Systematic Review and Evaluation of Pain-Related Mobile Applications

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INTRODUCTION

Pain and in particular chronic pain is highly prevalent in the general population across all age groups. A survey including 15 European countries and Israel and 46,394 adults (>18 years), found that chronic pain prevalence varies between 12% in Spain to 30% in Norway (Breivik, Collett, Ventafridda, Cohen, & Gallacher, 2006). Of these, 46% reported pain for 10 years or longer that interfered with daily activities such as maintaining relationships with family and friends, performing household activities, walking or exercising. When asked how many times they had seen their doctor because of the condition that causes their pain, 60% of respondents reported to have seen their doctor two to nine times and 11% had seen their doctor at least 10 times. The high prevalence, high disability and high costs associated with pain that were reported in this study are supported by findings of other authors in other countries and for specific pain conditions (Jakobsson, 2010; Leadley, Armstrong, Lee, Allen, & Kleijnen, 2012; Manchikanti, Singh, Datta, Cohen, & Hirsch, 2009; Parsons et al., 2007).

The World Health Organization (WHO) defines mobile health (mHealth) technologies as a component of eHealth. mHealth covers medical and public health practice supported by mobile devices, such as mobile phones, patient monitoring devices, personal digital assistants, and other wireless devices (WHO, 2011). It is an emerging and rapidly developing field that can contribute to the transformation of healthcare and increase its quality and efficiency while simultaneously containing costs (de la Vega & Miro, 2014). The International association for the Study of Pain has published in December 2013 a clinical update recognizing the importance of mobile technology in managing chronic pain as a means to improve access to healthcare, contain costs and improve clinical outcomes (Vardeh, Edwards, & Jamison, 2013). However, this publication also highlights the need to evaluate existing solutions.

Electronic applications can cover a wide range of purposes including easy access to information related to patient's health conditions or treatments, provide patients with simple applications to organize and track their health information, help patients self-manage their disease or conditions, help patients to document, show or communicate potential conditions to health care providers and enable patients or

health care providers to interact with health care record systems (US Food and Drug Administration, 2013). In terms of pain related applications, the most common include:

1. Electronic diaries which are used to monitor aspects of pain such as pain intensity, location, aggravating factors and/or intake of medication,
2. Internet-based interventions which usually consist of structured self-administered therapy programs and
3. Text messaging, for communication between patients and healthcare professionals (Vardeh et al., 2013).

Electronic applications are virtually available to everyone in the general population independently of their ability to critically assess its content and without being necessarily indicated by a health professional. In addition, there is no one to recur to if anything unexpected occurs (Rocio de la Vega & Miro, 2014) and the available guidance for health care applications developers is still in its early steps (US Food and Drug Administration, 2013). Taken together these aspects suggest that it is particularly important that electronic applications in general and, pain-related applications in particular, are carefully designed and evaluated before being made available to the general public. There is a need to guarantee that applications are both suitable for users and based on the best available evidence in order to promote its potential (Moore, 2012). The aim of this systematic review is to review and evaluate mobile applications in terms of user involvement, healthcare professionals' involvement, usability, reliability, validity and clinical usefulness for pain-related mobile applications available both at a commercial store and in scientific databases. It is considered that if applications involve users and healthcare professionals during their development and/or testing they are more likely to meet the users' needs both in terms of content and usability and be based on up to date scientific evidence. If the application is used to measure any pain characteristic such as pain intensity, pain duration, location or pain associated disability it has to fulfil the requirements of any measurement device: measure what it is intended to measure (validity) in a consistent manner (reliability). Furthermore, to be of clinical value, the use of the application has to result in any health benefit for its users (clinical usefulness), for example improved adherence to pain medication.

METHODS

This section describes the methods of this systematic review.

Data Sources and Searches

This systematic review employed a two-phase search.

In the first phase, a search for pain applications in the Android platform was performed using the terms pain and ache. This platform was used because it is the number one in the ranking of Smartphone operating systems worldwide (Singla & Mendiratta, 2014). The search was conducted on the 7th of October 2014. This search aimed to identify applications related to pain.

In the second phase, we performed a search on pain-related applications in five databases (Pubmed, Web of Science, Science Direct, Academic Search Complete and IEEE). Databases were searched since 1st January 2000. The following search terms were used: (pain OR *ache) AND i) (smartphone OR

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