

# Pervasive Mobile Health

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## INTRODUCTION

Recent progress in mobile health (mHealth) is very encouraging as it allows healthcare services to be accessed through powerful smart mobile devices. Nowadays smart mobile devices such as smartphones and tablets support many features that can be utilized to access healthcare services conveniently. mHealth will indeed be a convenient experience to patients since there is currently a growing trend towards pervasive knowledge acquisition and management. Pervasive mHealth is an electronic health where healthcare services can be accessed regardless of time and place, and patients can continuously be connected to their healthcare services through their smart mobile devices.

According to Eysenbach (2011), healthcare services in mHealth are delivered through mobile devices. Pervasive mHealth provides services that go beyond traditional healthcare services. It provides various services accessible through smart mobile devices, including searching relevant health information, interactive discussion of healthcare matters with colleagues or friends, updating health related information from smart mobile devices, and seeking opinion through online healthcare services. Pervasive mHealth is becoming an increasingly important instrument in healthcare services for the public.

Most healthcare initiatives perceive patients as recipients of healthcare, where they hardly have roles in the process of healthcare activities and decision-making. For example, it is difficult for a patient to get access to his/her own health

record or to find out his/her health history. On the other hand, the advancement of mobile technology has given customer (patients) a greater role in the process including the ability to gain access and control of information flow that fits their personalized needs. In terms of healthcare activities, many smart electronic devices have enabled patients to check their own health condition without assistance from healthcare staffs such as checking blood pressure, food hygiene Apps, mobile thermometer, mobile glucose measurement, mobile hypertension tool, etc.

In addition, the wide adoption of smartphones and tablets as well as the emerging of their utilization in healthcare raises the possibility to engage patients, patients' families, and society to participate in their own healthcare processes. For instance, social networking, which is accessible through smartphones, can provide an avenue to identify any misuse or misunderstanding in consuming antibiotics, share health information, promote positive behavior change, disseminate valid information, and explore how such tools can be used to gather real-time health data (Scanfeld et al., 2010). Pervasive mHealth can offer healthcare providers a comprehensive perspective of patient's condition and thus provide an environment in achieving complex healthcare goal(s) such as building lasting relationships with patients. The main goal of this chapter is to accommodate the concept of pervasive mHealth scenario within pervasive knowledge acquisition in healthcare systems. We propose a pervasive mHealth model that extends to multi-channel knowledge resources in mHealth. The model is designed to establish

longitudinal healthcare services anytime and anywhere which in turn will raise health literacy of individuals and the community at large.

## BACKGROUND

Currently almost every healthcare organization depends on information and communication technology (ICT) in every level of their activities. One of the most valued aspects of ICT is its capability to enhance processes or functions to improve consistency, accuracy, and efficiency. Similarly, efficient and effective healthcare services have become increasingly dependent on accurate and detailed clinical information, which is transferred from interrelated departments or even between organizations (Conrick, 2006). In addition, people's demands have changed because they have been empowered by the vast amount of information available and accessible to them through smart mobile devices, including mHealth related services (Anshari et al., 2013). For example, half of smartphone owners in US use their devices to get health information and one fifth of smartphone owners have health-related apps (Fox & Duggan, 2012). Despite some limitations of smartphones (Koushanfar et al., 2000), they can be used as services platform for mobile health information delivery, access and communication (Nkosi et al., 2010).

Rapid adoption of smartphones and smart mobile devices has removed the space, time and distance barriers for users, including the patients, to access information. In fact, smartphones facilitate the use of dynamic Web 2.0 and Apps allows intensive and immediate interactivity through social networks. In Web 2.0, users can collectively contribute contents and applications (O'Reilly, 2005). Web 2.0 is defined as a set of economic, social, and technology trend that collectively forms the basis for the next generation of Internet – a distinctive medium characterized by users' participation in using networks such as *Facebook*, *Twitter*, *Snapchat*, *Instagram* and *LinkedIn*, which have

indeed grown rapidly, facilitating peer-to-peer collaborations, participation and networking. The term social networks refer to the use of Web 2.0 that describes the social characteristics supporting the promotion of collaborative sharing. Web 2.0 is commonly associated with technologies such as weblogs (blogs), social bookmarking, wikis, podcasts, Really Simple Syndication (RSS) feeds (and other forms of many-to-many publishing), social software, and Web application programming interfaces (APIs) (Kristaly et al., 2008). Web-oriented applications and services use the Internet as a platform to provide unique features by engaging and providing users with rich interactive experiences (Rodrigues & Vaidya, 2010).

The widespread acceptance of the Web 2.0 services will affect the operation of future businesses. Greenberg (2009) explained these changes and that the customer's ownership of the conversation ultimately leads to organizations readjusting their business strategy. The fast adoption of smartphones has made customers or patients demand accessibility of health services through their smartphones. It is imperative for Health service providers to respond to these demands to sustain their businesses. In fact, health service providers can provide services that take advantage of smartphones' features or other mobile devices such as Web 2.0 features. The use of smart mobile devices with the Internet connection has permeated almost all aspects of our lives, creating pervasive computing.

Pervasive computing is associated with smart environments in which information and communication technologies employ intelligence and machine learning techniques to reason about, control and adapt to our physical surroundings. It focuses on sensing, interacting with and aiding humans at an individual and community level (Cook & Das, 2004). This means that pervasive computing should encompass every device worldwide that has built-in active and passive intelligence (Saha & Mukherjee, 2003). While mobile computing supports IT such as remote information access and adaptive applications, pervasive computing

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