



Mobile Application in Dentistry: A Literature Review

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Abstract

This study aimed to identify the current state of the art and trends of research using mobile applications in Dentistry through a literature review. SciELO, PubMed databases, using the terms "mobile application", "Dentistry" and "informatics", and in Google Scholar, to cover the gray literature, with the same terms in the English language, without time limitation were searched. The titles and abstracts of all articles found were read independently by two researchers. Studies based on primary data that were related only to oral health, whose medium of information was smartphones, in the English, The data described in the studies have shown the increasing adoption of the applications use as educational and assistance resources. The creation of mobile applications directed to Dentistry is appropriate, both in teaching, as a new possibility to build knowledge, and for professional use, since the global dissemination of the use of mobile devices is undeniable.

Keywords: Mobile Application; Dentistry; Informatics

Introduction

The use of mobile application technology is an increasing practice in society, and the widespread use of smartphones have allowed a new way to interact, share and obtain information profile among the users of this service [1].

This omnipresent use of the Smartphones among most dental practitioners has created opportunities for practitioners to implement several real-time health-related interventions using universally available resources [2]. Thus, development of mobile application solutions provides an effective means of delivering tools as well as reaching the desired target audience, either professionals, dental technicians and/or patients [3].

In Dentistry, the increasing demand in the use of mobile application technologies aims to facilitate the daily practice of the dental professional, be it as practitioner, assistant, technician, professor's and dental students [4]. A large part of dental health professionals' tasks consist of processing information like obtaining and recording patient's data, consulting in the profession, researching specific scientific literature, diagnostic procedures, treatment planning and strategies, interpretation of examinations or guiding epidemiological studies [1,5].

In this situation, the use of mobile applications can enhance as well as expedite dental treatment activities, optimizing the work time of these professionals and providing benefits to the general

population. Furthermore, the literature has highlighted the benefit of using information and communication technologies as an educational tool, in Dentistry. The traditional way of teaching has been sharing place with e-learning courses, simulators of clinical procedures, real-time communication software, among others. The importance of these tools is the ability to allow students to search and select information, independently learn and solve problems [6].

Thus, the aim of this study has been to identify, through a literature review, the current state of the art and the research trends which use mobile applications in Dentistry.

Methods

For the development of this study a literature review was carried out aiming at apprehending in the national and international scientific literature on "mobile applications related to dentistry". Search was done in the databases Sci ELO, PubMed and Google Scholar from January 2008 to December 2018.

For the search strategy, the following terms were used in the Descriptors in Health Sciences (DeCS): "mobile application", "Dentistry" and "informatics", with the boolean operator "AND" between each word. Indexed articles, theses, dissertations as well as end-of-graduation course manuscripts were all included, with cross-sectional as well as before and after intervention designs.

Two researchers independently read the titles and abstracts of all articles found. Inclusion criteria consisted of primary data related only to oral health, whose information medium was smartphones in English. Studies from the literature and those not related to the theme were excluded.

Review of Literature

1. Forsell, *et al.* (2008) [7] have studied data collection and storage in home visits. Based on needs reported by workers during field work. Available on Windows Mobile Platform (Microsoft). No usability testing was reported. The application was used from January 2006 to March 2008 for more than 40,000 oral evaluations. Users reported the system to be self-explanatory.
2. Souza, *et al.* (2013) [8] have studied prototype of an oral care application for patients with special needs. Available on IOS and Android platforms. So far, its usability has not been evaluated. According to the authors, it is essential to choose the appropriate platforms as well as emphasize the interdisciplinary work, between health professionals and the ones from technological development.
3. Figueiredo, *et al.* (2013) [9] have studied data collection and storage with geolocation to be used in homecare visits. Android platform. No applicability tests were reported with patients, only interdisciplinary meetings to discuss the system improvement. The authors highlight the importance of dentists and computer professional's teamwork.
4. Farias and Pereira (2013) [10] have studied Application for analysis of Bolton's dental mass discrepancy. The digital (two-dimensional) analysis of the software was compared with the manual (gold standard) analysis of 75 pairs of gypsum models. The system was assessed by 30 orthodontists. Mutliplatform (Java) Greater specificity of the application: to exclude people who do not have a clinically identified discrepancy. The software proved to be 6 minutes faster than in manual analysis. One hundred percent (100%) of orthodontists liked the application and 93% would use it.
5. B. Khatoon, K. B. Hill, A. D. Walmsley (2014) [11] have studied to understand how new mobile technologies, such as smartphones and laptops, are used by dental students and found that Laptops 55% (145) and smartphones 34% (88) were the most popular choice of device for connecting to the net and searching information. Laptops were preferred in first and second year. Students in year 3 preferred mobile phones, and by year 4 the use of mobile phones and laptops was similar. The top two application ideas chosen by students as the most useful on their smart phones were a dictionary for dental education (56%) and multiple-choice questions (50%). Students who chose smartphones as their first choice or second choice of device strongly agreed that having the Internet on their smartphones had a positive impact on their dental education (55%). With laptops (48%), students preferred to be at home when using them while for smartphones (31%) they used them anywhere with a connection. E-mail (47%) and social networks (44%) were the top two Internet communication tools used most on laptops. Instant messaging was popular on smartphones (17%) and concluded depending on the year in the course, laptops and smartphones are the most popular choice of device and desktop computers are the least popular. Applications on smartphones are very popular and instant messaging is an upcoming form of communication for students.
6. Moidin Shakil, Karteek Durbakula, Kulkarni Spoorti, Maji Jose (2015) [12] have studied Quick Response Codes are used in modern day lifestyle for various purposes. Yencode (QR Code) is an innovative approach in recording and maintenance of slide details. Having an access to slide information from any part of the world with mobile QR Code scanner software will enable in early diagnosis and effective treatment. Yencode is a boost to retrospective studies as it saves a lot of time and problems encountered in recollecting old details and minimizes manual efforts in retrieval of information.
7. Corey D Stein, *et al.* (2016) [13] have studied that dental emergencies are likely to occur when preferred care is less accessible. Communication barriers often exist that cause patients to receive suboptimal treatment or experience discomfort for extended lengths of time. Furthermore, limitations in the conventional approach for managing dental emergencies prevent dentists from receiving critical information before patient visits and concluded that Patient-provided information accompanied by high-resolution images may help dentists substantially in predicting urgency or preparing necessary treatment resources. The results illustrate the feasibility of patients using smartphone applications to report dental emergencies. This technology allows dentists to assess care remotely when direct patient contact is less practical.
8. Marian Iskander, Jennifer Lou, Martha Wells, Mark Scarbecz (2016) [14] have studied that Prompt management of dental trauma in children affects outcomes, and multiple educational resources are available. The aim of this study was to compare subjects' accuracy in answering a survey about dental trauma management utilizing a poster and a mobile healthcare application and to determine user preference for mode of

- delivery of information and found that Eighty-nine surveys were usable. The majority of respondents were aged 36–45 years (50.6%), had education beyond high school (64%), and had private insurance (52.8%). Less-educated individuals were more likely to report searching the Internet (74%) compared to individuals with a graduate degree (57%) ($P = 0.017$). The majority of subjects answered trauma management questions correctly with both tools. However, for an avulsed permanent tooth, individuals receiving the mobile application were more likely to select: 'put the tooth back in place' (71.1%) compared to those utilizing the poster, who chose 'put the tooth in milk' (56.8%) ($P = 0.004$). Less-educated individuals were willing to pay more for the application ($P = 0.015$) and were more likely to report being interested in receiving dental information through mobile technology in the future ($P = 0.006$). In conclusion both a poster and a mobile healthcare application are effective in delivering dental trauma information.
9. Erokan Canbazoglu, Yucel Batu Salman, Mustafa Eren Yildirim, Burak Merdenyan, Ibrahim Furkan Ince(2016) [15] The field of dentistry lacks satisfactory tools to help visualize planned procedures and their potential results to patients. Dentists struggle to provide an effective image in their patient's mind of the end results of the planned treatment only through verbal explanations. Thus, verbal explanations alone often cannot adequately help the patients make a treatment decision. Inadequate attempts are frequently made by dentists to sketch the procedure for the patient in an effort to depict the treatment. These attempts however require an artistic ability not all dentists have. Real case photographs are sometimes of help in explaining and illustrating treatments. However, particularly in implant cases, real case photographs are often ineffective and inadequate. The purpose of this study is to develop a mobile application with an effective user interface design to support the dentist–patient interaction by providing the patient with illustrative descriptions of the procedures and the end result. Sketching, paper prototyping, and wire framing were carried out with the actual user's participation. Hard and soft dental tissues were modeled using three dimensional (3D) modeling programs and real cases. The application enhances the presentation to the patients of potential implants and implant supported prosthetic treatments with rich 3D illustrative content. The application was evaluated in terms of perceived ease of use and perceived usefulness through an online survey. The application helps improve the information sharing behavior of dentists to enhance the patients' right to make informed decisions. The paper clearly demonstrates the relevance of interactive communication technologies for dentist–patient communication.
 10. Gomes., *et al.* (2016) [16] have studied the application for oral cancer screening composed of two steps: a questionnaire focused on the predisposition of cancer and obtaining photos and videos. Fifty-five individuals with cancer risk factors were recruited for usability testing; the data from these patients, collected by the application and by standard tests were compared. Android Platform. When comparing the application use with the standard exams, the mean sensitivity was 91%, specificity of on average 90.5%, and mean accuracy of 90.90%.
 11. Stein., *et al.* (2016) [17] have studied Exchange of information system (photos and reports) between patients and dentists in cases of dental emergencies. It consisted of 4 phases: (1) quality evaluation of intra-oral images captured by smartphones, (2) development and (3) refinement of the prototype, and (4) evaluation through usability tests and satisfaction with 20 potential users. Android platform. The quality of oral conditions images is satisfactory in different models of smartphones. During the refinement of the prototype, some ambiguous or redundant words and selection options were found, and when asked about when the pain started, response options were no accurate; these issues have been corrected. All participants successfully completed the simulation of a case report in less than 4 minutes and reported being satisfied with the application.
 12. Samira Abbasgholizadeh Rahimi, Matthew Menear, Hubert Robitaille and France Légaré(2017) [18] have studied that mobile health (mHealth) applications intended to support shared decision making in diagnostic and treatment decisions are increasingly available. In this paper, we discuss some recent studies on mHealth applications with relevance to shared decision making. We discuss the potential and disadvantages of using mHealth in shared decision making in various contexts, and suggest some directions for future

Conclusion

The studies of this review have confirmed the increasing need to create systems focused on Dentistry and other health areas, in order to better reach the target audience, due to the undeniable global use of mobile devices. In Dental teaching, these resources lead to possible knowledge construction, both by students and professors. Traditional teaching methodology should not be neglected once they are not yet substitutable, as the studies have shown. Identifying professionals' and students' needs regarding technical training is essential to design and implement new and appropriate technologies, according to the necessary demands.

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