Artículo Especial

mHealth in Costa Rica: Prescribing Mobile Applications for Health

mSalud en Costa Rica: prescribiendo aplicaciones móviles para la salud

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Abstract	Resumen
Globally, mobile phones have expanded at an unprecedented rate, and mobile phone applications have become increasingly frequent among users, offering portability to access at any time and from anywhere. The objective of this review is to describe the process of adoption and implementation of strategies that promote the use of mobile technologies in public health in Costa Rica. **KEY WORDS:** mHealth, Mobile Applications (Source: MeSH NLM)	A nivel global, los teléfonos móviles se han expandido a un ritmo sin precedentes, y las aplicaciones de teléfonos móviles se han vuelto cada vez más frecuentes entre los usuarios, ofreciendo portabilidad para acceder en cualquier momento y desde cualquier lugar. La presente revisión tiene como objetivo describir el proceso de adopción e implementación de estrategias que promuevan el uso de las tecnologías móviles en la salud pública de Costa Rica. **PALABRAS CLAVE:** salud móvil, aplicaciones móviles en salud (Fuente: DeCS-BI-REME)

INTRODUCTION

In recent decades there have been changes and advances in medical and consumer technologies that have paved the way for novel and high impact healthcare solutions to improve population health. Since the advent of Computerized Axial Tomography (CAT), Magnetic Resonance (MRI), the Internet, and the human genome, we have seen the emergence of technologies that have transformed our understanding of health and the rate at which we can access and process information. Recently, mobile technology has been added to this list of revolutionary tools, due to its ability to transfer the power of communication and engagement to the medical field. With the emergence of mobile telephony and its seemingly limitless applications, access to healthcare has improved, we have citizens and patients increasingly

more and better informed, with high potential to know in detail their health-disease process that they were previously unaware of, and of which they are now an active and protagonist component. Cell phones now represent healthcare delivery devices within an arm's reach. Given the widespread penetration of this market, they offer high impact solutions to improve health.

Mobile Health (mHealth) is defined by the World Health Organization (WHO), as "the area of electronic health (eHealth or eHealth) that offers health and information services through mobile technologies"[1]. Likewise, the Global Electronic Health Observatory (GOe for its acronym in English: Global Observatory for eHealth) defines mHealth as "the medical and public health practice carried out with the support

of mobile devices, such as mobile phones, monitoring of patients, personal digital assistants (PDA), and other wireless devices "[2]. As such, mHealth involves the use of a mobile voice telephone and text message service (SMS), as well as the more complex functions and applications that comprise the general radio packet service (GPRS), mobile telecommunications systems of third and fourth generation (3G and 4G systems), global positioning systems (GPS, Global Positioning System) and Bluetooth technologies [2]. With advances in embedded sensor technologies (e.g., accelerometer, light detection, temperature, etc.), context sensing and its use to inform intervention delivery has been actualized.

Worldwide there are more than 7 billion subscriptions of mobile phones in use, a figure that means there are almost as many mobile phones as there are people in the world. In the field of medicine, mobile has a wide range of potential applications. Health professionals, such as doctors and nurses can send text messages (SMS), or create automated messages to remind patients to take their medicine, improving compliance with treatment for many diseases [3-7]. So we have, that SMS have been used to promote adherence to antiretroviral treatment (ART) in patients infected with the human immunodeficiency virus (HIV) by increasing adherence in 12-13%, with good opinions and acceptance of patients [8-11], as well as tuberculosis [12,13], or to help quit smoking [14].

Mobile phones also help patients self-manage their health conditions, such as monitoring their vital signs, accessing recommendations to improve diet and physical activity, or teleconsulting by video call in search of a second opinion. A modern presentation of mobile telephony is represented by smartphones or smartphones such as Apple's iPhone, BlackBerry and Google's Android, Windows Windows Phone, which fulfill functions of pocket computers, providing mobile access to many computer functions, such as Email, Internet browsing, mobile banking, instant messaging and social networks. The first smartphone called "Simon" was designed by International Business Machines (IBM) in 1992 and released to the public in 1993. In addition to be a mobile phone, it also contained a calendar, address book, world clock, calculator, notebook, notes, email, fax, and games: basic things to facilitate the management of daily life [15]. There is every reason to further include a medical element in this list of resources.

In the last decade, more sophisticated applications have been developed and designed for smartphones called mobile applications in health or apps, which are emerging rapidly and are defined as any electronic, technological or application tool designed to interact directly with consumers, with or without the presence of a health professional, and that provides or uses individualized information to help a patient manage or better manage their health (16), as indicated by the National Institutes of Health of the United States (NIH) that "mobile technologies allow providers to help patients improve their health in real time, allowing them to personalize health care options and monitor progress" [17].

According to estimates from the mobile health technology industry, 325,000 health apps (health & fitness and medical apps) was available in 2017 and 3.7 billion apps was downloaded, this represent an increase of 16% compared to 2016. "This 3.7 billion mHealth apps represent the supply side of the mobile health app market. The demand for mobile health apps is fueling the supply. The health industry is experiencing the same phenomenon as other industries before: The demand for apps fuels supply growth." [18]. Also, a survey by the Economist Intelligence Unit conducted in 23 countries on the impact of mobile health that included 144 CEOs, managers, managers and business development strategists in public and private healthcare, reported that 63% believe that " the greater access of patients to their personal data will allow people to make better decisions about their health." mHealth could reduce medical costs to individuals, offer more effective approaches for the prevention of epidemics and pandemics, and reduce costs for institutions [19].

POLICIES AND REGULATION OF MHEALTH STRATEGIES IN THE WORLD

Regulation for the large number of mobile applications available in health issues is complicated, since they are developed globally, and in different languages, which makes it difficult to normalize their validity depending on the health of people.

However, theoretically it is possible to evaluate and recommend to the population about the most functional apps and those that do not represent risks for the patient. To establish an effective system, it is necessary to create or send a regulatory organization to implement a universal strategy to qualify and evaluate mobile applications.

The United States Food and Drug Administration (FDA) has the responsibility to protect public health by regulating medications and medical devices, which include mobile applications in medicine. In September 2013, it issued a guide which guidesits use with emphasis on the applications that present a greater risk for patients if they do not work as expected (table I) [20].

Table I. Criteria for exclusion of medical apps according to the FDA

1. Electronic copies of medical textbooks, training materials or reference material for training or continuing education.
2. Apps to record, monitor, evaluate or make decisions about the state of health (health and welfare) with no intention of treating or curing any disease
3. Apps for management and administration of services.
4. Apps that help users but without specific medical indication (audio recording, dictation).
5. Electronic medical history apps or personal medical information system.

Likewise, in the United Kingdom, the Regulatory Agency for Medicines and Health Care (MHRA) issued a guide for the use of health apps [21]; In the same way, the European Commission of Communication, Content and Technology Networks published the European Directory of Health Applications, which contains 200 health applications recommended by patients and users empowered by their use [22]. Among the challenges faced by all these guides are: 1) coordinate the content, 2) implement them in a systematic and controlled way, and 3) keeping up to date with the rapidly evolving marketplace. Another obstacle faced in the broader adoption of mHealth services is the lack of large-scale projects [23].

WHO is promoting a mhealth strategy aimed at noncommunicable diseases. To address this problem, it has joined forces with the International Telecommunications Union (ITU), the United Nations agency for communication technologies, to establish the "Be Healthy Be Mobile" initiative: a healthy life is a mobile life. The objective is to provide governments with the knowledge resources necessary to create and implement national mHealth programs for noncommunicable disea-

ses. The evidence for the interventions themselves comes from the most successful mHealth tests worldwide, from which the initiative identifies the essential features and ways to implement them at the national level. These strategies are aimed at the prevention, diagnosis or treatment of a disease, so that the user can be either a sick or at elevated risk [24]. Similarly, the benefit of mHealth displayed results in behavior changes strategies, knowledge, and attitudes at the population level [25] and how to improve the adherence to treatment of patients with chronic diseases, even in older adults [26]. The goal of the initiative is to enable Member States of the United Nations to offer mHealth components within national health systems in a safe, sustainable, and evidence-based manner It is an example of an attempt by the international community to standardize the provision of evidence-based mHealth to improve public health.

Globally, we can classify mHealth applications into 2 large areas based on the function they fulfill: a) support of the health system (information and knowledge management for professionals and patients) and ubiquitous health services (Table II).

Tabla II. Classification of mobile applications in health

Support of the health system	Ubiquitous provision of health services
Information and knowledge management among professionals	Telemedicine provided by professionals
Information and knowledge management for patients	Self-care
Social strategies a. Influence between pairs b. Social support from family and friends	Telemonitoring by professionals
Access to health information a. Access to documentation and self-management of health history b. Informative messages c. Alerts and reminders	Self-care and self-monitoring
Entertainment and education for patients (Gamification)	Support for diagnosis by professionals
	Auto diagnosis

CHALLENGES FOR THE IMPLEMENTATION OF MHEALTH STRATEGIES IN COSTA RICA AND WORLDWIDE PERSPECTIVES

Since 2013, Costa Rica is one of the 8 countries that took on the challenge of promoting the use of mobile health strategies as a health policy, initially seeking interinstitutional consensus with the organizations and institutions involved in the issue as established by the World Organization of Health in its electronic health strategy [27]. This is how it has been promoting the cessation of smoking as a strategy to deal with noncommunicable diseases and initiating a process of creating a health policy, associated with the Anti-tobacco Law No. 9028 called the "Law of Life", articulating initially to 3 institutions such as the Institute on Alcoholism and Drug Dependence (IAFA), the Costa Rican Social Security Fund (CCSS) and the Ministry of Health, these organizations have joined efforts to review procedures, validate methodologies and use a common platform for cessation of smoked with the use of text messages through mobile telephony, with increasingly promising results [8,29].

From this initiative, the need to create discussion spaces on how these health strategies was raised, which were addressed in the first congress of mobile technologies in Health held in March 2015. Topics such as diabetes were analyzed with specialists from different levels of care, such as hypertension and mental health, all with the aim of carrying out a review of the needs of patients, existing mobile solutions and defining a list of applications validated by experts and national health authorities in order that doctors at different levels of care can in the future not only prescribe medications, but also applications for mobile phones that support the patient and the doctor in the treatment of the disease.

A component of this initiative is the realization of Hackathon contests for the development of mobile applications in health, events coordinated by the Ministry of Health of Costa Rica and the World Health Organization, which in the years 2013 and 2015 have carried out this activity, rewarding the three best proposals of Apps in Health, highlighting among them those related to strategies for the cessation of tobacco through reminder messages, wearables and devices attached to the mobile phone, as well as the early diagnosis of depression in patients with chronic diseases with gamified component for more interaction and devices.

Beyond the famous wearables (e.g., fitbit) and apps of physical activity, for example from those in which health facilities make available to the citizen to have all their personal data, or as the project eZaintza [30], aimed at people with space disorientation and temporary and cognitive impairment (such as people with Alzheimer's), to improve their autonomy. Teleconsultations, on the other hand, allow the specialist or the face-to-face consultation to be referred only to those who need it, thus reducing the waiting lists and enhancing immediate access to health services. Thus, we have initiatives such as Appdemecum, a platform aimed at providing guidelines for prescribing applications aimed at professionals and health organizations in three specific areas: Medicine, Pharmacy and Nursing, based on the concept of 'curated mHealth', which consists of selecting, evaluating and categorizing applications with the aim of preparing them for reliable and effective use (31). Another area of the use of mobile applications is aimed at citizen empowerment to make reports or reports on public health, such as those aimed at alerting about possible sources of infection of diseases transmitted by vectors, such as the case of Zika [32].

We are living in a moment of change of mHealth. The scientific interest in the services that technology can contribute to public health is growing more and more. However, to continue on this path, it is necessary to establish standards for its design and use, to avoid a loss of confidence or quality in the contributions of mobile phones to national health systems. The apps are one of the areas that requires the development of a prequalification system to support their contribution to the health of users. It is necessary to identify an authority that has the knowledge and scope to create, introduce and execute the global standards of apps for mHealth.

CONFLICTS OF INTEREST
The authors declare no conflicts of interest

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