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Self-supporting wound care mobile applications for nurses: A scoping review protocol

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ABSTRACT

Aim: Mobile health (mHealth) is playing an increasingly important role in the computerization of wound care on an international scale with an aim to improve care. The aim of this scoping review protocol is to present a transparent process for how we plan to search and review the existing evidence related to self-supporting mobile wound care applications used by nurses.

Materials and methods: The scoping review will follow the Joanna Briggs Institute (JBI) methodology. An exploratory search was performed using MEDLINE (Ovid), Embase, CINAHL (Ebsco), to identify concepts, keywords, MeSH terms, and headings to identify study types looking for mobile applications in wound care. The findings of this search will determine the final search strategy. Data sources will include MEDLINE, Embase, CINAHL, Web of Science, LiSSa, Cochrane Wounds (Cochrane Library) and Erudit. The titles and abstracts of the identified articles will be screened independently by two authors for relevance. Full texts will also be screened by two independent reviewers and data extraction will be performed in accordance with a pre-designed extraction form. All types of studies and literature linked to self-supporting mobile wound care application used by nurses will be included (quantitative, qualitative, mixed methods and grey literature).

Conclusion: The results of the scoping review will give an overview of the existing self-supporting mobile applications in wound care used by nurses. These will also help to identify the existing applications, and describe knowledge in nursing about their utilisation, development, and evaluation, as well as synthesize the available literature on their impacts.

1. Introduction

Wounds are a public health issue having serious implications for individuals and the health care system [1–3]. They can manifest as ulcers, burns, skin tears, cancer or bed sores, and can affect patients of all ages in all health care settings [1,4]. From a global perspective, the prevalence of chronic wounds was reported at 2.21 per 1000 population in 2019 [5]. This number is increasing yearly as a result of an aging population, a sedentary lifestyle, increased rates of obesity and chronic diseases, particularly diabetes [3,5,6]. The care of patients with chronic wounds is costly and has a financial burden on society, adding not only a multi-billion-dollar economic burden to the health care system, but also significantly reducing its productivity [2,4,7–10]. In the United Kingdom (UK), in 2017–2018, the annual National Health Service cost of wound management was £8.3 billion [10]. In the United States (USA), a 2018 retrospective analysis using 2014 Medicare data report an annual out-of-pocket cost of treating chronic wounds of nearly US$32 billion [9]. However, beyond the financial consequences, wounds have serious

Abbreviations: DoPHER, Database of Promoting Health Effectiveness Reviews; JBI, Joanna Briggs Institute; JBISRIR, JBI Database of Systematic Reviews and Implementation Reports; PCC, Population, concept, and context; PRISMA-ScR, Preferred Reporting Items for Systematic reviews and Meta-Analyses for Scoping Reviews.

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repercussions on the quality of life of patients due to pain, amputations, immobility and social isolation [1,2]. Overall, the volume of wounds, their related complications, and their significant negative impact on length of hospital stay, health care costs, and patient mortality are overwhelming and will continue to be a considerable clinical, social, and economic challenge [3].

Nurses play a vital role in wound healing and wound care management [11]. Their involvement can positively influence patient outcomes through early prevention and a systematic and holistic evidence-based care approach [4,12]. Given the complexity of assessment and the rapid evolution of multiple treatment options, implementing an evidence-based treatment plan in wound care is a challenge that requires a wealth of knowledge and skills [13–16]. Despite best practice guidelines and recommendations, there remains a theory and practice gap in wound care; the literature reports that decision-making is often influenced by using intuition or selecting products based on branding [12,17–21].

To address this gap, mHealth applications may be a strategy that can promote evidence-based practice in wound care and thus revolutionize the delivery of care by enabling a more comprehensive assessment of clinical situations and providing instant access to best practice recommendations [22–24]. With more than 8,6 billion mobile-cellular telephone subscriptions worldwide, "mobile phones are becoming ubiquitous" and remain the most widely used information and communication device in the world [25, p.17]. In fact, digital tools have become an integral part of wound care nursing practice [26,27]. The use of technology has increased in the last few years and we are now seeing a wide variety of mobile applications for wound care [3,27,28]. Recently, the mobile applications in wound care are used more frequently due to COVID-19 pandemic, allowing patients to continue to receive adequate care despite the cancellation of their in-person appointments [29]. Their development, use and evaluation are rarely regulated, leaving room for multipurpose use of the technology and content that is perhaps not validated or that may be influenced by commercial bias [28,30,31]. In addition, the important preparatory work for the development of a mobile application is often lacking [32]. Thus, given that the number of health-related mobile applications worldwide surpass now 325′000, it may be difficult to distinguish between mobile applications whose development process has followed a rigorous approach [33]. As health care professionals find innovative ways to provide patient care, the use of mobile applications may further increase. Given that the current development of mHealth applications is progressing at a much faster pace than the science which assesses their validity and effectiveness, there is a risk of being ineffective, erroneous or even potentially dangerous [34]. Furthermore, it is important to examine self-supporting mobile applications that do not require a network to run the application. This is particularlyrelevant because the majority of patients requiring wound care are managed in the community and the internet access is not available to everyone [25,35,36]. A practical example of a self-supporting wound care application is the one developed by Jordan et al.'s interdisciplinary team [37], which "is designed to support (but not replace) clinical decision-making in wound dressing selections, particularly for healthcare providers with little education or experience in wound management". It is particularly useful in rural community settings in the absence of a specialized nurse or physician.

To enhance the mHealth applications effectiveness, the World Health Organization (WHO) suggests to take a more strategic approach in their development and evaluation [38]. The WHO not only recognizes the innovative role that mobile applications can play in strengthening the health care system, but also support the importance of ensuring the validity of the information used to create them, such as algorithms and decision flow charts [38]. Thus, it is important that these applications be developed rigorously and that their effectiveness be evaluated to ensure that these investments do not inappropriately divert resources from existing ones [38].

While there are numerous mobile applications available, and the use of technology has the potential to improve wound care, the evidence is limited. A preliminary search of MEDLINE, CINHAL, JBISRIR, the Cochrane Database of Systematic Reviews and JBI Evidence Synthesis, PROSPERO and DoPHER showed that no systemic review or scoping review has been published addressing existing evidence related to self-supporting mobile wound care applications used by nurses with respect to their development, evaluation, and outcomes on patients, nurses and the health care system. Four reviews [30,39–41] were located examining areas linked with the topic of the present scoping review, however, they do not address the issue from a nursing perspective. Two reviews explored the use of mobile applications with a specific type of wound, such as surgical wounds [39] or pressure ulcers [30]. The remaining two explored telemedicine exclusively [40] or the effectiveness of digital education [41] in wound care. A protocol was identified for a scoping review designed to explore the literature on nurses' use and evaluation of mobile applications in chronic wound care [42]. However, the work considered by Vaughan et al. [42] exclusively addresses chronic wounds. Therefore, this scoping review protocol offers a unique perspective in several ways: it includes all wound types, it explores the development process of self-supporting mobile applications in a nursing perspective, and describes the evaluation of their effectiveness.

Review questions

The following primary research question will be addressed:

What self-supporting mobile applications exist for nurses to provide wound care?

The further sub-questions will be:

- How do nurses' use self-supporting mobile applications in wound care?
- How are nurses involved in the development and evaluation of these applications?
- What outcomes are reported at the patient, nurse and health care system level?

The objectives of this scoping review protocol is to present a transparent process in particular:

- To search the databases to identify studies in which wound care mobile applications used by nurses in any care setting in any country are reported,
- To describe information sources of the identified studies reporting the use of self-supporting wound care mobile applications by nurses,
- To extract the data from the included studies about the use of self-supporting wound care mobile applications by nurses.

2. Materials and methods

As per the Joanna Briggs Institute (JBI) methodology, this review will examine the existing literature to map the types of available evidence [43,44]. We developed this scoping review protocol in accordance to the Preferred Reporting Items for Systematic reviews and Meta-Analyses for Scoping Reviews (PRISMA-ScR) [45] that is recommended by the JBI [43]. The protocol was registered in Open Science Framework (https://doi.org/10.17605/OSF.IO/2JDB4).

2.1. Eligibility citeria

To identify the elements under study and create the eligibility criteria, the acronym PCC (Population, Concept, Context) is recommended in the JBI methodology [43].

2.1.1. Population

The target population for this scoping review focuses on nurses of all

ages and educational levels, including students.

2.1.2. Concept

The topic of interest explored is self-supporting mobile applications in wound care, derived from the concept of mHealth. The definition used by WHO will be used in this study to include any "medical and public health practice supported by mobile devices, such as cell phones […] personal digital assistants, and other wireless devices" such as tablets [46, p. 6]. This definition allows us to include applications used for telemedicine, wound and patient assessment, dressing selection, treatment plan development and education for all wound types. The applications will be included regardless of their origin and cost. Self-care applications, web-based applications and applications developed solely for laptops or desktops will be excluded.

2.1.3. Context

To increase the scope of the review, the context explored will be broad and will include all care settings without geographic limitation. This section is thus open-ended and could include primary care facilities, hospitals, community settings and all other care settings where wounds are privately or publicly managed.

2.2. Search strategy

2.2.1. Search strategy and information sources

To help identify all literature relevant to this review, the search strategy was developed in collaboration with a health sciences librarian. We used the Population-Concept-Context (PCC) method [43] to identify relevant items for our search strategy. We identified initial keywords based on our knowledge of the field. Then, we conducted a limited search of MEDLINE (via Ovid), the Cumulative Index to Nursing and Allied Health Literature (CINAHL via Ebsco) and Embase to retrieve the terms contained in the titles, abstracts and the thesaurus (MeSH) used to describe the articles.

Building on these, we will search the following electronic databases: MEDLINE (Ovid), Embase, CINAHL (Ebsco), Web of Science, LiSSa, Cochrane Wounds (Cochrane Library) and Erudit. Using Boolean operators AND and OR, truncation, wildcards, quotation marks and proximity searches, the search strategy including all keywords was adapted for each database (see Table 1 for the MEDLINE (via Ovid) search strategy). The citation lists of all selected literature will be scrutinized for additional articles.

The same methodology will be used to search for sources of unpublished articles and grey literature. These include Nursing and Allied Health Premium (ProQuest), ProQuest Dissertations and Theses, Global Index Medicus (WHO), OpenGrey (1980–2020), Grey Literature Report (1999-2016), National Institute for Health and Care Excellence (NICE), Wounds Canada, European Wound Management Association, American Professional Wound Care Association, WorldWideScience, Prospero, ClinicalTrial.gov, and Cochrane Central Register of Controlled Trials. We will replace study protocols by the completed study when possible. Both French and English publications will be included. In view of the recent emergence of mHealth, no time limit will be set in the databases.

2.2.2. Types of sources

We will include all types of studies and literature linked to self-supporting mobile wound care application used by nurses. With respect to review questions, data related to the development and evaluation of the applications, as well as patients, nurse, and system outcomes will be examined. The scope of evidence reviewed will include all quantitative, qualitative and mixed methodologies. In addition, literature reviews, policies and protocols that meet the inclusion criteria will also be considered. Grey literature that includes information on mobile applications in wound care that can provide information not controlled by commercial publishing and can include conference abstracts, theses, government reports, clinical practice guidelines and policies, will also be included. Commentary, editorial and opinion papers, narrative review, and studies that do not explore self-supporting mobile applications in wound care will be excluded.

Table 1
Search strategy for MEDLINE (via PubMed) database (1946 to June 13, 2022).

Search	Query	Results
1	exp nurses/or exp nursing staff/	158350
2	Students, Nursing/	28598
3	nurs*	507950
4	(nurs* adj3 (student* or trainee*))	27212
5	1 or 2 or 3 or 4	571331
6	Wound Healing/	102678
7	(wound* adj3 (car* or heal* or manag* or treat* or assess* or dress* or monitor*))	113540
8	(pressure adj3 (sore* or injur*) or "bedsore*")	6579
9	ulcer*	229421
10	"diabetic foot"	10328
11	or/6-10	394634
12	Mobile Applications/	10144
13	Cell Phone/	9653
14	wireless technology/	4323
15	telemedicine/	33850
16	("mhealth*" or "m-health*" or "m health*")	8415
17	((mobile or cell or phone* or portable or digital or software) adj3 app*)	82798
18	smart tech*	461
19	(cellphone* or cell-phone* or cell phone* or cellular*)	874524
20	(smartphone* or Smart phone* or smart-phone)	20101
21	(wireless adj3 (technolog* or phone* or telephone* or device*))	2970
22	Tablet*	59633
23	(hand held device* or hand-held device*)	500
24	(mobile adj3 (phone* or telephone* or device* or technolog*))	21087
25	(mobile adj3 (health* or care*))	10003
26	("personal digital assistant*" or "PDA")	15363
27	(iphone or i-phone)	1059
28	(telemed* or tele-med*)	21472
29	(telecar* or tele-car*)	1259
30	(teleconsult* or tele-consult*)	2058
31	(teledermatology or tele-dermatology)	1137
32	(telediagnos* or tele-diagnos*)	278
33	(telemonitor* or tele-monitor*)	2273
34	or/12-33	1101022
35	5 and 11 and 34	**202**

2.3. Study/source of evidence selection

Following the search, all identified citations will be collated and integrated into Covidence® (Veritas Health Innovation, Melbourne, Australia) [47]. Recommended by Cochrane and the JBI, this software is recognized for its efficient selection and extraction of data. It will be used to eliminate duplicates and highlight disagreements between reviewers. Following a pilot test, an initial screening of titles and abstracts will be performed by two independent reviewers using the review eligibility criteria. To verify that they meet the eligibility criteria, two independent reviewers will then retrieve and read the potentially relevant sources in their entirety. Studies that do not meet the inclusion criteria will be excluded. Reasons for the exclusion will be kept and presented in the flow diagram. Any dispute or disagreement over interpretation among the reviewers will be resolved by discussion and consensus, or by a third reviewer with expertise in the subject matter. The results of the research shall be fully documented in the scoping review and shall be presented with the PRISMA-ScR flowchart [45] (Fig. 1).

2.4. Data extraction

Included study data will be extracted and managed independently by two reviewers using Covidence® and a data extraction tool developed

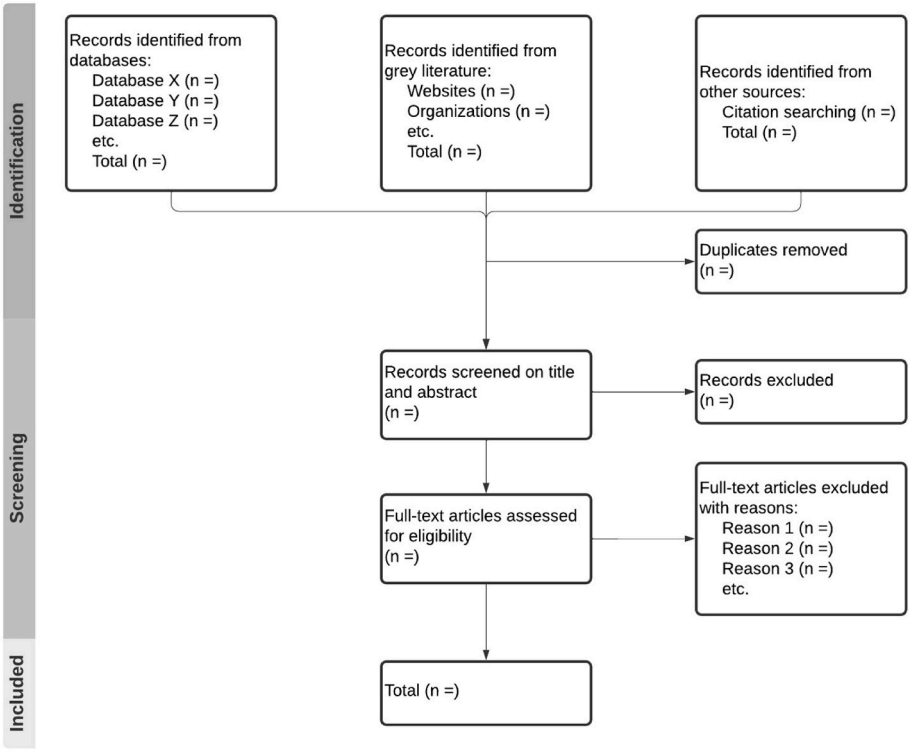

Fig. 1. PRISMA-ScR flow diagram.

by the research team (see Table 2). The information will include study details (e.g., study ID, author, year, journal), study method (e.g., aims of study, setting, study design, outcomes method of data analysis), and results. To reduce the risk of error, the full text in Covidence® will be selected and "copied and pasted" into the data extraction tool. For the first four studies, the tool will be pre-tested by the reviewers to ensure that they are extracting the same data and executing in the same manner. The data extraction tool will be modified as needed. Any disagreements or differences in interpretation between reviewers will be resolved by a third reviewer.

Should the same study be published in several articles, the data will be considered as coming from a single source in order to avoid overrepresenting the study and its results. If an article does not contain all the data studied or if some information is missing despite an extensive search of possible subsequent publications, we will consult the authors of the article by email to obtain clarification.

Table 2
Draft data extraction instrument.

Evidence source details and characteristics
Study ID
Authors
Date of publication
Article title
Journal
Country, province/state
Aims
Design, population and sample size
Context or setting
Methods
Details/Results extracted from sources of evidence (in relation to the wound care application)
App characteristics
purpose of the app
free or cost
Details about app's development
Details about app's evaluation
Outcomes about patient
Outcomes about nurses
Outcomes about health care system
Recommendations
Limitations of the study
Others
Author correspondence (details of correspondence with study authors for additional information or clarification of queries)
References (additional relevant articles cited in reference list)

2.5. Data analysis and presentation

The search strategy and selection process will be presented in a PRISMA-ScR flow diagram [45]. Using the completed extraction tool, the data will be analyzed in a descriptive manner to map the available evidence. Data key information will be categorized and classified to generate a summary of the self-supporting mobile applications existing for nurses in wound care. Each research question will be reported separately using appropriate charts and tables. The results will be synthesized with supporting narratives presenting the extent of the available evidence related to self-supporting mobile wound care applications used by nurses. This narrative description will be used to synthesize the study findings and describe how they relate to the review questions.

In accordance with the JBI methodology and the purpose of this scoping review, no assessment will be made of the quality nor the level of certainty of the data collected and an analytical synthesis of the results will not be carried out [43].

3. Discussion and conclusion

The results of this scoping review will be useful in guiding further research on mHealth in wound care. The methodology detailed through this protocol allows the scoping review to be conducted in a transparent and robust manner. The findings will be published in a separate article that will be submitted to a peer-reviewed journal.

This scoping review marks the first step in a multi-method research project ultimately aimed at developing an algorithm for a wound care mobile application that provides evidence-based recommendations for nurses. The use of such a digital tool could support nurses in their clinical decisions and promote an efficient transfer of knowledge to bedside care. In line with the premise of the *Knowledge Translation in Health Care: Moving from Evidence to Practice* model [48], the results of the scoping review will be discussed with experts and knowledge users to ensure that they align with their needs.

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Authors' contributions

All authors are accountable and responsible for the entire article. Specifically, JG designed the review, performed the protocol recording and acquired the funding under the supervision of ML. JG, ML, SB, and JC designed the research questions and contributed to the protocol design. JG developed and refined search strategy with a research librarian. JG prepared and drafted manuscript. ML, SP and JC contributed in writing the manuscript. All authors edited and revised manuscript. All authors read and approved the final version to be published.

Declaration of competing interest

None.

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