

Dental Apps for Smartphones: New Way of Providing Services and Education

Isabella Marques Faria, Mariana Coutinho Sancias, Andréa Vaz Braga Pintor,
Laura Salignac Guimarães Primo*

Department of Pediatric Dentistry and Orthodontics, Universidade Federal do Rio de Janeiro, Rio de Janeiro, Brazil

Email: *lprimo@pobox.com

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Abstract

Objective: To review the literature about dental applications (DAPP) for smartphones (SP) and search/describe DAPP available in Portuguese, in 3 operating systems. **Methods:** Aiming the review, the terms “smartphones”, “app” and “dentistry” were searched in the databases Pubmed, Virtual Health Library (BVS) and Google Scholar. Based on the review results, DAPP were searched for teaching and learning (TL), clinical practice (CP), patient orientation (PO) and professional update (PU), in Portuguese, in the Android, iOS and Windows systems. In 3 SP (iPhone 5S with iOS 9.3.5; Samsung Galaxy A5 6 2016 with Android; Microsoft-RM-1109 with Windows Phone 8.1 Update2) the term “dentistry” was inserted in APP searches. **Results:** Forty-three papers were included in the review and 215 DAPP were selected: 120 on Android, 90 on iOS, and 5 on Windows. DAPP were classified according to the focus in: CP (n = 99); PO (n = 6); CP/PO (n = 64); TL/CP (n = 6); TL (n = 38); TL/CP/PO (n = 1) And PU and TL (n = 1). The majority of the DAPP was not validated by any Dental institution (93.02%) and was no cost way for users (81.86%), although only 58.14 were updated. **Conclusion:** Most of the papers showed as main focus CP, TL and PO. The DAPP available in Portuguese for Dentistry were mostly developed for clinical practice, with a lack of those for patient orientation and teaching and learning. Future Dental APP should provide evidence-based, validated, updated data.

Keywords

Apps, Smartphone, Dentistry, Education, Clinical Practice

1. Introduction

Smartphones have been one of the success stories of the last decade (Boulos et

al., 2011). They are mobile phones with an integrated computer capable of performing a wide variety of tasks, including downloading various applications that are not typically associated with a mobile phone (Franko, 2011). The development of mobile computing applications for smartphones represents an interesting and effective way to provide a new technological tool and reach the desired target audience (Tibes, Dias, & Zem-Mascarenhas, 2014).

Therefore, with the development of mobile applications designed specifically for the medical and dental areas, healthcare professionals have been experiencing a new way of providing services and teaching (Khattoon, Hill & Walmsley, 2015). The use of applications through mobile devices, can facilitate and expedite the communication with patients, access to patients' exams, contributing to the establishment of diagnosis and with the follow-up. In addition, mobile apps enabled the possibility of access to scientific literature and guidelines of clinical protocols in the palm of the hand (Souza et al., 2013). Within the health area, this has been one of the fastest growing categories with numerous potential benefits. Its development has created new opportunities to integrate mobile technology into daily clinical practice (Baheti & Toshniwal, 2014).

There are few studies considering the use of apps for mobile phones on Dentistry, regarding clinical practice, patient orientation and teaching and learning process. Furthermore, an overview of the dental applications for smartphones available in Brazil has not been conducted yet. Therefore, the aim of this study was to review the literature about Dental applications (DAPP) for smartphones (SP) and search/describe those available in Portuguese, in 3 main operating systems.

2. Methods

2.1. Review of the Literature

Previously to the observational study, a prospective review of literature was performed aiming to know and understand the role of mobile applications for smartphones in Dentistry. The terms "smartphones", "app" and "dentistry" were searched in the database Pubmed using the search strategy (smartphone OR app) AND (dent*) NOT beta-amyloid precursor protein). The terms were also searched in Portuguese in Virtual Health Library (BVS) (*aplicativos AND smartphones AND odontologia*) and Google scholar ("*aplicativos para smartphones em odontologia*") databases. The articles published in English or Portuguese that considered the use of DAPP for the clinical practice, patient orientation and teaching and learning process were selected for reading. Thesis, dissertations, editorials and other types of publication that were not scientific articles or those in languages different from English or Portuguese were excluded.

2.2. Observational Study

Dental applications (DAPP) for smartphones (SP) targeted to teaching and learning (TL), clinical practice (CP), patient orientation (PO) and professional

update (PU), in Portuguese, were searched in the Android, iOS and Windows systems in Brazil. In three Smartphones (iPhone 5S with iOS 9.3.5; Samsung Galaxy A5 6 2016 with Android; Microsoft-RM-1109 with Windows Phone 8.1 Update 2) the term “dentistry” was inserted in APP searches. Applications that were not in Portuguese, games and those targeted to other issues that not dentistry were excluded. Portuguese was the only language included, since this is the official Brazilian language, clear for any Brazilian citizen.

Data extraction included the general characteristics of the selected DAPP: name, operative system, date of last update, cost, category and institutional validation. The data was tabulated in an Excel[®] chart.

3. Results

The forty papers selected based on the inclusion and exclusion criteria, were published between 2010 and 2017, showing a growing interest in recent literature regarding the use of mobile applications in Dentistry. Clinical practice represented the area of greatest interest, followed by the areas of teaching and learning and patient orientation (**Table 1**).

After analyzing the information available in the surveyed operating systems, 215 applications were selected, according the inclusion and exclusion criteria. Out of these, 120 (55.81%) were available on the iOS, 90 (41.86%) on Android and 5 (2.32%) on Windows. The majority of Dental applications did not have access costs (81.86%). The applications related to the topic Clinical Practice represented the great majority of the applications, when compared to those associated with the other topics researched. Recognized dental institutions validated less than 10% of the Dental applications. Furthermore, just over half of the applications (58.14%) were updated. The characteristics of the analyzed applications were described in **Table 2**.

4. Discussion

Smartphones and applications have contributed to the technological advancement in health care in recent years, influencing methods of research, access to information and communication between professionals and patients (Collado-Borrell et al., 2016). The data obtained in the review suggested that researchers were interested, mainly, in understanding the potential of using, developing and evaluating these new tools available for dentistry, especially those designed for the clinical activity (Dhuvad, Dhuvad, & Kshirsagar, 2015; Tam & Lee, 2016; Estai et al., 2016; Adams, 2016; Kalman, Chrapka, & Joseph, 2016). The interest is relevant, since applications for Dentistry can facilitate the tasks related to information processing and communication, such as: registration of patient information, research in specific literature, discussion with colleagues and auxiliary professionals and communication with patients. (Souza et al., 2013; Sarode et al., 2016; Stein et al., 2016; Bullock et al., 2015; Hardyman et al., 2013).

Regarding the teaching and learning process, the authors highlighted the

Table 1. Selected studies in chronological presentation and areas of interest.

Author	Area of interest
Alklayb et al., 2017	Patient orientation
Bohn et al., 2017	Patient orientation
Deshpande et al., 2017	Teaching and learning
Tam & Li., 2016	Clinical practice
Madan Kumar et al., 2016	Teaching and learning
Al-Musawi et al., 2016	Teaching and learning
Sarode et al., 2016	Clinical practice
Stein et al., 2016	Clinical practice
Pulijala et al., 2016	Patient orientation
Estai et al., 2016	Clinical practice
Adams, 2016	Clinical practice
Petruzzi & Benedittis., 2016	Patient orientation
Kalman et al., 2016	Clinical practice
Djemal & Singh., 2016	Clinical practice and patient orientation
Estai et al., 2016	Clinical practice
Könings et al., 2016	Teaching and learning
Khatoun et al., 2015	Teaching and learning
Li et al., 2016	Patient orientation
Dhuvad et al., 2015	Clinical practice
Masika et al., 2015	Teaching and learning
Underwood et al., 2015	Patient orientation
Bullock et al., 2015	Clinical practice
Zotti et al., 2016	Patient orientation
Bullock & Webb, 2015	Teaching and learning
Pinheiro et al., 2015	Review
Senthoor et al., 2014	Clinical practice
Rung et al., 2014	Teaching and learning
Baheti & Toshniwal., 2014	Teaching and learning and Clinical practice
Lin et al., 2014	Patient orientation and Clinical practice
Keim, 2014	Clinical practice
O'Reilly et al., 2014	Clinical practice
Tibes et al., 2014	Review
Schulz et al., 2013	Teaching and learning
Mladenović et al., 2013	Clinical practice
Hardyman et al., 2013	Clinical practice
Figueiredo et al., 2013	Clinical practice
Souza et al., 2013	Clinical practice
Bahcall, 2012	Clinical practice
Pavan et al., 2012	Clinical practice
Richards, 2012	Clinical practice

Table 2. Characteristics of the analyzed applications.

Characteristics	N	Percentage
Operating system		
Android	120	55.81%
iOS	90	41.86%
Windows	5	2.32%
Cost		
Yes	37	17.20%
No	176	81.86%
Categories		
Clinical practice	99	46.04%
Teaching and learning	38	17.67%
Patient orientation	6	2.79%
Patient orientation + Clinical practice	64	29.76%
Clinical practice + Teaching and learning	6	2.79%
Teaching and Learning + Clinical practice + Patient orientation	1	0.46%
Professional update + Teaching and learning	1	0.46%
Last updating (year)		
2016	125	58.14%
2015	44	20.47%
2014	24	11.16%
2013	9	4.19%
2012	6	2.79%
2011	1	0.46%
2010	1	0.46%
Validation		
Yes	15	6.97%
No	200	93.02%

importance of using smartphone applications as a new tool available to facilitate learning (Rung et al., 2014). Mobile devices have become popular technologies not only for Internet access, which enables quick access to books and articles, but also for the possibility of downloading applications that can be used as pedagogical tools inside and outside the classrooms (Pineiro et al., 2015). The use of mobile technology for educational purposes is known as mobile learning (m-learning) (Farias et al., 2015). The use of mobile applications offers: accessibility, mobility, continuous capability of data transmission, geolocation and multimedia capability (Pineiro et al., 2015). Teaching and learning methods

should be dynamic and in line with social needs and demands. The current generation of students was born and grew up surrounded by and involved with information technology, which permeates their social relations and in general their perception of the world (Schulz et al., 2013). Thus, the use of mobile learning is already a reality (Rung et al., 2014; Bullock et al., 2015). Information and communication technology has proved to be a critical component of teaching and learning in higher education and in the education of health professionals. Mobile devices can contribute significantly to a new way of educating in health (Deshpande, Chahande, & Rathi, 2017).

Currently, smartphones and applications are accessible to most people (Al-Musawi et al., 2016), due to their fast popularization and lower acquisition costs, generating a society increasingly immersed in the context of mobile devices and permanently connected. However, this society could benefit even more from the use of oral health applications by the use of m-learning as an educational strategy targeted to the most vulnerable population providing knowledge about preventive actions and promoting oral health (Madan Kumar et al., 2016). Therefore, in view of the technological scenario that we are experiencing, mobile devices are seen as a great strategy to contribute to health education (Farias et al., 2015; Khatoon, Hill, & Walmsley, 2015). Moreover, the articles that discussed the use of applications in relation to Patient Orientation concluded that the applications represent an important vehicle for information access (Pulijala et al., 2016) for selfcare in oral health (Petruzzi & Benedittis, 2016; Li et al., 2016, Zotti et al., 2016). Thus, the use of applications can contribute to an upstream approach to oral health promotion, that is, it could minimize inequalities, facilitate access to information relevant to health and the creation of favorable environments for it. In Brazil, applications were developed to support the dental professionals who work in the Family Health Strategy Program. Through this system, it is possible to archive information regarding the oral health of patients who received home visits. These systems were recommended for the purpose of ensuring efficiency in home care, organization of data collected and patient orientation (Tibes, Dias, & Zem Mascarenhas, 2014).

Applications for patient education have been developed to explain dental treatment. In this sense they can be an interesting method to reduce patient's anxiety, helping them to cope with the dental treatment. The effectiveness of an application in educating mothers about the importance of preventive dental care was also reported. The Internet and the use of smartphones have changed the way we live in the 21st century. The use of the Internet in the incorporation of new ideals is well known, however it must be remembered that it could also serve as a channel to improve the life of individuals and the society (Alklayb et al., 2017).

The present study presented relevant information about the applications available in Portuguese for Dentistry by the main operating systems used in smartphones in Brazil. It was observed that Clinical practice represented the

main thematic focus and represented the largest number of applications identified. This observation brings light to a wide range of possibilities for the development of applications for oral health professionals and the support and guidance of patients. In addition, it was noted that most applications do not have validation by scientific institutions or commissions. Since applications are currently an important source of information, it becomes evident that application's developers should seek endorsement from recognized Dentistry references.

Regarding the applications available for Clinical practice and Patient orientation, it was observed that the main objective was to assist the professional and inform the patient. Within this group, many applications were related to dental health plans, which at the same time helped the patient to find a nearby clinic, to consult the accredited network, access to the virtual identification card to use in emergencies and assist the dentist in their clinical practice by facilitating patient access to the dental office.

The applications focused on the theme of Teaching and learning had as main purpose the communication between institutions/teachers and students. Such applications represent an important point in the advancement of information exchange in real time, but are still poor in the process of teaching and learning itself. From the pedagogical point of view, expanding access to content inside and outside the classroom and searching for information “in the palm of the hand” via applications could both enrich the discussion and stimulate students in the search for knowledge (Rung et al., 2014). We understand that the use of these new tools could immediately become a challenge for students and teachers, especially regarding the compatibility of contents. However, the role of teachers, as tutors, through the direction of critical thinking, dealing with real time information, could benefit students in the construction and retention of knowledge.

5. Conclusion

Dental applications research presented as main focus clinical practice, teaching and learning and patient orientation. The overview of the dental applications available in Portuguese for smartphones showed that the great majority was developed for clinical practice, with a lack of applications aimed at patient orientation and teaching and learning. Future Dental APP should provide evidence-based, validated, updated data.

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