

# How Informatics Can Improve Health and Healthcare in Portugal in the XXI century?

- Mobile medical *apps* for Patients linking to the National Health System -

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## ABSTRACT

Mobility is a central feature of healthcare delivery. In parallel to the exponential growing in mobile information and communication technologies (MICTs) to be used by physicians, patients want to be more engaged in their own healthcare. This article will discuss the advantages of empowering the patients in their own health, enabling them to contribute with their own personal health record (PHR). The idea is to implement the concept of an official mobile medical application for patients linked to the national health system database. By interconnecting the patient and provider information it will be possible to reach a summit in the healthcare system - a complete Electronic Health Record (EHR). This *resourceful* EHR will transform the healthcare provider/patient relationship and the system by empowering the patient to play a central role, including him in self-care, self-monitoring and self-management co-responsibilities. It will also stress the need and challenge of implementation and sustainability of new technologies in health systems.

**Keywords:** Electronic health record; Patient empowerment; Mobile medical application for patients; Healthcare improvement; Patient-Physician relationship.

## INTRODUCTION

### General View

Traditionally, clinical records have been sequestered in hospitals and provider's offices. Although assumed that patients can access their medical records, it is not specified the manner in which this access

is given, so most patients must visit the medical records departments of caregivers to obtain paper copies.<sup>1</sup> In the last decade, health information websites became very popular and attracted significant venture-capital funding. Although the number of visits to healthcare information websites grew substantially in the early 2000s,

public opinion surveys demonstrated that consumers were interested in receiving more than just health information from unknown sites; they were interested in receiving information that was endorsed by their own physicians and getting in touch with their own physician offices. Nowadays, more and more clinicians use electronic medical records (EMRs) and EMR developers - both commercial and institutional - were stimulated to develop products linking clinician and patient, such as web-based patient interfaces to their information residing in the EMR.<sup>2-3</sup>

In this line, a raising number of patients will demand access to records online and it assumes a major importance to provide the patient the possibility of having an active role in his healthcare management.

In Portugal, a nationwide health information network, the Health Data Platform (PDS), is a pure example of that.

In this article it will be discussed the advantages of empowering the patients in their own health, enabling them to contribute with their own personal health record (PHR). By interconnecting the patient and provider information it will be possible to reach a summit in the healthcare system - a complete Electronic Health Record (EHR).

### **Background**

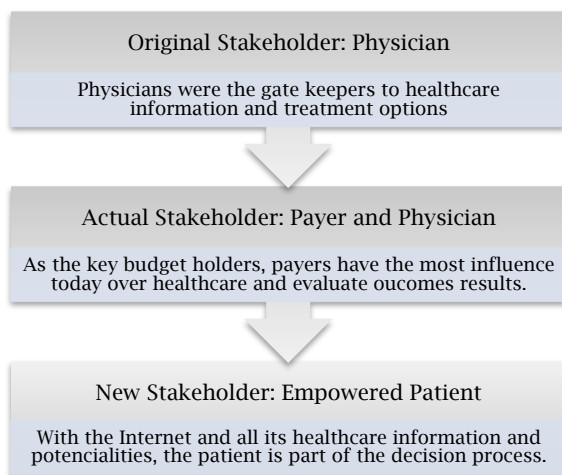
Mobile information and communication technologies (MICTs) are widely promoted as increasing the efficiency of work practices in healthcare. MICTs are said to constitute an unprecedented revolution in healthcare, with some authors suggesting that the adoption of MICT is inevitable.<sup>4-6</sup>

Mobility is a central feature of healthcare delivery.<sup>7</sup> Clinical work, conducted in multiple locations, requires physicians to communicate and collaborate with different individuals and to move between patients, wards, clinics, laboratories, operating theaters, and offices. Physicians require information systems, which provide access to data, resources, and people where and when they undertake work.<sup>8-10</sup> Technology can potentially improve information accessibility. Nevertheless, clinical systems have only partly delivered upon the promise of providing the right information, about the right patient, at the right time, in the right place.<sup>7, 11, 12</sup>

A review identified evidence about the ability of mobile handheld technology to positively impact rapid response, error prevention, information accessibility, and data management in healthcare settings. The study findings support claims of the potential beneficial impact of this

technology on aspects of healthcare delivery.<sup>7</sup>

In parallel to the exponential growing in MICTs to be used by physicians, patients want to be more engaged in their own healthcare.<sup>13</sup> Despite intense concerns about confidentiality and security, the widespread use of EHR will assume a very important part of that, since patients have high expectations for electronic information. Government, health systems and information technology companies have to be aware of this paradigm change: the patient is an indispensable and active stakeholder in the present and future of healthcare, besides the physician and the payer (figure 1).<sup>14</sup>



**Figure 1 - Evolution of Health Stakeholders**

Although being not supposed for the patient to have tools to replace the specific roles of the physician and the payer, patients are encouraged to take a more active interest in their health and in the

understanding on their overall wellbeing future consequences on their later life and for the National Health System.

By having the patient aligned with the importance of wellness programs and sickness prevention, health systems can hope to realize savings – especially from a lower burden of multiple chronic conditions. As such, there are more frequent examples of healthcare payers and/or governments pushing increasing responsibility for healthcare onto the patient. As an example, bonuses for health-related behavior in Europe are a key feature of private health insurance systems such as in the United Kingdom. Also, in Dubai, local government officials announced a 30-day challenge (to coincide with Ramadan) in which it promised to pay participants a gram of gold for every kilogram of weight lost.<sup>14</sup>

**Mobile medical applications for patients**

This push for the general population to have a higher awareness - and to be more involved - on managing their health is occurring at the same time that technology is enabling the quick and easy access of information. More than half of all Americans have looked online for health information in the last year, and more than one-third have used the Internet to self-diagnose a condition.<sup>15</sup>

The Global Observatory for eHealth (GOe) within the World Health Organization (WHO) defines mobile health or mHealth as “medical and public health practice supported by mobile devices, such as mobile phones, patient monitoring devices, personal digital assistants (PDAs), and other wireless devices”.<sup>16</sup>

A mobile application (or mobile app) is a software application designed to run on smartphones, tablet computers and other mobile devices. They are usually available through application distribution platforms, which are typically operated by the owner of the mobile operating system, such as the Apple App Store, Google Play (Android), Windows Phone Store, and BlackBerry App World.<sup>17</sup> Across geographies the majority of smartphone users have more than 20 apps on their device at present; in many cases this is closer to 30 apps. Gaming apps and social media apps such as Facebook remain the categories commanding most of users’ time.<sup>14</sup>

Although the number of healthcare apps is large and growing, there is significant variation in the capabilities of the current apps. Most medical apps nowadays are simple in design and do little more than provide information.<sup>14</sup>

Briefly, medical apps can be used to:

-Inform: in a variety of forms (text,

photos,...);

-Instruct: provide instructions to the user;

-Record: capture user-entered data;

-Display: graphically displaying user entered data;

-Guide: guidance based on user-entered information, offer a diagnosis, and recommend a consultation or a course of treatment;

-Alert: providing reminders to the user;

-Communicate: with the patient / healthcare practitioner or providing links to social networks.

Jim Cunnar, director of DuPage Family Medicine, said regarding mobile medical apps "I think apps give an opportunity for patients to have instant access to themselves".

## THE IDEA

To make it possible and easy for patients to actively contribute to their EHR using a mobile medical application.

This mobile medical app would be official as part of the National Health System, created/sponsored by the Government and linked to the PDS.

It is possible to divide the role of this mobile medical app in four basic steps, succinctly explained below.

Firstly, the patient may use the app to *Collect Data*, either by choice or on physician recommendation. Then, it would be possible to *Share Data*, transmitting it to the PDS, being accessible everywhere at any time and making it possible for the patient and the physician to *Evaluate Data* entered. Finally, the *Intervention* will be decided: a behavioral change, a therapy recommendation or an appointment rescheduling can be made timely.

As an example: a patient with asthma and diabetes *mellitus*. This official application should give the patient access to the diagnosis already added to the EHR by their healthcare practitioners. Expanding each disease, the corresponding fields would open and it will be possible for the patient to fill them up (e.g. number of asthma crisis per week, number of misses to school/work, physical activity limitations, adherence to the prescribed treatment, glucose level, daily activity tracking, carbs ingestion and many other parameters). The data collected would be instantaneously shared to PDS and *abnormal values* would create an alert that should be reviewed by an adequate healthcare provider, physician or nurse. After data evaluation, an intervention would be proposed: adjusting the prescription or rescheduling the next appointment, for example.

## DISCUSSION

### The Potentialities

Different and interdependent health stakeholders would be positively affected by this idea: the patient, the healthcare provider and the health system/payers.

Empowering the patient, improving the way the system interacts with him and the way care is delivered all have the potential for improved outcomes in healthcare. As stated elsewhere<sup>13, 18</sup>, in the past Medicine was about disease, not the patient. The physician in the last two centuries has gradually relinquished his unsatisfactory attachment to subjective evidence - what the patient says - only to substitute a devotion to technology evidence - what the machine says.

Gathering patient and physician data, an optimized EHR has the potential to create a more complete and balanced view of the patient. Because the PHR is owned and managed by the patient, it puts the patient back in the center of healthcare process. In this line, this *resourceful* EHR will transform the healthcare provider/patient relationship and the system by empowering the patient to play a central role. This optimization of information access means that individuals can access, manage information and get advice from

anywhere at any time.

The patient would be able to complete a clinical summary of all episodes of health services, centering it in the EHR, which would be fully accessible. Health status parameters may also be registered and shared, such like habits, nutrition, exercise and biometric data. The follow-up of chronic conditions, like essential arterial hypertension and diabetes mellitus will also be possible and better managed by the patient, empowering him with self-care, self-monitoring and self-management co-responsibilities. Thereby, with the analysis of the user-entered data, it would be possible to periodically assess the risk for certain disease or complication and to recommend a behavioral or therapeutic change to better manage a condition.

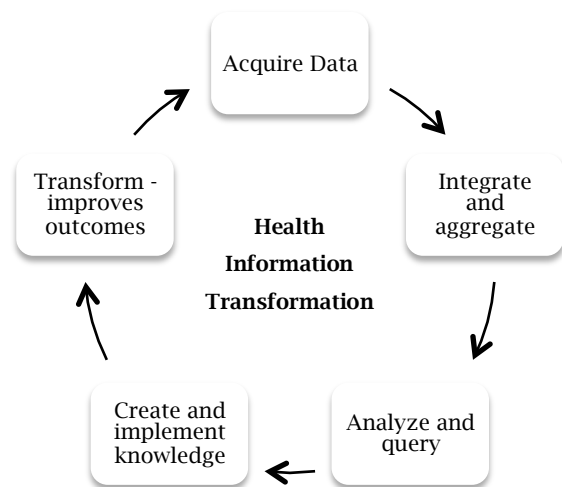
The patient would also be capable of timely stating optional living will and organ donation preferences, making them accessible and reliable everywhere for any healthcare provider.

For the healthcare practitioner, this is a win-win revolution. Patient empowerment itself is useful for the provider, since its values lies in shared information and shared decision-making.<sup>13</sup> To share the decision process with the patient and continuously informing and helping the patient will transform the healthcare delivery to a more efficient and

coordinated healthcare: e-visits, remote monitoring and other possibilities will be opened and potentially applied, bit by bit.

Making it easier for the physician to access patients' records, to seamlessly integrate all the health services provided to his patient and to contact the patient promptly would certainly benefit healthcare delivery.

Improved information management will help care providers creating positive, self-fed, cycles of transformation as the insight gleaned from data collection and analysis creates change, and the outcomes of change create new data (figure 2).<sup>19</sup>



**Figure 2 - Health Information Transformation**

The United States National Committee for Vital and Health Statistics states that a first-class healthcare includes three interlocked computer-based e-health records: a medical record, a personal record and a community/population

record.

With the optimization of this *complete and easily accessible EHR*, it would be possible to eliminate duplicative services while improving the quality and lowering the cost of healthcare. There is also the opportunity for other consumers of healthcare, including government itself, pharmaceutical companies, universities and payers, to access new and larger data banks faster and for a lower cost, making it easier to run clinical trials and supporting drug discovery.

The universal spreading - through an official medical app - of decision support tools, risk management platforms and professional advice have the potential of avoiding unnecessary and unproductive visits. Our actual overbooked health system will benefit a lot of a better population health culture and from a wiser specialist referral.

Increasing the quality and satisfaction of the health service provided will reduce costs and benefit all the stakeholders in healthcare and, ultimately, all country and its people.

### **Problems to overcome and Future Challenges**

As all new projects and ideas, there are problems to discuss and overcome during

its implementation trial.

Nowadays patients and physicians have to navigate a maze of healthcare apps with little guidance, proof of reliability and potential benefits.

The importance of a governmental source and management is crucial for the app to be fully reliable and to serve the best interests of the patients, physicians and the national health system. Doctors and patients have to trust the app and the data that it is collecting and distributing. The *institutional stamp* support evidence for use, and will help solving liability and technical issues, among many aspects. Also, the burden on the patient if every specialist seen decided to recommend or prescribe their own preferred app for adherence would quickly lead to app overload, similar to that experienced by patients receiving uncoordinated guideline-recommended care for multiple co-existing chronic conditions.<sup>21</sup> There would be other problems if many less regulated applications were allowed this function - e.g. regarding data privacy/security, legalities, choice/ratings, reimbursement and regulations.

The demographic skew of smartphones users make it harder for the most expensive healthcare system users to be targeted - the elderly suffering multiple chronic conditions.

The smartphone penetration by age group range from nearly 80% for people aged 18-24 to less than 20% for people aged >65.<sup>20</sup>

Methods for increasing smartphone penetration and app downloads amongst the elderly are essential to unlock the full potential of mobile apps in healthcare efficiency improvements. An alternative is to consider family and caregivers.

Besides all the accessibility and reliability problems, we still have to keep in mind that technology is a tool, but challenge remains in changing patients' behavior. We should take note that many families have only limited time for daily healthcare management tasks and not all patients will be available or willing to try this new concept. Over time, the positive influence these apps have in changing behavior and attitudes towards wellness, exercise, diet and health could potentially have a very significant impact on future levels of chronic disease and the associated healthcare burden.

Liability is also an important issue. Any medical repercussion as a result of app using would be a concern for everyone. The official nature of the app and clearly stated regulations and policies are essential in this point.

Data privacy and security have also to be guaranteed. Data protection commission has to be involved in regulation and

authorization of app functionalities of data collecting, transmitting and storing. The connection to the PDS and EHR must be made in a secure manner and all the stakeholders involved must accept their commitment for protecting the data contained in it.

Self-diagnosis apps are likely to require the highest level of evidence and the results from evaluating several apps suggest this is an urgent and critical need.<sup>22</sup> Diagnosis apps may be less likely to be reimbursed by payers in mature markets where there is an expectation that a physician will be undertaking the diagnosis. There is a strong likelihood of self-diagnosis apps becoming widely used in emerging markets where access to physicians can be severely limited in remote locations, and yet where smartphone penetration is continually increasing.<sup>14</sup>

Since patients will want a single EHR, the seamless integration with all their sites of care will require the country to implement national standards clinical data content, transmission and terminology, in both public and private health providers, promoting the widespread use of a consolidated EHR.

Making possible to gather a community diagnosis characterization, it would be a next step to provide the patients the



possibility to connect with others with the same disease he has. This could be done using a chat room, email list, etc. Of course, privacy guarantee is a limiting factor that should be reassured before implementation.

Patient/Clinician messaging is another hot issue. The challenge of secure messaging regards legal liability and reimbursement for medical advice online.

As a last but not least future challenge, European Union may discuss the adoption of a European Health Data Platform (EU-PDS) and EHR. The free and exponential growing movement of people and goods through the European borders makes this point one of major importance for a better quality of the healthcare provided abroad.

## CONCLUSIONS

Status quo is not an option for healthcare. Increasingly, value-focused healthcare systems will emphasize new value dimensions – for example, the ability to activate citizens in self-care and self-management and the ability to continuously improve and innovate.<sup>19</sup>

Being not an exception, for the successful implementation and sustainability of mobile medical apps in healthcare, many challenges will be faced and all

stakeholders must be engaged and evidence developed (figure 3).<sup>19</sup>

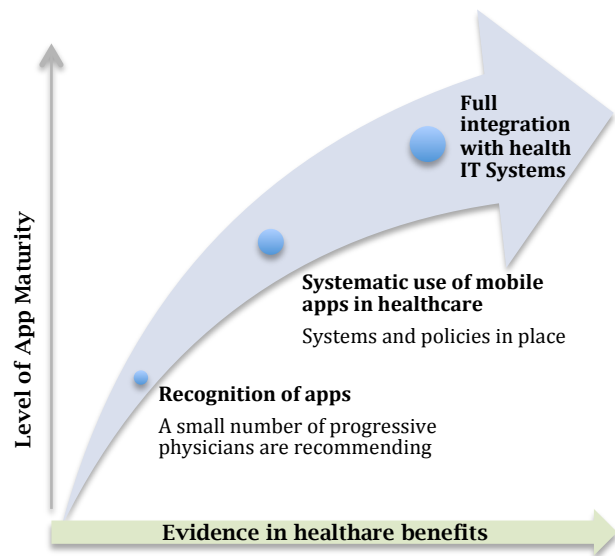


Figure 3 - The app maturity model.

We are all co-responsible for a more value-focused healthcare, in which health promotion and care delivery decisions provide evidence-based and increasingly personalized healthcare, appropriately based on patient preferences across preventive, diagnostic, therapeutic, and rehabilitative, end-of-life and palliative services. However, no single stakeholder created the current challenges and no single stakeholder can solve the problems. Active participation, collaboration and change will be required on the part of all stakeholders.

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