Mobile technologies in the Nursing area

Tecnologias móveis na área de Enfermagem

Tecnologías móviles en el área de Enfermería

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ABSTRACT

Objective: To identify in the literature studies on mobile technologies in Nursing. Method: Integrative literature review in which was used the Population, Interest and Context (PICo) strategy, the tool of the National Library of Medicine for formulation of the research question, and search without a determined period of time in the following bibliographic databases: Medical Literature and Retrieval System onLine/PubMed®, Cumulative Index to Nursing & Allied Health Literature (CINAHL), SCOPUS (Elsevier), Latin American and Caribbean Literature in Health Sciences (LILACS) and Nursing Database (BDENF). Data collection period was from January to March 2017. Results: Fifteen articles were selected, in which were addressed mobile technologies in Nursing for nurses, undergraduate students and patients. Conclusion: Mobile technologies in Nursing are a recent theme and enable care data sharing, experience acquisition by undergraduate students and patient empowerment.

Descriptors: Mobile Applications; Smartphone; Nursing Informatics; Application of Medical Informatics; Mobile Phones.

RESUMO


Descritores: Aplicativos Móveis; Smartphone; Informática em Enfermagem; Aplicação de Informática Médica; Teléfonos Celulares.

RESUMEN

Objetivo: Identificar en la literatura estudios sobre tecnologías móviles en el área de Enfermería. Método: Revisión de la literatura en que se utilizó la estrategia Población, Interés y Contexto (PICo), herramienta de la National Library of Medicine para formulación de la cuestión de pesquisa e busca sin recorte temporal en las siguientes bases de datos bibliográficos: Medical Literature and Retrieval System onLine (MEDLINE/PubMed®), Cumulative Index to Nursing & Allied Health Literature (CINAHL), SCOPUS (Elsevier), Literatura Latinoamericana y del Caribe en Ciencias de la Salud (LILACS) y Base de Datos en Enfermería (BDENF). El período de la recolección de datos fue de enero a marzo de 2017. Resultados: Se seleccionaron 15 artículos, que abordaron tecnologías móviles en el área de Enfermería para enfermeros, estudiantes y pacientes. Conclusión: Las tecnologías móviles en el área de Enfermería son tema reciente y posibilitan compartir datos en la asistencia, adquisición de experiencia por estudiantes y empoderamiento del paciente.

Descriptores: Aplicaciones Móviles; Smartphone; Informática en Enfermería; Aplicación de Informática Médica; Teléfonos Móviles.

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INTRODUCTION

The term ‘technology’ has been misconceived as product, computerization, cybernetics and robotics. However, depending on the context, it can mean technical or scientific knowledge, tools, processes and materials created from such knowledge, which are related, base the Nursing care and generate solutions to practical problems.

Information and Communication Technologies (ICTs) are all communication technologies that facilitate transmission of information through digital means, and include computers, wireless networks, among other devices. They have been used globally in personal, educational, business and health contexts. In these contexts, from ICTs, it was also possible to process and transform data, images and voice, act on mechanisms that operate changes of state, sensors and actuators; to store, persist, maintain and recover data, images, voice and communication, and carry from one point to another what was processed and stored.

Among ICTs, smartphones stand out because they enable communication, have several functionalities and offer many options for users given their efficient operating system and easy internet access. In Brazil, according to the Global Mobile Consumer Survey, in 2016, 80% of people used smartphones daily, a very close percentage to the global average, which at that time was 81%.

Studies have been conducted in the health field for identifying the use of mobile technologies in the national and international literature. A systematic review of smartphone-based health technologies according to their functionality has shown that many smartphone applications are developed and used in health professionals’ education, self-management of diseases and remote patient monitoring. In Brazil, in another integrative review study, was identified that research involving mobile technologies applied to health has been more used for professional support.

The present study was proposed given the lack of an integrative review of the literature on mobile technologies in the Nursing area. Furthermore, it is part of a macro project with the aim to develop a smartphone application on intestinal elimination ostomy. Its result will allow the identification of the state of the art on mobile technologies in Nursing, of other gaps in the literature, and the expansion of the body of knowledge.

OBJECTIVE

To identify in the literature studies on mobile technologies in the Nursing area.

METHOD

An integrative literature review. It implies the analysis of relevant research that supports decision making and improvement of clinical practice, enables the synthesis of the knowledge state of a given subject, and points out knowledge gaps that need to be filled with new studies.

The steps of this integrative review were the following: elaboration of the research question; sampling and data collection strategy; extraction of relevant data from primary studies; evaluation of studies; analysis and synthesis of the results of the review and presentation of the integrative review.

The research question to be answered was ‘What is the scientific production on mobile technologies in the Nursing area?’. It was developed by using the PICo strategy (Population/Problem, Interest and Context), which is a tool of the National Library of Medicine. This strategy is based on segmentation of the research question, and allows researchers to select words that bring the appropriate definition of the initial questioning by identifying the best scientific information about the topic. Chart 1 describes the strategy used in the development of this review.

Chart 1 - Research question according to Population/Problem, Interest and Context (PICo) strategy, Brazil, 2016

<table>
<thead>
<tr>
<th>Description</th>
<th>PICo</th>
<th>Components</th>
<th>Descriptor</th>
<th>Type</th>
<th>UND</th>
</tr>
</thead>
<tbody>
<tr>
<td>Population/Problem</td>
<td>P</td>
<td>Original studies</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Interest</td>
<td>II</td>
<td>Mobile phone applications</td>
<td>“Computers, handheld”</td>
<td>DeCS MeSH</td>
<td>iPhone/Android blackberry blackberry Windows Mobile Windows Phone device application</td>
</tr>
<tr>
<td>Context</td>
<td>CCo</td>
<td>Nursing</td>
<td>“Mobile applications”</td>
<td>DeCS MeSH</td>
<td>nurs* Nursing</td>
</tr>
</tbody>
</table>

Note: UND = Uncontrolled descriptor

The following bibliographic databases were used for the selection of articles: Medical Literature and Retrieval System onLine (MEDLINE/PubMed) via National Library of Medicine, Cumulative Index to Nursing & Allied Health Literature (CINAHL); SCOPUS (Elsevier); Latin American and Caribbean Literature in Health Sciences (LILACS) and Nursing Database (BDENF). The controlled descriptors used in the search strategy were selected in MESH (Medical Subject Headings), DeCs (Health Sciences Descriptors) and Emtree (CINAHL Terminology), as well as uncontrolled descriptors (described in Chart 1). A search strategy was used for each bibliographic database (Chart 2).

Original articles in full and available online in selected bibliographic databases, published in Portuguese, English and Spanish (with no determined period of time) until the search was completed in December 2016 were included. Articles of theses, dissertations, review articles, non-material scientific papers, articles in which it was not possible to identify a relationship with the subject by reading title and abstract, and duplicate articles in the bibliographic databases were excluded.

The search and selection of articles were performed by two reviewers independently in order to give more rigor to this procedure. Initially, the selection of studies was performed by reading the titles...
and abstracts based on inclusion criteria. From this selection, the remaining articles were read in full in order to include only relevant publications and consistent with the problem of the study.

After applying the inclusion and exclusion criteria, reading titles and abstracts, and full texts, the sample consisted of 15 articles. For the collection of information of articles, was used an instrument adapted from the literature that included the following information: identification (authors, title, publication year and journal, database and mobile technologies in the Nursing area) and methodological characteristics (type of study/level of evidence).

Figure 1 shows a flowchart of the search and selection process of articles by bibliographic database.

In this review, the classification of the type of study/level of evidence was the following:

level I: systematic review or meta-analysis of all relevant randomized controlled trials, or from clinical guidelines based on systematic reviews of randomized controlled trials; level II: at least one well-delineated randomized controlled clinical trial; level III: well-delineated clinical trials without randomization; level IV: well-delineated cohort and case-control studies; level V: systematic review of descriptive and qualitative studies; level VI: a single descriptive or qualitative study; level VII: opinion of authorities and/or report of expert committees.

![Flowchart of the process of identification, screening, eligibility and inclusion of articles in the integrative literature review, Brazil, 2017](image-url)
The articles were analyzed descriptively and summarized in Charts with categorization of mobile technologies in Nursing according to the target audience: nurses, nursing undergraduate students and patients.

The research project of this review was not sent to the Research Ethics Committee (REC) because there is no direct involvement of human beings. In all stages of this review were respected the ethical principles and authors’ copyright by citing each one of them.

**RESULTS**

Of the 218 articles selected by title and abstract, 203 mentioned the impact and usability of mobile technologies in the lives of patients and health professionals, but since there was no reference to the development process, these were not included in this study.

Of the 15 articles included, four were published in Brazil and 11 abroad. Regarding the target audience, six articles described mobile technologies in Nursing for nurses (Chart 3), two for undergraduate students and seven for patients (Chart 4).

Chart 3 and 4 show articles describing mobile technologies in Nursing for nurses, undergraduate students and patients according to authors, titles, year/journal, type of study/level of evidence and name of the application (when it was named and quoted by the author).

Almost all articles (93%) from the last five years. Seven (46%), from the two last years. In the majority (87%), was used some qualitative method for evaluation of the mobile technology during its development, or the process and development stages were only described and classified as level VI. In studies in which was used randomization (13%), the aim was to compare participants’ perceptions before and after the development and use of mobile technology.
DISCUSSION

The use of ICTs in Nursing has changed the way of dealing with massive amounts of information on care and resources used in a fast and organized way. Mobile technologies are a way of storing and sharing information, they improve the nursing team performance and promote customer care.27

Smartphone mobile technologies enable a range of computing activities and telephony activities such as data access, internet browsing, e-mail sending and receiving, instant messaging applications, wireless communication technology (Wi-Fi), among others. In the health and nursing context, several functions can be used by patients or professionals. Emerging mobile technologies allow that professionals share information in real time, obtain data through a wireless system, and stimulate the self-care of patients of certain clinical conditions.28

These technologies fit into the context of mHealth, which means "health and medical practice supported by mobile devices such as mobile phones, patient monitoring devices, Personal Digital Assistants (PDAs) and other wireless devices.29 This modality of patient care has been growing in line with the innovation of mobile devices, their popularization and new demands on patient health care.30"

Mobile technologies in Nursing for nurses

Mobile technologies have proven innovative in Nursing practice and changed the way nurses perform their interventions and communicate with patients and other health professionals. This allows for preventive and diagnostic actions, and for disease treatment.31

In general, nurses are open to the acquisition of mobile technologies at work for reducing the time in insertion and sharing of patient data. Mobile technologies should not be an extra form of record, but rather facilitators of systematization and access to patient information and the care process.32

Mobile technologies are tools for expanding the knowledge and systematization of work, and offer nurses the opportunity to

<table>
<thead>
<tr>
<th>Database</th>
<th>Authors</th>
<th>Title</th>
<th>Year/Journals</th>
<th>Type of study/ Level of evidence</th>
<th>Mobile technologies in Nursing according to target public</th>
</tr>
</thead>
<tbody>
<tr>
<td>Study A</td>
<td>Juric, S.; Zalik, B.</td>
<td>An innovative approach tonear-infrared spectroscopy using a standard mobile device and its clinical application in the real-time visualization of peripheral veins</td>
<td>2014/ BMC medical informatics and decision making</td>
<td>Qualitative study/ Level VI</td>
<td>mVeinVision</td>
</tr>
<tr>
<td>Study B</td>
<td>Chang CW, Ma TY, Choi MS, Hsu YY, Tsai YJ, Hou TW</td>
<td>Electronic personal maternity records: Both web and smartphone services</td>
<td>2015/ Computer methods and programs in biomedicine</td>
<td>Qualitative study/ Level VI</td>
<td>Pregfone Care</td>
</tr>
<tr>
<td>Study D</td>
<td>Kang H, Park HA.</td>
<td>Development of a smartphone Application for Clinical-Guideline Based Obesity Management</td>
<td>2014/ Healthcare Informatics Research</td>
<td>Qualitative study/ Level VI</td>
<td>Not mentioned</td>
</tr>
<tr>
<td>Study F</td>
<td>Morrison CF, Szulczewski L, Strahlendorf LF, Lane JB, Mullins LL, Bai AL</td>
<td>The development and feasibility of a web-based intervention with diaries and situational feedback via smartphone to support self-management in patients with diabetes type 2</td>
<td>2012/ Diabetes research and clinical practice</td>
<td>Descriptive study/ Level VI</td>
<td>Not mentioned</td>
</tr>
<tr>
<td>Study G</td>
<td>Jaensson M, Dahlberg K, Eriksson Mj, Grönlund Å, Nilsson U.</td>
<td>Designing Technology to Address Parent Uncertainty in Childhood Cancer</td>
<td>2016/ Advances in Nursing Science</td>
<td>Randomized controlled trial/ Level II</td>
<td>Not mentioned</td>
</tr>
<tr>
<td>Study H</td>
<td>Cho MJ, Sim JL, Hwang SY.</td>
<td>Development of Smartphone Educational Application for Patients with Coronary Artery Disease</td>
<td>2014/ Healthcare Informatic Research</td>
<td>Descriptive study/ Level VI</td>
<td>Strong Heart</td>
</tr>
</tbody>
</table>
Mobile technologies in Nursing for nurses, undergraduate students and patients

**CONCLUSION**

The articles selected in this review were on mobile technologies in Nursing for nurses, undergraduate students and patients. The profile of selected articles indicates the theme...
is recent and developed in countries where there are more technological resources.

For professionals, the possibilities of creating mobile technology range from the record of patient data, mean of information about diseases, managerial and administrative activities, among others. The increasing complexity of patients' cases and of nurses' job demands encourages the development of mobile technologies that make the work agile and optimize professionals' time during care and management activities.

Despite these limitations, mobile technologies can be great allies for building students' knowledge and their acquisition of experience before entering fields of practice.

For the technology business, patients represent a growing consumer market of mobile technology, which is no different when it comes to health. In this study, the aim of mobile technologies in Nursing for patients is empowering their health, self-care and frequent monitoring of changes in their health conditions by complementing nursing consultations.

In summary, results indicate the need for new studies on mobile technologies in Nursing, especially with undergraduate students. New studies may fill the current gaps and contribute to the practice of flexible, systematized and safe Nursing.

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