

Medicine and Society

Mobile health (mHealth) in mental health: Scope and applications in low-resource settings

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INTRODUCTION

Mobile health (mHealth) is a component of eHealth. It has been defined by the Global Observatory for eHealth as medical and public health practice supported by mobile devices such as mobile phones, patient monitoring devices, personal digital assistants (PDAs) and other wireless equipment.¹ Mobile technologies have spread rapidly across the world and are being used in various fields of healthcare such as maternal and child health, tuberculosis and HIV. In recent years, these technologies have also been used to assess and manage various mental disorders. The lower cost and multiple functions of mobile phones have led to their use at a larger scale than other mobile devices such as patient monitoring devices and PDAs. Few studies have used PDAs in mental health,² but mobile phones have mainly been used in mHealth in the mental health sector.

Globally, about 7 billion people live in an area covered by a mobile-cellular network and 84% of the population is covered by mobile broadband networks.³ Unlike traditional health services, mobile phones do not require physical proximity of health providers and can deliver services at a clinic or home or fixed basic physical structures (telephone, internet or telemedicine-based services) such as telephone connection and handset or a personal computer and internet connection.⁴ Also, users do not have to learn new skills, since many people who have no access to computers or internet connection use mobile phones to get information and access various services. Mobile phone technologies offer choices for healthcare delivery that are cheap, user-friendly and use the existing infrastructure. Mobile phones with their ubiquitous presence, portability, increasingly better computational capacities at a cheaper cost, and internet connectivity make them an ideal platform for healthcare applications.^{4,5}

Mainly high-income countries have done research in mHealth. Though low- and middle-income (LAMI) countries lack resources, they have seen remarkable penetration of mobile technology. In India, there are 971 million wireless telephones with a teledensity of 77.6% and a share of 97.2% of total telephones.⁶ mHealth has the potential to become an important service link between the meagre mental health services and unfulfilled mental healthcare needs of the vast majority of unreached patients and caregivers. We discuss the scope and application of mobile phones in mental health in low-resource settings.

USE OF MOBILE PHONES IN MENTAL HEALTH

Mobile phone technologies can complement and supplement clinic or home-based care by their ability to deliver mental health services outside the clinic. Most (72%–97%) patients with mental illness have reported the use of mobile phones for activities other than spoken conversations such as sending emails, web browsing and social networking.^{7–9} Smartphones are increasing faster than basic phones.¹⁰

Broadly, mobile phones are of two types: feature phones and smartphones. The former has functions such as voice calling, text messaging, basic multimedia and internet capabilities, whereas the latter combine functions of a personal computer and can run a variety of applications such as access to the internet, touch screen user interface, media player, camera phone, navigation unit for global positioning system (GPS) and motion sensors. Mobile phone technologies in mental health use short message service (SMS), within application notifications, voice messaging or video and vary according to the level of interaction between the clinician and the patient, which can be live, asynchronous or autonomous.^{11,12} Mobile phone technologies can be standardized or tailored to user data, which may be acquired as stored recorded data in a mobile device or ecological momentary assessment as a record of a patient's real-time experiences. The recorded data can be stored locally on the device or uploaded to a centralized server.²

In high-income countries, mobile phones have been used to evaluate and manage different aspects of psychiatric disorders. The use of mobile phones for evaluation includes assessment of symptoms and medication adherence, comparing ecological momentary assessments recorded in real time on mobile phones and retrospective reports, identifying relapse and its early treatment, and prompting health-promoting behaviour.^{13–22} SMS has also been used as an adjunct to phone-based psychotherapy in crisis situations²³ and in cognitive behaviour therapy for depression and cessation of smoking.²⁴

Research on mobile technologies includes short-term project-based studies by mental health and technology professionals mostly from high-income countries. Most of these interventions have been designed for use by patients. Research has shown the feasibility, acceptability and utility of mobile-based technologies for implementing psychosocial interventions in various mental illnesses.^{13,20,21}

Limitations of mHealth include (i) how to use huge data generated by these devices; (ii) whether consumers will accept 24×7 interactions with mobile technologies; (iii) how to develop interventions for persons at high risk for self-harm and other psychiatric emergencies; (iv) difficulties in making and implementing mobile-based protocols; and (v) the issue of data protection and confidentiality.

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SCOPE IN LOW-RESOURCE SETTINGS

In LAMI countries, there is a gross mismatch between mental health morbidity, and funds and resources allocated to mental health. For example, in India, with lifetime prevalence of 13.7%, nearly 150 million persons above the age of 18 years need active intervention for psychiatric disorders.²⁵ However, mental health gets only 0.06% of the total health budget.²⁶ Most patients with psychiatric disorders seeking treatment in LAMI countries receive only pharmacological treatment, and negligible psychosocial interventions due to shortage of non-medical mental health professionals.^{27,28} In a survey, 88% of patients attending outpatient services at the authors' institute were using mobile phones regularly.⁹ The mobile phone is used mostly for making and receiving phone calls. Other usage included sending and receiving short text messages (68%), clock and alarm functionalities (49%), recreational activities (39%) and accessing social network sites (30%). Most people felt that mobile phones can be used as an aid in the treatment of psychiatric disorders for sending reminders for appointments and taking medications, and for receiving educational messages.

In LAMI countries like India, feature phones are more widely available and are cheaper (₹1000–1500), though have limited functions. However, these can be used to provide SMS-based interventions. The costlier (≥₹4000) smartphones can be used for more sophisticated interventions.

Increasing awareness

Mobile phone technologies, especially SMS-based messages in local languages, can be used for increasing awareness about various aspects of mHealth and mental illnesses. The messages may include early signs of mental illness, need for treatment, where to seek help and from whom, kinds of treatment available, simple psychosocial measures important for recovery and how long to continue treatment. Similar messages regarding alcohol and drug use disorders can be used. The technology can promote positive mental health such as improving sleep hygiene, lifestyle modification and how to say no to drugs. These educational messages can also be targeted at the general population. For special population groups such as women, school- and college-going children and adolescents, and the elderly, messages can be tailored to their needs. Bulk messages on special days such as the world mental health day can also be sent. Women and their caregivers can be sent messages regarding identification and management strategies for postpartum blues. This can help in reducing stigma related to mental illnesses and seeking treatment.

Training

Mobile phone-based applications can be used for training medical, nursing and paramedical students, primary care physicians and health workers. These can also be used to sensitize teachers in schools and colleges to identify mental illnesses in their students and seek help. There is potential for their use in workplaces. Similar applications in vernacular languages can be used to train *anganwadi* workers.

Linking tertiary care centres with primary and secondary care centres

Service providers in primary healthcare centres can be linked with secondary and tertiary care centres using mobile phone technology for seeking opinion, appointment and management. Phone service over the internet such as Skype can be used to provide telepsychiatry services at a cheaper cost in contrast to the traditional telemedicine

facilities which require elaborate infrastructure at both ends.²⁹ This model can be used to link a psychiatrist in a tertiary care centre to patients at primary and secondary care centres.

Clinical services

Mobile phone technologies have been used to assess and manage patients with mental illnesses in high-income countries. However, protocols from high-income countries may not be suitable for use in LAMI countries due to differences in quality and quantity of mental health resources and the prevailing sociocultural norms. In high-income countries, mobile technology protocols for psychosocial interventions have been designed and implemented in the context of sociocultural expectation that adults after a certain age live independently and not with their families. High-income countries have a well-developed community care service in the form of social workers, case managers, support for vocation, housing and education, and social security benefits, all geared towards making the patient stay independently. In contrast, in low-resource settings such as India, due to lack of community care services, families play an important role in initiating treatment, procuring and supervising medicines to providing psychosocial support to patients with mental health problems.³⁰ Thus, in low-resource settings, mobile phone technology protocols would also need to be designed for caregivers along with patients.

Psychosocial interventions are an important mode of treatment for common mental disorders and form a crucial link between reduction of symptoms and recovery for patients with severe mental disorders. In the context of low mental health resources, providing psychosocial interventions is a challenge, and can be addressed by using increasingly efficient, convenient and affordable mobile phone technologies (with deep penetration into the population) with availability of vernacular languages on android platforms. Integration of these technologies with clinic-based services may help to bridge the gap between services and users, and may also offer individualized and cost-effective psychosocial interventions. Mobile phone technologies may offer greater flexibility in the duration, timing and setting of interventions, and reduce number and duration of face-to-face sessions, which may translate to reduced costs.³¹

In LAMI countries, most mental health services are concentrated in tertiary care centres situated in urban areas. Many patients with their caregivers travel long distances to seek psychiatric help with one or more family members. The instant messaging service can be used to upload key points related to a drug (name, dose, duration) and psychosocial treatment (sleep hygiene, activity scheduling, need for resuming work, no alcohol, etc.) to the family members at home who may be the chief caregiver for the patient and whose understanding about the illness and its treatment is crucial to a good outcome.

Social networking sites and WhatsApp messenger-like platforms have the potential to form caregivers' support groups at the local and national levels. Similar groups can be formed among various stakeholders.

Research

Mobile phone technologies can also help in conducting surveys using simple questionnaires among a large population spread over different geographical locations. Psychosocial interventions could be assessed with real-time data, and thus can be a useful input for research.

There have been few initiatives in using mHealth in mental health in India. Open-source mobile technologies have been used

in Kashmir to collect data on prevalence of depression, anxiety and post-traumatic stress disorder.³² A Cloud-based mental health platform has been designed to connect rural populations with specialist care through community mental health workers.³³ Mental health services have also been extended to university students in India.³⁴

CONCLUSION

Mobile phones are increasingly being used to get mental health information and other services on the internet. Integration of mobile phone technologies with clinic-based services can bridge the gap between services and users and may help in providing psychosocial interventions. Efficient, convenient and affordable mobile technologies may also be used in increasing awareness about mental illnesses in the population and linking personnel in primary care centres with secondary and tertiary care services. mHealth protocols designed for mental healthcare should focus on caregivers as they remain a crucial resource in the absence of facilities for community-based care in low-resource settings.

REFERENCES

- 1 WHO. *mHealth: New horizons for health through mobile technologies: Second global survey on eHealth*. Geneva, Switzerland: World Health Organization; 2011. Available at www.who.int/goe/publications/goe_mhealth_web.pdf (accessed on 6 Jun 2015).
- 2 Depp CA, Mausbach B, Granholm E, Cardenas V, Ben-Zeev D, Patterson TL, et al. Mobile interventions for severe mental illness: Design and preliminary data from three approaches. *J Nerv Ment Dis* 2010;**198**:715–21.
- 3 ICT facts and figures 2016. Available at www.itu.int/en/ITU-D/Statistics/Documents/facts/ICTFactsFigures2016.pdf (accessed on 20 Feb 2017).
- 4 Aggarwal NK. Applying mobile technologies to mental health service delivery in South Asia. *Asian J Psychiatry* 2012;**5**:225–30.
- 5 Proudfoot J, Parker G, Hadzi Pavlovic D, Manicavasagar V, Adler E, Whitton A. Community attitudes to the appropriation of mobile phones for monitoring and managing depression, anxiety, and stress. *J Med Internet Res* 2010;**12**:e64.
- 6 Annual Report 2014–15. Department of Telecommunications, Ministry of Communications and Information Technology, Government of India, New Delhi. Available at www.dot.gov.in/sites/default/files/English%20AR%202015.pdf (accessed on 20 Feb 2017).
- 7 Ben-Zeev D, Davis KE, Kaiser S, Krzsoš I, Drake RE. Mobile technologies among people with serious mental illness: Opportunities for future services. *Adm Policy Ment Health* 2013;**40**:340–3.
- 8 Torous J, Friedman R, Keshavan M. Smartphone ownership and interest in mobile applications to monitor symptoms of mental health conditions. *JMIR Mhealth Uhealth* 2014;**2**:e2.
- 9 Sood M, Chadda RK, Sinha Deb K, Bhad R, Mahapatra A, Verma R, et al. Scope of mobile phones in mental health care in low resource settings. *J Mobile Technol Med* 2016;**2**:33–7.
- 10 Ericsson Mobility report on the pulse of the networked society, June 2015. Available at www.ericsson.com/res/docs/2015/ericsson-mobility-report-june-2015.pdf (accessed on 12 Jun 2015).
- 11 Harrison V, Proudfoot J, Wee PP, Parker G, Pavlovic DH, Manicavasagar V. Mobile mental health: Review of the emerging field and proof of concept study. *J Ment Health* 2011;**20**:509–24.
- 12 Mohr DC, Burns MN, Schueller SM, Clarke G, Klinkman M. Behavioral intervention technologies: Evidence review and recommendations for future research in mental health. *Gen Hosp Psychiatry* 2013;**35**:332–8.
- 13 Španiel F, Hrdlička J, Novák T, Kořený J, Höschl C, Mohr P, et al. Effectiveness of

- the information technology-aided program of relapse prevention in schizophrenia (ITAREPS): A randomized, controlled, double-blind study. *J Psychiatr Pract* 2012;**18**:269–80.
- 14 Španiel F, Vohlídka P, Kořený J, Novák T, Hrdlička J, Motlová L, et al. The Information Technology Aided Relapse Prevention Programme in Schizophrenia: An extension of a mirror-design follow-up. *Int J Clin Pract* 2008;**62**:1943–6.
- 15 Komatsu H, Sekine Y, Okamura N, Kanahara N, Okita K, Matsubara S, et al. Effectiveness of Information Technology Aided Relapse Prevention Programme in Schizophrenia excluding the effect of user adherence: A randomized controlled trial. *Schizophr Res* 2013;**150**:240–4.
- 16 Granholm E, Ben-Zeev D, Link PC, Bradshaw K, Holden JL. Mobile Assessment and Treatment for Schizophrenia (MATS): A pilot trial of an interactive text-messaging intervention for medication adherence, socialization, and auditory hallucinations. *Schizophr Bull* 2012;**38**:414–25.
- 17 Montesa JM, Medina E, Gomez-Beneyto MJ. A short message service (SMS)-based strategy for enhancing adherence to antipsychotic medication in schizophrenia. *Psychiatry Res* 2012;**200**:89–95.
- 18 Faurholt-Jepsen M, Frost M, Vinberg M, Christensen EM, Bardram JE, Kessing LV. Smartphone data as objective measures of bipolar disorder symptoms. *Psychiatry Res* 2014;**217**:124–7.
- 19 Wenze SJ, Arney MF, Miller IW. Feasibility and acceptability of a mobile intervention to improve treatment adherence in bipolar disorder: A pilot study. *Behav Modif* 2014;**38**:497–515.
- 20 Ben-Zeev D. Mobile technologies in the study, assessment, and treatment of schizophrenia. *Schizophr Bull* 2012;**38**:384–5.
- 21 Van Os J, Delespaul P, Barge D, Bakker RP. Testing an mHealth momentary assessment routine outcome monitoring application: A focus on restoration of daily life positive mood states. *PLoS One* 2014;**9**:e115254.
- 22 Ainsworth J, Palmier-Claus JE, Machin M, Barrowclough C, Dunn G, Rogers A, et al. A comparison of two delivery modalities of a mobile phone-based assessment for serious mental illness: Native smartphone application vs text-messaging only implementations. *J Med Internet Res* 2013;**15**:e60.
- 23 Furber GV, Crago AE, Meehan K, Sheppard TD, Hooper K, Abbot DT, et al. How adolescents use SMS (short message service) to micro-coordinate contact with youth mental health outreach services. *J Adolesc Health* 2011;**48**:113–15.
- 24 Vidrine DJ, Arduino RC, Lazev AB, Gritz ER. A randomized trial of a proactive cellular telephone intervention for smokers living with HIV/AIDS. *AIDS* 2006;**20**:253–60.
- 25 National Mental Health survey of India, 2015-2016. Available at www.nimhans.ac.in/sites/default/files/197/National%20Mental%20Health%20Survey%20-2015-16%20Summary_0.pdf (accessed on 20 Feb 2017).
- 26 Mental Health Atlas 2011 Country Profile India. Available at www.who.int/mental_health/evidence/atlas/profiles/ind_mh_profile.pdf (accessed on 20 Feb 2017).
- 27 Sood M, Chadda RK. Psychosocial rehabilitation for severe mental illnesses in general hospital psychiatric settings in India. *BJ Psych Int* 2015;**12**:47–8.
- 28 Chadda RK, Prashanth R. Allied mental health professionals: Clinical psychologists, psychiatric nurses and psychiatric social workers: Availability and competency. In: Trivedi JK, Tripathi A (eds). *Mental health in South Asia: Ethics, resources, programs and legislation*. New Delhi: Springer India; 2015:221–32.
- 29 Gogia P. Letter from Ganiyari. Mental healthcare: The telepsychiatry way. *Natl Med J India* 2015;**28**:153–4.
- 30 Chadda RK. Caring for the family caregivers of persons with mental illness. *Indian J Psychiatry* 2014;**56**:221–7.
- 31 Brian RM, Ben-Zeev D. Mobile health (mHealth) for mental health in Asia: Objectives, strategies, and limitations. *Asian J Psychiatry* 2014;**10**:96–100.
- 32 Papadimitriou N, Housen T. Use of mobile technologies in data collection for a mental health survey in Kashmir, India: A pilot study. *MeIdecins Sans Frontières (MSF)*, New Delhi, India, 2016. Available at www.msfindia.in/sites/india/files/8_final_atc_mobile_technologies_kashmir.pdf (accessed on 10 Jun 2015).
- 33 mh2: Mobile health for mental health. WHO and LSHTM. A global health of mental innovators. Available at <http://mhinnovation.net/innovations/mh2-mobile-health-mental-health/#.VXQSnYQxH-Z> (accessed on 10 Jun 2015).
- 34 Mobile technology for mental health for students in Indian universities. Available at www.consano.org/projects/58-mobile-technology-for-mental-health-for-students-in-indian-universities (accessed on 10 Jun 2015).