Mobile Medicine Development Strategy

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Abstract. The paper considers the issue of applying the technologies of mobile medicine in practical healthcare. The aim of the study is to analyze real prospects for mobile medicine and its development. We have suggested the classification of mobile devices. Today the classification of mobile devices is already extremely wide. It includes at least 15 groups. We have divided them into four subgroups. The fields of application of mobile medicine have been summarized nowadays. We have come to the following conclusions. 1. Mobile devices are worthy of special attention first of all due to their high efficiency in terms of limited resources. 2. In order to ensure the effective implementation of mHealth technology, it is necessary to develop legal support of the use of medical mobile devices.

Keywords: mobile medicine, e-medicine, smartphones, tablets, classification, legal support.

1 INTRODUCTION

In the world literature the mobile medicine is also known as mHealth. It includes the use of mobile devices in order to provide the services to both patients and doctors.

The mobile medicine is a part of e-medicine that unites this area with the use of medical electronic information resources and ensures prompt access of medical staff and patients to them [1]. E-Medicine started gaining ground in the world in 1999 [2]. Since then it has been constantly changing and expanding from healthcare practices using the Internet to the use of computers in medicine [3-5].

Mobile devices can help people manage their own health, promote healthy lifestyles, and gain access to useful information whenever and wherever they need it. Smartphones and tablets are considered to be the two most common mobile devices [6]. The fact that they can be applied in healthcare turned out to be unexpected. The statistics show that in the United States only one in four MDs used a smartphone for professional purposes in 2004 and after 6 years it became more than 50%. According to industry estimates more than 500 million users of smartphones and tablets used the healthcare software worldwide in 2015. It is expected that by 2018 mobile healthcare applications will have been downloaded to 50% of smartphones and tablet PCs used by 3.4 billion users [7]. We would like to emphasize that the cohort of users includes both healthcare experts and doctors, pharmacists, as well as, of course, patients [8].

The aim of the study is to analyze real prospects of mobile medicine, its development and justification for groups of patients for whom mobile medicine is the most effective.

2 CLASSIFICATION

Today the classification of mobile devices is extremely wide. It includes at least 15 groups which we divided into four subgroups:

1. The devices that are classified as medical devices and require special registration and certification.
2. The devices that are not classified as medical devices and do not require special registration and certification.
3. The devices that are subject to control over usage.

4. The devices that are used as accessories to an adjustable medical device or transform mobile platforms into an adjustable medical device.

The gadgets from 4th subgroup and the ones that transform mobile platforms into an adjustable medical device [21] are perhaps the most numerous ones today. They are divided into several groups. These are the devices that:

- provide a permanent access to reference materials (e.g., medical dictionaries);
- are designed to train practicing physicians (e.g., medical flash cards);
- are designed to help a patient (such as the ones containing certain recommendations);
- are intended for automation of general operations at hospitals;
- non-medical universal tools (e.g., magnifying applications);
- mobile medical programs.

3 GLOBAL CHALLENGE

A global challenge is connected with four contingents of patients: a) healthy or employable young patients, but with risk factors; b) people that are in sustained remission of the main process; c) patients in rehabilitation period; g) elderly people who require monitoring of basic physiological parameters.

In the first case the main task is only to monitor the known risk factors; in the second case the key factors and associated processes are monitored in addition; in the third case a set of monitoring parameters is determined by the etiology of a pathological process; and finally, in the fourth case it is defined by the essence of pathological process (class of diseases). Consequently, the medical protocols (standards) have to be developed. Then, a certain sensor set will be recommended for the state of each subgroup.

In addition, the three main processes characterize the state of modern medicine such as: patients' verification; identification of current state of a certain subgroup. Depending on the conformity of the data to the picture of the state provided (a pattern recognition issue) the third basic process is the individualization of approach for patients' correction.

In fact, the major medical objective of the project is to investigate the subgroups of states and the corresponding sets of mobile devices.

During the monitoring of the selected indicators it will be possible to identify the various deviations from the steady and planned behavior of indicators (the risk factors). In the simplest case there will be an excess of the specified thresholds. In a more complex and undoubtedly more important event an assessment of the dynamics of indicators and prediction of the patients' status will take place. Accordingly, it is necessary to develop a classification of indicator curves to demonstrate typical variants of the disease process. However, the question of a "typical" or "atypical" dynamics remains to be seen, and that could become the second objective of the project.

The third main objective is decision making logic (medical, nursing) after obtaining the data from mobile devices.

We would like to emphasize that there are only a few countries where the laws regulating mobile medicine have been adopted. This regulatory uncertainty hinders the development of innovative medical mobile devices and medical programs; it also slows down their integration into the healthcare practice. Doctors are still afraid to use mobile devices due to the fact that such healthcare programs are unreliable and have not been verified. The issues of normative legal use of an arbitrary set of mobile devices are especially outstanding. That standard regulation is going to be the fourth objective of the project.

The issue of rapid correction of patients' states should be focused especially on the patients from the first group and partially for the third and fourth ones. These should be simple and cheap devices. It is important to ensure that a network space can be created based on grid and cloud technologies, which will be the main working tool for storage, processing, and medical decisions.

The dynamic monitoring of the patient's condition requires the automatic data processing and automated decision making concerning emergency conditions accordingly. It has to create the rules for system operation and to determine the changes in its parameters within the certain limits that will be indicated as an urgent condition.

It is very important to determine the value of a mono sensor that may indicate the onset of the state other than the normal or emergency condition which is especially critical in patients of the 3rd and 4th groups.

Also, there will be established the evaluation system of summarized parameters and the parameters that have a certain diagnostic value in the group; their total change is a sign of an emergency onset.

User workspace should be able to receive the relevant information about the real-time patient condition, as well as to update the data acquired from the sensors in case of the risk or onset of emergency conditions. In cases where the medical emergency occurred, a user must have the possibility monitor a patient continuously until the latter is admitted to hospital.

Thus, we consider that it is crucial to formulate a series of rules for the use of working space in order to prevent, detect and deal with urgent conditions with the application of a cloud service eAmbulance. These rules will be based on the principles of the decision-making theory, evidence-based medicine and the mathematical models for development of pathological conditions. An important aspect of the use of this service is to develop the rules intended to prevent the onset of states carrying certain threat or emergency status of patients.

4 CONCLUSIONS

1. Mobile devices are worthy of special attention first of all due to their high efficiency in terms of limited resources.

2. In order to ensure the effective implementation of mHealth technology, it is necessary to develop legal support of the use of medical mobile devices.

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Biography

Professor Ozar Mintser, DSc, Full Fellow of the International Academy of Informatics, President of the All-Ukraine Public Non-Government Organization "AMETHYST"

(Association of the Experts on Medical Informatics, Statistics and Biomedical Equipment), the Head of the Medical Informatics Department of Shupyk National Medical Academy of Postgraduate Education (UA), the founder of medical informatics and cybernetics discipline and scientific school in Ukraine. In the recent years Prof Ozar Mintser has focused on two scientific problems: the creation of the theory of health and informational medicine.