Chapter 42
Mobile Healthcare in an Increasingly Connected Developing World

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ABSTRACT

Global health care has become an enormous industry worldwide, where trends such as aging populations, environmental and climate changes, catastrophic events, and the spread and evolution of diseases pose significant challenges. With the rapid growth of information technology (IT), wireless technologies, and mobile services, health care processes are able to increasingly benefit from new technological advances. Specifically, the area of "mobile health" or mHealth, which leverages mobile phone functionality to provide medical and public health services, has become a very promising trend. Wireless and mobile technologies have great potential in improving patient care, reducing costs, streamlining processes, and allowing adherence to regulations. However, the developing world faces numerous challenges in realizing the infrastructure and technical expertise required to adopt secure mHealth solutions and applications. In this paper the authors discuss these challenges and solutions suitable for the developing world, highlighting existing problems and risks in realizing secure mHealth applications and services.

INTRODUCTION

Technological advances such as the Internet, mobile and personal communication devices, *wireless technologies*, and portable sensor devices are continuing to revolutionize the fields of *health care* and wellness. Today's medical field is very different from just a decade ago as exemplified by the use of medical informatics, modern testing techniques, and novel surgical equipment. The rapid proliferation

of the Internet is also altering the traditional relationship between doctors and their patients. More and more people rely on the Internet to address their health and wellness needs concerns and the Internet is making it possible for patients to assume much greater responsibility for their *health care* (Ballas, 2001). For example, according to the Pew Internet and American Life Project, more than 80% of Americans already search online for answers to their health questions with 8 million search queries every day (Fox, 2006). Particularly *mHealth* has the potential to transform the way we obtain and use health and wellness-related information. The area of *mHealth* is typically considered to be a sub-segment of *eHealth* and relies on the pervasiveness of mobile devices and mobile communications to provide anytime and anywhere *health services* and information. Examples include the electronic delivery of *health care* information to patients, practitioners, and researchers, the real-time monitoring of vital signs, clinical health data collection using mobile devices, and mobile *telemedicine*.

The *mHealth* trend has been enabled by the incredible proliferation of cell phones in all parts of the world, thereby facilitating access to various online resources, including *health care* information and services. During the 2010 Mobile World Congress, the CEO of Google reminded us that half of all Internet connections are from mobile devices and more than half of all online search queries in emerging markets (such as *health care*) come from mobiles. As an example to illustrate the potential of mobile technology, he further described the experiences of two survivors of the devastating earthquake that hit Haiti in January 2010, one of them using an iPhone application to learn how to treat his own wounds and another buried victim who used her mobile to update her Facebook status to alert rescuers as to her whereabouts.

Such mobile *eHealth* systems and applications can be particularly beneficial in developing countries, where the *health care* system faces significant challenges. For example, for various reasons, *health care* workers struggle to provide satisfactory care for their patients. Such reasons include the cost of communication and transportation, lack of scheduling, recording, and appropriate reminders, and poor technology and infrastructure. These deficiencies have severe consequences, e.g., in Nigeria, 26% of HIV patients fail to continue their treatment, and in sub-Saharan Africa, more than 50% of infants do not complete their vaccine series for diphtheria-tetanus-pertussis. These problems could be addressed with improved *mobile health* technology, e.g., health-care workers would be able to more efficiently visit patients in their homes, while instantly accessing these patients' *health records* using their mobile applications. However, technology constraints are also a concern in developing countries. While cell phones have become omnipresent, coverage and connectivity remain significant challenges, e.g., only about 60% of Africans are within reach of a signal. While coverage for *voice communication* continues to increase, *data communication* remains unreliable, of poor quality, or even non-existent. The lack of reliability makes it difficult for *health care* workers operating in the field to utilize the vast array of emerging health applications. Moreover, the access to even the most basic health information is problematic and without it, the quality of *health care* remains at unacceptable levels. In the work of Aranda et al. (2014), authors reviewed forty-four *mHealth* projects in Africa from 2003 till 2013. They looked at projects' sustainability, long-lasting goals, ability to scale up, integration to health system and other various aspects. The authors acknowledged the overall positive impact of *mHealth* projects. However, they noted that their success depends on their accessibility to the general audience, government involvement, and low-cost technologies. In addition, their dependency on unreliable funding and infrastructure can threaten such applications.

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