

Mobile Monitoring of Vital Parameters: Aims, Instruments and Current State of Implementation of mHealth Projects Worldwide and in Russia

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Abstract

The unprecedented spread of mobile technologies as well as advancements in their innovative application to address health priorities has evolved into a new field of eHealth, known as mHealth. According to the International Telecommunication Union there are now close to 5 billion mobile phone subscriptions in the world, with over 85% of the world's population now covered by a commercial wireless signal (1).

The penetration of mobile phone networks in many low- and middle-income countries surpasses other infrastructure such as paved roads and electricity, and dwarfs fixed Internet deployment. The growing sophistication of these networks – offering higher and higher speeds of data transmission alongside cheaper and more powerful handsets – are transforming the way health services and information are accessed, delivered, and managed. With increased accessibility comes the possibility of greater personalization and citizen-focused public health and medical care.

mHealth is a component of eHealth. To date, no standardized definition of mHealth has been established. For the purposes of the survey, the Global Observatory for eHealth (GOe) defined mHealth or mobile health 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.

mHealth involves the use and capitalization on a mobile phone's core utility of voice and short messaging service (SMS) as well as more complex functionalities and applications including general packet radio service (GPRS), third and fourth generation mobile telecommunications (3G and 4G systems), global positioning system (GPS), and Bluetooth (and other short-range) communication technology.

The survey performed by the World Health Organization (WHO) (2) found that most Member States use mHealth initiatives: 83% of the 112 participating Member States reported the presence of at least one mHealth initiative in country. Of these, three quarters reported four or more types of mHealth initiatives. There are several types of mHealth initiatives in the world and patient monitoring is mentioned in 30% of reports.(Fig.1). Patient monitoring is still in early stage of development and implementation that is illustrated by the Fig. 1, showing that most of the project is in the pilot stage, but not are well established and used on day-to day basis.

Patient monitoring initiatives were most frequently reported in the European (47%) and Americas Regions (33%). The survey indicated that private companies are beginning to develop solutions for chronic disease patients. For instance, Switzerland reported a local company that is using telebiometry for the management of patients with chronic diseases such as diabetes, heart insufficiency, and hypertonia. Vital signs such as blood pressure, weight, blood sugar, and electrocardiography (ECG) are measured using wearable biosensors and transmitted over the

mobile wireless network to a central server. Several other countries in the European Region are also piloting similar patient monitoring systems, including Austria, Bulgaria, and Estonia. Only a few specific implementations were reported in the Americas region. For example, Canada described the Congestive Heart Failure Home Telehealth Project being implemented in the province of Nova Scotia to increase access to clinical care for communities in rural areas.

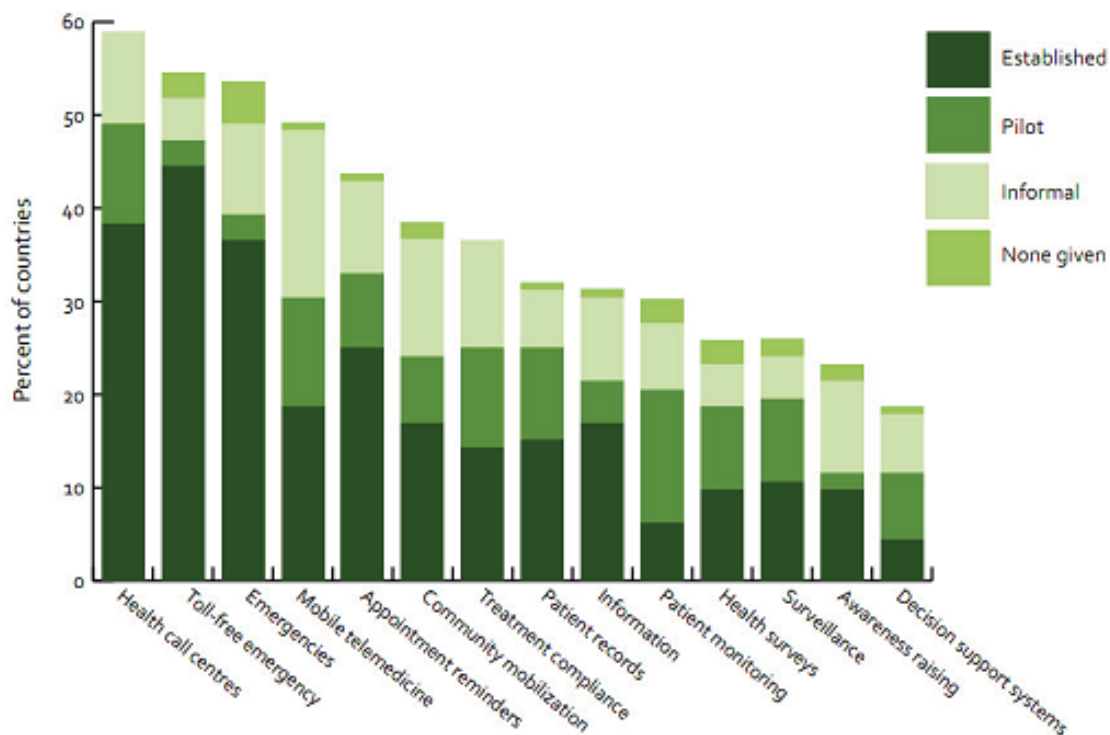


Fig. 1. mHealth initiatives

One of the more recent drivers within the European Union is that of personal health systems (3). These systems promote personalized care through wearable, portable, or implantable systems with the objective of early diagnosis and remote disease management. It is an efficient method of managing chronic diseases and often allows patients to remain at home – both of which can significantly cut health care costs.

Mobile patient monitoring requires diagnostic sensor technology, which is not yet available at the low costs that would make it accessible in developing countries. Since health data are transmitted via the telecommunication network, patients are required to have access to a mobile phone and/or wireless device, to which diagnostic sensors can easily connect (4). In regions where mobile patient monitoring initiatives have been implemented, delays in care may be resolved. The literature primarily reported patient monitoring studies for elderly individuals in high-income countries throughout the European and South-East Asia Regions (5-7). Caregivers are increasingly able to monitor the real-time status of vital signs of patients remotely, using a mobile phone, PDA, and/or computer.

Russia is still a beginner in the area of patient monitoring. First important steps forward were made in the year 2011, when Ministry of Public Health and Social Development of Russia have approved the Concept of Informatisation of the HealthCare (8). “Systems of the remote health monitoring of the different groups of patients” were mentioned officially and their role was determined in the state controlled health care.

We have developed the project for implementation of such system for the monitoring patients with cardio-vascular and endocrinological (mostly diabetes) diseases.

The architecture of such system includes the following elements:

- set of measuring sensor device and smartphone;

- server part of the system, which collects and analyse the information received and providing access to these data;
- working places for physicians, providing care to the patient being monitored;
- module of interaction with the regional information systems of the Ministry of Public Health.

System is able to receive data of the personal monitoring of physiological and biochemical parameters like ECG, blood pressure (BP), glucose level in the blood. We used monitors manufactured by the AND Medical, Japan (BP monitors), Alive Technologies, Australia (ECG monitor with 3D movement sensor), BodyTel, Germany (Glucometer) and by Russian Company Altonika (ECG monitor). The primary purpose of the system is to monitor the health condition of the patients and to send alarm signal in case of appearance of life threatening abnormalities to the Emergency services. The system will help to provide high quality care to patients at home that will unload the hospitals .

The system will be tested till the end of 2011 and after getting positive results could be recommended for implementation in the Russian Federation.

Index Terms: Medicine, mHealth, Mobile monitoring of vital parameters, Global Observatory for eHealth, mobile healthcare, cardiology, endocrinology.

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