



Review

Mobile health in China: Current status and future development



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ABSTRACT

Mobile health applications offer unique opportunities for monitoring patient progress, providing education materials to patients and family members, receiving personalized prompts and support, collecting ecologically valid data, and using self-management interventions when and where they are needed. Mobile health application services to mental illness have evidenced success in Western countries. However, they are still in the initial stage of development in China. The purpose of this paper is to identify needs for mobile health in China, present major mobile health products and technology in China, introduce mobile and digital psychiatric services, and discuss ethical issues and challenges in mobile health development in a country with the largest population in the world.

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Digital-health, E-health or mobile-health has been developing rapidly in western and developed countries. Currently about 85% (BBC, 2012)–97% (Sanou, 2013) of the world's population have access to a mobile phone. Mobile health is defined as the use of small, portable computers or telecommunications equipment to meet the needs of consumers about health care or health information services (Chen, 2012). Mobile communication devices include laptops, portable computers, wireless phones, tablets, smart phones, and radio frequency identification (RFID) technology, etc. One important development, however, is smart phone applications of mobile health (Wu, 2013). The mobile health applications offer unique opportunities for monitoring progress,

providing education materials, receiving personalized prompts and support, collecting ecologically valid data, and using self-management interventions when and where they are needed (Donker et al., 2013). The purpose of this paper is to identify needs and current status of mobile health in China. This paper is composed of six sections: (1) needs for mobile health in China, (2) major mobile health products and technology in China, (3) mobile and digital psychiatric services, (4) ethical issues related to mobile health, (5) challenges in mobile health development, and (6) prospectus of mobile health technology development in China.

1. The needs for mobile health in China

Mobile phones are widely distributed in different parts of the world due to its decreasing cost. The global smart phone users will reach 1.4 billion in 2015, of which one-third of the users will install

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health-related mobile applications in their phones (Gao, 2012). In 2011, the Price Waterhouse Consulting Corporation (PwC) commissioned the Economist Intelligence Unit (EIU) for the investigation of market potential of mobile health worldwide (involving a total of more than 1000 patients, 433 doctors and 345 clients) (Zhang, 2012). This survey included 103 Chinese patients, 76 Chinese doctors, 31 hospitals and 14 government officials and managers within the medical insurance field. The survey results indicate a great need for the development of Chinese mobile health market. In addition, China has approximately 1.2 billion mobile phone users (total Chinese population is 1.38 billion), this number is still growing (Woodhouse, 2013). According to the International Telecommunication Union and the Chinese Ministry of Industry and Information Industry Data, mobile phone users will reach about 95% coverage in 2015. Meanwhile, China's basic medical insurance coverage is also expanding and will reach about 97% coverage in 2015 (Zhang, 2012).

Mobile health application services to mental illness have evidenced success in Western countries (Wang and Guo, 2011). However, they are still in the initial stage of development in China. Currently, the U.S. leads in mobile health application development, making up more than 50% worldwide. Europe accounts for 20%, Africa and Latin America, 12%, and, Asia-Pacific, only 4% (Wang and Guo, 2011). Therefore, it seems the promotion of mobile health application development in China is much needed.

As indicated above, mobile health services are just emerging in China, creating great potential to serve patients with mental illness. Mobile health provides clinical services and information through PDAs, mobile phones and satellite communication technology. Mobile health is a new concept for most patients with mental and illness in China. Yet, many Chinese people are familiar with wireless network technology, tablet PC, and smart phones. Through wireless network technology and tablet PC, medical staff can obtain medical records in a faster, more accurate, and more effective way allowing medical decisions to be made and delivered quickly. Furthermore, patients can get medical services in a more convenient way through network technology collaboration and medical information system integration technology. This kind of integration and combination of mobile information technology and/or designated mobile vehicles and medical health services will optimize medical resource allocation to a maximum degree, and in the end, to benefit patients.

In addition, the traditional face-to-face medical model can no longer meet the increasing patient needs for medical services in China. Mobile health can be widely used in information dissemination and communication, followed by diagnostic and treatment applications. Mobile health functions can facilitate illness surveillance and monitoring, and subsequently improve medical resources allocation at a national level. Furthermore, at an individual level, mobile health may alleviate patient burden, such as expensive travel and accommodation costs (Ha and Ji, 2013). Mobile health may also decrease delayed or aborted treatments and prevent problematic interactions between doctors and patients/patient family, which have increased tremendously over the last few years (Medical Information, undated). With the emergence of individualized smart phones and the development of mobile health applications, mobile health service may become a promising direction for Chinese people who are in need of health services and information (Ha and Ji, 2013), mental health care in particular.

2. Mobile health applications in treating mental illnesses in China

Statistics released by China Center for Disease Control in 2009 shows that there are more than 100 million people with mental

illness and over 16 million with major mental disorders (Medical Information, n.d.). In other words, one in 13 people develop some kind of mental disorder in China, and approximately one in 100 experience serious mental disorders. Unfortunately, few people seek help from mental health professionals due to stigma, culturally formed beliefs about mental illness, and lack of access to services. For example, the life-time prevalence of depression amounts to 4% of Chinese population, or approximately 26 million people. Only about one third of those affected sought mental health treatment and 10% have received proper medication (Medical Information, n.d.). Most patients abandon treatment right after their first hospital visit.

In addition, schizophrenia is a chronic mental illness with high rate of relapse and disability, accounting for 50% hospitalized psychiatric patients (Wang and Fang, 2011). About 75% of schizophrenia patients have social function deficits. Furthermore, these patients often experience difficulties in managing their social life, family responsibilities and social obligations. According to a research report in China, schizophrenia leads to 93.6% of disability rate, bringing about a significant burden to China's mental health services (Wang and Ma, 2012). Furthermore, there is an extreme lack of mental health services. By the end of 2005, there were only 575 mental health medical institutions nationwide, with a number of 132,000 beds. This means that there were 1.04 beds per 10,000 people on average, fewer than the world average, which was 4.3 per 10,000 (Medical Information, undated).

Therefore, a type of de-stigmatized and culturally sensitive mobile health application may be a great option to engage patients in self and professional help and benefit patients and care-givers in terms of long-term care and family burden reduction. However, there are very limited mobile health applications for mental disorders in China. A graduate student from Beijing University of Posts and Telecommunications designed and implemented a mobile mental health service application to provide services to people who experienced a traumatic earthquake (Zhang, 2010). This seems to be one of the earlier attempts to address mental health with mobile health technology, while most mobile health in China focuses on physical health.

3. Mobile health and tele-consultation in China

Mobile health technology has promoted the development of teleconsultation. Teleconsultation is cross-regional medical consultation by means of computer and communication technology between medical institutions. The First Affiliated Hospital of Zhejiang University School of Medicine began an official implementation of a new model of health care services called "smart medicine, handheld Zhejiang Hospital" (Wang et al, 2012). Based on the framework of digital hospital construction, they innovatively designed the first medical mobile applications, integrating medical information gathered from pre-diagnosis, diagnosis, and post-diagnosis stages. This mobile health application includes smart triage for medical help, real-time registration, phone inquiry, and medicine information. People are also able to browse health information from an encyclopedia like source, which is regularly updated on the mobile applications. To a certain extent, this mobile health application, though not specifically for mental health, may change the disease intervention to prevention, keeping healthy people away from disease, including mental illness.

4. Ethical issues related to mobile health services

Mobile health systems may improve quality of healthcare and patients' and family members' quality of life, they may also generate new security and privacy issues for patients. Those concerns have to be addressed before mobile health is widely

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