A Comparative Study on the Benefits and Challenges of the Application of Mobile Technology in Health

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Abstract: Background: The application of mobile technology in the health domain i.e mobile health (mhealth) commonly refers to the use of mobile telecommunication and multi-media technologies for providing health services and public health systems. Some scholars consider mobile health as a subsystem of health technology which, due to the existing conditions, has become more significant compared to other interventions in this field. The present study intends to investigate the global approach on mobile health technology on the one hand, and its benefits and challenges on the other. Materials and Methods: As a comparative-descriptive study conducted in 2011, the present study has tried to explore mhealth technology strategies in public health domain, different types of mhealth interventions and benefits of using mhealth as well as its challenges and obstacles. The data were collected through informational sources such as articles, books, magazines and valid websites. Then, the status of the countries were compared and analyzed as far as the development of this technology is concened. Results:Based on the findings of the study, one of the criteria affecting the development of mhealth is the high penetration of mobile phone. By October, 2011, the estimated number of mobile users has been over 5 billion showing a penetration coefficient of %76.   The review of the research on the obstacles and challenges experienced in moving towards the development of this technology by World Health Organization revealed that prioritization and increasing knowledge level are the most significant obstacles in the way to develop this technology. Discussions: Mhealth technology has been provided in most countries with the aim of promoting public health and accelerating the supply of health services. Having a penetration coefficient of over %90 in Iran, it can be predicted that this country can take effective steps towards development of this technology.

1. Introduction

Mhealth term which was first introduced by Professor Robert Stepanian in 2003 generally refers to providing health services through portable communication tools and network technologies. Since then, this technology has had a great development in the public health and wellfare domians. Due to the unexpected expansion of telecommunication infrastructures and mobile phone services, it has created a remarkable movement all around the world especially among low-income nations (Mechael, 2010). The abbreviated term mhealth in fact covers a wide spectrum of products and services ranging from blood, cholesterol and blood pressure controlling and on-line physical fitness plans to medical plan networks developed for chronic patients (Sarasohn, 2009). Moreover, "mhealth" as one technological capability has experienced increasingly development during the recent years (Mechael, 2010). It is predicted that mhealth will turn into a $5 billion-industry in 2014 (Ollivier, 2009). Today, mobile phone is used for

making standard contacts, short message services (SMS) and multimedia services (MMS) and in some cases check mail and electronic mail (Gomez, 2008). Besides the advantages that mobile phone has in business and data accessibility, the researchers are now studying the possibility of using mobile technology in the public health services enabling the patient to take benefits from mobile services for purposes such as satisfying health information requirements, management of health and care data registration and remote monitoring under the conditions of chronic disease like Diabetes, Asthma and high blood pressure. Many scholars regard this change as a revolution in the health services (Chatterjee, 2009). Among the advantages of mhealth project throughout the world, the following cases can be enumerated: an increase in the access to the health care-related information for various purposes such as population control, an increase in productivity, a decrease in the expenditures of health services provision, an enhancement in the capability of diagnosis, treatment and discovery of the disease,

timely use of public health information, widespread access to medical continuous education for health care providers, supporting physicians' and prescribers' orders (Mechael, 2010). Although mobile technology is still at early stages of its development, the existing signs are indicative of the start of transferring this technology to the health system so that health services and data have also come into use for population control and a move has been made towards population-based health care and treatment (Nakajima, 2007). Throughout the world, there is an inclination towards using advancements in telecommunications and rapid absorption of portable communicative technologies in the health domain. Given the high interest in implementing this technology especially in developing countries, there seems to be a need to a conduct a deep analysis on the results of the research performed or explore the issues that are required to be studied. Lak of such data impedes making effort for investment for the development of telecommunication networks hindering achievement in the pilot mhealth projects (Sarasohn, 2009). The first survey on the mhealth projects entitled "*World Perspective on the Electronic Health in 2007*" was conducted by World Health Organization and studies carried out in 2009-2010 were reviewed and published in the public council of mobile union so as to provide researchable and up-to-date information regarding the application of mhealth (Hayn,2009).

2. Materials and Methods:

In the present study which was descriptive-comparative in nature, mhealth concepts including its definition and description, objectives, capabilities as well as its applications in the nations in question and some challenges facing its development were studied and compared. Data collection instrument was data collecting papers which had content and face validity and confirmed by the experts. Data resources included documents, articles, textbooks and magazines. Study data were gathered by studying texts provided from the libraries and health-related web-sites, US Food and Drug Administration, health association and Health Electronic Transformation National Agency. First, search strategy was designed based on keywords and MESH system. Then, the search was done through search engines such as Google, Embase, Magiran, and ScienceDirect. The used articles were in English belonging to 2003-2010. Gathering the data, the researcher studied the capabilities and interventions of this technology in the health services and its challenges.

3. Results:

A total of 205 articles were found. Following the Quality Assessment Framework was conducted with 114 articles of which 98 papers were foreign and other domestic articles. Articles were classified based on the aims of researches about various advantages of application of mobile technology in health and the present challenges about that. Number of articles on application of mobile technology in preventing disease and Health measures such as Vaccination, network coverage in line with informing about regional communicable diseases was 36 cases. The numbers of articles related to the effect of this technology on reminding the time of drug use and warn against the type of drug consumption to control drug intervention and to avoid wrong consumption of drug especially in elderly was 41 cases. Articles about the role of mobile technology in tele-consultation, supporting the patients after their discharge from the hospital, emergency conditions interventions and unexpected accidents, telemedicine and telesonography were 21 cases.The findings of the study obtained from the comparative comparison of the status of mhealth have been classified as follows:

Table 1. Comparative Comparison of the Status of Mhealth in the Nations in Question

The Comparison of the Nations in Question	Peru	South Africa	Uganda	Philipines	Thailand	England
Preventing disease	*	*	*			
Reminding the time of drug use		*		*	*	
Vaccination				*	*	*
Tele-consultation		*				*
Medical Advanced Cares	*					
Emergency Conditions Interventions and Unexpected Accidents		*				*
Supporting the patients after their discharge from the hospital						*

Table 2. A Comparison of the Challenges and Obstacles Facing Mhealth Technology

Challenges and Obstacles Facing Mhealth Technology	
Cost-benefit analysis for implementing mhealth	The increase in the aged population of the societies
Accessibility and transfer of the main health priorities	Continuous check of health parameters
IT technology infrastructures architecture	Shortage of financial resources
Network coverage	The shortage of expert forces and inappropriate diversity
The integrity of health information systems	The limitation of space and facilities
Development of mobile information system in the rural areas	The security of data and preservation of data privacy

4. Discussion

According to the findings of the studies carried out in the developed and developing nations, mobile technology can promote health care efficiency making it more effective. Based on the long-term goal and expectations, mhealth projects may have considerable effects on the clinical outcomes including a lower infant mortality, a longer longevity, a lower disease load. An investigation into the performance of different nations regarding mobile application in the health domain in Peru, using mobile phones for sending short messages about the symptoms of the disease has been accompanied by the capability of rapid response to disease symptoms (Curioso, 2010). In South Africa, sending Massey Lulack's short messages with the aim of providing information about AIDS has resulted in a triple increase in the volume of the contacts to the local informing center. Sending short messages about AIDS virus in Uganda has increased the number of the visitors for AIDS test as much as %40 (Curioso2, 2010). In Philippines and Thailand in 2007, daily contacts were made with the patients with Pneumonia so as to remind them of the time of using their drug. %90 of the patients in these two countries used their drugs based on this technology. The same trend was observed in South Africa, i.e. %90 of the patients used their drugs by receiving these messages. Compared to the patients who did not receive such messages, the efficiency of drug use was promoted by %30-%68 among these patients. Research conducted in Spain, Australia, Finland and South Korea on the advantages of using mobile technology for following vaccination and Asthma or Diabetes proved that the results of using this method are considerable as far as improving the patients' status is concerned. In China, during a period of sending textual messages for reminding the visit time, the rate of visits was increased with the costs reduced to 1/3. Researchers in England found that the reduction in the visits to the hospitals due to meeting health service requirements by using mHealth technology is accompanied by an annual £575,000,000 saving in

the health expenditures (Vital Wave Consulting, 2009). Hence, the common capabilities of mHealth can be divided into 7 distinct domains:

1. Notification and informing: Public notification regarding Poliomyelitis with the help of mobile operators was performed in India.
2. Reminder services: This is used for those patients who have to use medicine for a long time at given time with time interval between drug useage being of high significance. Providing such services by mobile operators will increase effective medication therapy and decrease thinking concerns of the family members regarding timely use of drugs by the aged parent.
3. Distance-consultation: Online consultation entitled help-line consultation attempts to deliver such services.
4. Remote-control: Controlling life symptoms and heart pulse pattern is very helpful and effective at the time of a sudden heart attack.
5. Diagnosis: Placing a micro-chip in the mobile phone can analyze one's blood sample and report the results with an image from the sample.
6. Fighting against the accidents and epidemics: data exchange in crisis circumstances such as mental crises, trauma, poisoning, informing about members transplant, informing about the suffered individuals, informing about blood bank all deserve giving a thought.
7. Distance-data collection(Puccio, 2009)
8. Supporting the patients after discharge from hospital: One recent study by Grimsman (2007) showed that medication therapy changes at the time of discharge for %98 of the inpatients with at least 5 cases of change registered for % 60 of them. Currently, medication-related data are exchanged through discharge paper which of course are satisfied with some delay and do not

necessarily include physicians' required data (karapinar, 2010).

9. Using Personal Digital Assistant (PDA): PDA is the abbreviated term for personal digital assistant referring to the first version of mobile phone with some modern capabilities such as web check, e-mail and facilitating writing using light pen. Intelligent phone is the newest communication technology including an integration of the functions of a mobile phone and PDA that provide capabilities such as access to Internet, picture and video. Although this type of mobile phones has gained a high popularity in the nations of high income, they are expensive for low-income nations (Mechael, 2010). However, it is noteworthy that the distance between intelligent mobile phone and ordinary mobile phones is increasingly decreasing (Mechael, 20101). The applications of mobile in the developing nations have been established in some domains such as banking and agriculture. The move towards taking benefits from this technology in the health domain is slow, while the results of the surveys by the Health World Organization and World Bank have provided some evidence on the development of the mobile applications in the health domain (Krishnamurthy, 2006). In Uganda, PDA plan using wireless phones has been used for checking, collecting and reporting the illnesses resulting in a saving as much as %24 in the expenditures. %87 of the health care providers participating in the plan announced that it has led to a rapid and accurate diagnosis prompting public awareness and enhancing illnesses management. On recent study carried out in USA on the use of wireless PDA by patients suffering from Diabetes type 2 revealed that those patients who used it regularly experienced a higher promotion in their blood sugar indices as opposed to those who did not use it. Despite such benefits, implementing this technology suffered some challenges such as widespread coverage in the rural areas, using equipments of efficient performance, training , providing financial resources and efficient check and evaluation.

Data security in data exchange and data storing is one critical issue which may endanger individuals' data if it is not given due consideration. Parameters such as data protection by password, connecting to the network if necessary, assimilating the files in the computer and getting a supportive file and installing file improver and other similar software all are a part of mobile security policy. To prevent the removal of the data and getting polluted by the viruses, the system must also be equipped with a strong anti-virus program and firewall capability (Cocosila, 2004).

5. Conclusions:

It is generally concluded that most nations have made some provisions for the use of mobile phones in health domain with the aim of individuals' accessibility to their health data. Using new informational technologies can promote the quality of medical services. As it is evident, with mhealth for both individual and social health purposes being one form of them, the possibility of using such technologies in the health domain is in increase day by day. Taking all these into account, hence, it is necessary for Iran to provide necessary preliminaries for using mobile services in the health domain based on other nations' experiences.

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