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<tbody>
<tr>
<td>digital health</td>
<td>chronic disease</td>
<td>systematic review</td>
</tr>
<tr>
<td>mobile health/mHealth</td>
<td>non-communicable disease</td>
<td>review</td>
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<tr>
<td>eHealth</td>
<td>long-term disease</td>
<td>evaluation</td>
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<tr>
<td>smartphone/mobile phone</td>
<td>Cardiovascular disease</td>
<td>- hypertension</td>
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<tr>
<td>mobile application</td>
<td>Diabetes</td>
<td>- COPD</td>
</tr>
<tr>
<td>short message service/SMS</td>
<td>- chronic obstructive pulmonary disease</td>
<td>- hypertension</td>
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<tr>
<td>telehealth/telecare/telemedicine</td>
<td>- - illness</td>
<td></td>
</tr>
<tr>
<td>- telemedicine</td>
<td>- COPD</td>
<td>- hypertension</td>
</tr>
</tbody>
</table>

The search strategy will be: (digital health* OR Mobile health OR mHealth or eHealth OR smartphone OR mobile phone OR mobile application* OR short message service OR SMS OR telehealth OR telecare OR telemedicine) AND (chronic disease* OR illness* OR non-communicable disease OR long-term disease* OR cardiovascular disease* OR diabetes* OR chronic obstructive pulmonary disease OR COPD OR hypertension) AND (systematic review OR review).

**Data collection**

All studies that are identified by the search strategy will be screened against the inclusion criteria (Table 1). RefWorks, a reference management software, will help sort the data and duplicate publications will be removed. Titles and abstracts will be screened initially. Those that fit the eligibility criteria will move onto the next phase of the review. The full text of these studies will be obtained and read. Only studies that fully match the inclusion criteria will be included in the final stage of the review (Table 1). During the selection process, a Prisma flow diagram will be used to show the number of studies excluded at each stage of the selection process.

**Quality assessment and data extraction**

As the methodological rigour of the final studies is expected to vary, quality will be assessed using the Measurement Tool to Assess Systematic Reviews (AMSTAR) checklist for systematic
reviews.20 The AMSTAR checklist will give an understanding of each study’s generalisability, statistical issues or bias as well as the strength and quality of the reported data. Two reviewers will assess quality independently and studies of low-quality will be removed from the review to maintain high-quality output.

Data extraction will be guided by a data extraction form which has been created specifically for this overview. The key features that will be extracted onto this form include: year of publication, main research questions or objectives, setting and location, population characteristics, number of included studies, types of mobile interventions used, types of chronic diseases it addresses and the primary and secondary study outcomes. If a study has missing information the authors will be contacted directly for clarification. Both the quality assessment tool and the data extraction form will be piloted on a sample of studies to ensure that they capture all the relevant information.

Data synthesis

Data analysis will be through narrative synthesis and will be descriptive.21 A summary of the findings of the included studies will be produced, as a detailed tabular presentation. The following characteristics will be described: type of mHealth intervention, type of chronic disease as well as target population characteristics such as summary of age groups, gender, ethnicity, education level, socioeconomic status and country setting. Where possible, data will be summarised using the standard mean difference or mean difference with a 95% confidence interval (CI). Evidence that is high-quality will be given priority, and results that indicate potential bias will be interpreted with caution.

Conclusion

This overview of systematic reviews will provide a detailed summary of the evidence regarding mHealth interventions on chronic disease management for patients. This information will add to the current body of knowledge and will be used to inform policy and practise towards the uptake of mHealth technologies among health care providers and their patients.

Declarations

Conflicting interests

The authors have no conflict of interest to declare.

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Ethical approval

Ethical approval has been obtained from Teesside University to conduct the systematic review.

Authorship

Each of the four authors have contributed to the design of the research, drafted or revised the paper and approved the final version. All contributing authors have given consent for the publication of this paper.

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References


