The use of mHealth Apps by nurses in the management of chronic wounds: a scoping review protocol

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ABSTRACT

Objective: The objective of this scoping review is to explore the existing literature related to nurses’ use of mHealth apps in the management of chronic wounds and chart if and how these apps are being evaluated.

Introduction: mHealth technology is increasingly used within health care facilities. There is now a plethora of wound care apps available to support nurses delivering wound care, promising many benefits, but little is known about their use.

Inclusion criteria: Studies involving nurses of all grades, in all clinical settings using mHealth apps in the care and management of chronic wounds will be included. Criteria used to evaluate these apps will also be included. The context will be all primary care, hospital, and community settings, which includes general practice, nurse-led clinics, public health services, nursing and care homes, and all hospital settings. There will be no limit on the geographical setting of the research. All studies and reports that focus on qualitative, quantitative, and mixed methods will be included as will text and opinion papers and published gray literature.

Methods: An initial search of MEDLINE, CINAHL, and Embase will be undertaken to identify index terms. This will be followed by an analysis of the text words contained in the title. A search of commercial app stores (eg, Apple’s App Store and Google’s Play Store) will not be carried out. A data extraction form will be used and piloted on the first 10 articles. Results will be reported in tabular form and presented in a PRISMA flow diagram.

Keywords: complex wounds; health care professional; mobile health application; nursing; wound care


Introduction

Mobile health, referred to as mHealth, can be understood as “the use of wireless communication devices to support public health and clinical practice.”1(p.254) Increasingly, mHealth technology is widely present within health care facilities.2 The term “applications” (apps) refers to software programs developed for use on mobile devices. There are apps that allow users to track fitness,3 diet,4 and health conditions such as diabetes.5 The use of apps also assists health care professionals with time management, access to education, communication, consulting and advising management related to patient care, improving clinical diagnosis, treatment adherence, and patient education.6-10 It is believed that digital health technologies are very quickly changing the practice of medicine and influencing approaches to dealing with problems in health care and improving patient outcomes.11

Marintengo et al.12 estimated the global prevalence of chronic wounds of mixed etiologies as 2.21 per 1000 population, highlighting the burden of chronic wounds. While the number of studies included was small (n = 11), they say the estimate is aligned with other reports on prevalence of chronic wounds in the health care system.12 All wounds, at some point in their development, may become chronic regardless of their origin.13 Acute wounds, however, follow a normal and timely process towards complete healing while chronic wounds are purported to stagnate in the inflammatory phase...
due to intrinsic and extrinsic factors that impact the person, the wound, or the healing environment.\textsuperscript{14,15} There is little consensus on what the duration of a chronic wound is, with a recent paper proposing a duration of three weeks or more in its definition of chronic wounds.\textsuperscript{12}

In the UK, it has been reported that the total cost of treating chronic wounds, ranged from £2.1 to £3.2 billion\textsuperscript{16}; costs associated with wound care in the United States have been estimated to extend to $96.8 billion for Medicare patients alone.\textsuperscript{17} Atkin et al.\textsuperscript{18} recommend that wound management or a good standard of care (SoC) for any wound comprises a systematic approach. This includes, holistic patient assessment; wound assessment and measurement; a care plan; managing underlying pathology; implementation of wound care according to the wound bed preparation or TIMERS (tissue, information, moisture, edge, regeneration, social factors) framework; reassessment; referrals as necessary; patient and family education; discharge or transition to maintenance treatment; and recording of actions/outcomes.\textsuperscript{18}

Several research studies have been conducted on apps used in wound care.\textsuperscript{19,20} Key findings from Wang et al.\textsuperscript{20} on the Swift Wound app suggest that the app provided accurate, reliable, and robust wound measurement for different wound shapes versus the standard ruler method.\textsuperscript{20} In addition, the app measured wounds quickly without touching the wounds, helping to reduce unnecessary pain for the patient.\textsuperscript{20} The app was also reported as user-friendly for family and carers. An overlay feature allows nurses to compare and contrast wound parameters with previous images, increasing reliability and saving time. This app also allows exchange of communication between key stakeholders. Lastly, an infrared camera installed within the app, allows health care professionals to measure skin surface temperature, an important marker that indicates signs of inflammation or infection, therefore, influencing the plan of care.\textsuperscript{20}

Another software application, developed for Android smartphones and tablets, provides an electronic medical record for chronic wounds and replaces the nurse’s paper documentation on patients, and was trialed in a personal care home.\textsuperscript{21} A high degree of ease in using the app was reported. In addition, nurses reported a reduction in dressing changes, which promoted healing as the wound image provided a clear and objective assessment sufficient for remote specialist consultations, if required.\textsuperscript{21} Moreover, a key benefit proved to be the wound images and wound histories as these helped to increase concordance with treatment for patients, families, and carers. The app also provided continuous professional development support for nurses not specialized in wound care or data analytics (eg, graph-based wound histories) and enabled remote consultation between departments and multidisciplinary teams.\textsuperscript{21} However, the nurses found that wound histories would have been more useful in a longer trial, and indicated that the dressing formulation section was too lengthy and convoluted on a small smartphone or tablet screen.\textsuperscript{21}

The Wound Care Buddy app, a digital wound care application, was developed and implemented to support best practice for community nursing and allowed nurses to choose appropriate treatments for patients.\textsuperscript{22} Findings suggested that use of the app aided clinical decision-making, built confidence and skills, supported cost-effective use of dressings, and improved patient care.\textsuperscript{22} One year after the app was implemented, there was 100% adoption by the community nurses with an average of 36 active users each month.\textsuperscript{22}

There is now a plethora of wound care apps available to support nurses, which promise many benefits,\textsuperscript{19-22} however, definite analysis of the quality of the apps is difficult given different evaluation designs.\textsuperscript{23} Additionally, some reviews of commercial health-related apps indicate that few are subjected to clinical trials.\textsuperscript{11} The WHO recommended that an international framework for the evaluation of mHealth programs would be an important step in gaining information on their effectiveness.\textsuperscript{6} Testing and evaluation of wound care apps is necessary to fully understand their impact on patient care.

While there are many mHealth or mobile phone apps being used in the management of chronic wound care, little is known about which ones are being used by nurses. The objective of this scoping review is to explore the existing literature related to nurses’ use of mHealth apps in the management of chronic wounds and how these are being evaluated. Consistent with JBI methodology, this scoping review will conceptually map the available evidence and identify any gaps in the literature.\textsuperscript{24}

In order to address the research objectives, we propose conducting a scoping review of evidence
generated by qualitative, quantitative, and mixed-methods research. A preliminary search of JBI Evidence Synthesis, the Cochrane Database of Systematic Reviews, and PROSPERO was completed in June 2020 and found no relevant completed or in-progress systematic or scoping reviews.

**Review questions**

i. What mHealth apps are nurses using to assist them in the management of chronic wounds?

ii. Have these apps been evaluated, and if so, what types of evaluation have been conducted and what are the outcomes of the evaluation?

**Inclusion criteria**

**Population**

Studies involving nurses of all grades in all clinical settings who are involved in the care and management of chronic wounds will be included.

**Concept**

Two related concepts will be combined in this review: nurses’ use of mHealth in the management of chronic wounds and any methods used to evaluate these apps. This includes apps used in areas such as wound assessment, measurement, and education on wound care. For this review, we are using the Global Observatory for eHealth definition of mHealth, which includes “medical and public health practice supported by mobile devices, such as mobile phones, patient monitoring devices, personal digital assistants, and other wireless devices.”

Mobile health apps are understood as “software that are incorporated into smartphones to improve health outcome, health research, and health care services.” We will extend this definition to include apps used on all wireless devices. This review will not include apps that are developed solely to work on a laptop or desktop computer.

**Context**

The context will be primary care, hospital, and community settings, which include general practice, nurse-led clinics, public health services, nursing and care homes, and all hospital settings. There will not be a limit on the clinical setting as wound management is an issue of importance in primary care, hospital, and community settings. In addition, there will be no limit on the geographical setting of the research.

**Types of studies**

All studies and reports that focus on qualitative, quantitative, and mixed methods data looking at nurses’ use of mHealth apps in the management of chronic wounds will be included. Text and opinion papers will also be considered for inclusion.

Gray literature that includes information on the use of mHealth apps by nurses in the management of chronic wounds will also be included.

**Methods**

The JBI scoping review methodological framework will be used. In addition, the review will be conducted in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses Extension for Scoping Reviews (PRISMA-ScR) checklist.

**Search strategy**

A three-strand search strategy has been developed in conjunction with a subject librarian to identify the relevant articles for this review. Initial scoping of CINAHL (CINAHL Subject Headings), MEDLINE (MeSH), and Embase (Emtree) was run to identify the appropriate index terms. Keywords were developed using the synonyms supplied in the indexes, in addition to suggested author keywords, feedback from the team, and any additional keywords found in the scoping phase. A combination of both the index terms and the keywords will be run across CINAHL Complete (1937-), MEDLINE (EBSCO; 1879-), PsycINFO (1967-), ASSIA (1987-), Embase (1947-), Web of Science (Core Collection; 1945-), the Global Index Medicus (WHO Library Database; 1948-), and the Cochrane Library (1990-).

Each database was chosen for its relevance to the subject area and to ensure a wide coverage of literature. A search strategy was specifically created for each database using relevant index and free text terms and a sample is detailed in Appendix I. Finally, the reference list of all identified studies included in the review will be scrutinized for additional studies.

No limits will be placed on the language of the studies. No date limits will be set for the database searches. While some studies on app usage in mHealth search commercial app stores (eg, Apple’s App Store and Google’s Play Store), we will not be carrying out this search.
Information sources
In addition to the databases listed above, the following sources will be searched for relevant unpublished or gray literature. These include: ProQuest Dissertations and Theses, RIAN, LENSUS, HSRProj, Grey Matters, OpenGray, GreyLit, Google Scholar, National Institute for Health and Care Excellence (NICE), LINUX, Health Service Executive (Ireland), Wound Management Association of Ireland, European Wound Management Association, American Professional Wound Care Association, and other relevant conference proceedings and websites.

Study selection
The results of the search will be collated and uploaded to EndNote vX9 (Clarivate Analytics, PA, USA). Duplicate studies will be removed by the subject librarian. Initially, titles and abstracts will be screened by two independent reviewers using Covidence (Veritas Health Innovation, Melbourne, Australia) and assessed using the inclusion criteria for the scoping review. Studies deemed to meet the inclusion criteria will be retrieved in full. All potentially relevant full-text articles will be retrieved and screened for inclusion in the final scoping review. Information from the publications included will be imported into the JBI System for the Unified Management, Assessment and Review of Information (JBI SUMARI; JBI, Adelaide, Australia).

Full-text studies that do not meet the inclusion criteria will be excluded, with reasons for their exclusion provided in an appendix in the final scoping review. The PRISMA flow diagram will be used to present the results of the search. Disagreements arising between the reviewers will be addressed through discussion and consensus, or with a third reviewer.

Data extraction
This review will extract data using the data extraction form developed from the literature and piloted on one paper (Appendix II). The team will pilot this further on the first 10 articles. Following any revisions, the revised form will be further tested on an additional 10 articles. One author will chart data from the remainder of the articles and a second author will then verify the extracted data with any discrepancies resolved through discussion and consensus with all authors. If relevant key data is missing from studies, additional information will be sought from study authors.

Data presentation
The goal of the scoping review will be to summarize data on the use of mHealth apps by nurses in the management of chronic wound care and the evaluation of such apps to map available evidence and identify gaps in the literature. As set out in the PRISMA-ScR guidance documents, the results of the search will be reported in full in the final scoping review in a PRISMA flow diagram. mHealth apps will be grouped according to their purpose, for example, wound assessment (including measurement) or prescribing of wound care products. A tabular summary of results, based on the data-extraction tool (Appendix II) will be presented. The tabular summary will be elaborated in a narrative summary, addressing the objectives of the scoping review.

References
7. Yoo JH. The meaning of information technology (IT) mobile devices to me, the infectious disease physician. Infect Chemother 2013;45(2):244–51.
## Appendix I: Search strategy

### MEDLINE (EBSCO)

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<tr>
<td>S9</td>
<td>S7 OR S8</td>
<td>851,448</td>
</tr>
<tr>
<td>S8</td>
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<td>S7</td>
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<td>S6</td>
<td>S4 OR S5</td>
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<td>S5</td>
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## Appendix II: Data extraction template

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<td>Year</td>
<td></td>
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<tr>
<td>Title</td>
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</tr>
<tr>
<td>Origin/Country of origin (where source published or research conducted)</td>
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<tr>
<td>Jurisdiction of where the app can be applied (eg, Europe GDPR)</td>
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<tr>
<td>Aims/purpose of the study (ie, purpose of the app, eg, wound measurement, wound assessment, education and/or purpose of evaluation)</td>
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<tr>
<td>System requirements for running the app</td>
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</tr>
<tr>
<td>Study population and sample size</td>
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<tr>
<td>Concept</td>
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</tr>
<tr>
<td>Context or Setting (hospital or community)</td>
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</tr>
<tr>
<td>Methodology</td>
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</tr>
<tr>
<td>Was app evaluated</td>
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<td>Type of Evaluation used</td>
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<tr>
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