



Determinants of readiness to adopt mHealth in a rural community of Bangladesh



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ARTICLE INFO

Article history:

Received 2 April 2015

Received in revised form 20 June 2015

Accepted 25 June 2015

Keywords:

Access

Bangladesh

Health services

mHealth

Mobile phone

Technology adoption

Readiness

ABSTRACT

Introduction: Evidence in favor of mHealth for healthcare delivery in settings where trained health workforce is limited or unavailable is accumulating. With rapid growth in access to mobile phones and an acute shortage of health workforce in Bangladesh, mHealth initiatives are increasing with more than 20 current initiatives in place. “Readiness” is a crucial prerequisite to the successful implementation of telehealth programs. However, systematic assessment of the community readiness for mHealth-based services in the country is lacking. We report on a recent study describing the influence of community readiness for mHealth of a rural Bangladesh community.

Methods: A conceptual framework for mHealth readiness was developed, which included three categories: technological, motivational and resource readiness. This guided the questionnaire development for the survey conducted in the Chakaria sub-district of Bangladesh from November 2012 to April 2013. Multivariate logistic regression was used to examine ownership of mobile phones, use of the technology, and knowledge regarding awareness of mHealth services as predictors of the community readiness to adopt mHealth.

Results: A total of 4915 randomly selected household members aged 18 years and over completed the survey. The data explained the sub-categories of the readiness dimensions. In terms of access, 45% of respondents owned a mobile phone with ownership higher among males, younger participants and those in the highest socioeconomic quintiles. Results related to technological readiness showed that among mobile phone owners, 50% were aware of SMS but only sending and receiving SMS. Only 37% generally read the received SMS. Only 5% of respondents used the internet capabilities on their phone and 25% used voice messages. The majority (73%) of the participants were interested in joining mHealth programs in the future. Multivariate analysis showed that ownership of a mobile phone (aOR 1.3, 95% CI 1.1–1.5), younger age (aOR 2.6, 95% CI 2.1–3.3), males (aOR 1.8, 95% CI 1.6–2.1), educated respondents (11 years or more education) (aOR 11.1, 95% CI 6.2–19.2) and those belonging to the highest socio-economic group (aOR 3.7, 95% CI 2.9–4.7) were significantly independently associated with knowledge regarding awareness of current mHealth services.

Conclusions: We developed a conceptual framework to assess community readiness for mHealth. We described three high level dimensions of readiness and have partially tested the conceptual framework in a rural sub-district in Bangladesh. We found that the community has some technological readiness but inequity was observed for human resource readiness and technological capabilities. The study population is motivated to use mHealth. Our conceptual framework is a promising tool to assist policy-makers in planning and implementing mHealth programs.

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1. Introduction

mHealth, using mobile phone and multimedia technologies, has been successfully used, particularly in resource-poor settings, to increase access to primary healthcare, real time diagnosis and treat-

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ment, health education, emergency medical response, and data collection in disease surveillance [1–15]. Evidence in favor of its usefulness is accumulating. In resource poor countries, mHealth systems can act as a catalyst for providing basic health services to populations living in rural and remote settings, where health care facilities are either non-existent or of extremely poor quality [1,4,16,17]. According to the World Health Organization, more than a quarter of the world's countries, including Bangladesh, have critical healthcare workforce shortages, with a total deficit of 4 million [18]. In Bangladesh, the distribution of the formally trained health workforce is severely skewed toward urban and easily accessible areas [19,20]. mHealth is a low cost, easy access mechanism which is a potentially a viable solution to the population's healthcare needs by making quality health care more accessible, affordable, and effective across the country [21].

Currently there are 113 million mobile phone subscribers in Bangladesh with the penetration of mobile phones increasing rapidly, from 6% in 2005 to 74% in 2013 [22]. High penetration increases the opportunity to deliver health interventions through mobile phones to rural and hard-to-reach populations. In Bangladesh, "Telemedicine link" was the first to be established in 1999 followed by 'Health Line 789', a GSM infrastructure based call center for Grameen Phone [23]. "Health Line 789" started as a unique telemedicine service for its 10 million subscribers and provided real time medical consultations, emergency services, medical information facilities, emergency services, and SMS based laboratory services over mobile phones [24]. There are now 49 million Grameen Phone subscribers and this service has extended to include video calling services, extending the opportunities for mHealth. In addition, "789" has now become a unique number for the majority of mobile phone operators in the Bangladesh to deliver mHealth. As part of the 2008 'Digital Bangladesh' campaign, the public health sector, and private health sectors and non-government organizations (NGOs) have started using mHealth in Bangladesh with approximately 20 mHealth initiatives [25], including primary healthcare, disease surveillance and data collection, health promotion and disease prevention, and health information systems and support tools [26].

The mHealth platform is an inexpensive health services delivery mode for direct consultations with healthcare professionals; text message reminders for medication adherence, healthcare worker adherence to guidelines, post-treatment attendance and real-time SMS tracking of newborns in resource poor setting [6,7,10,27,28]. Like other developing countries, the mHealth services of Bangladesh uses text messages, direct consultations over mobile phones, interactive voice response (IVR) systems and video conferencing [25,26]. The Bangladeshi Government sends health-related text messages to every mobile phone subscriber as part of health awareness campaigns such as the National Immunization Day (NID) campaign. Recently, the Bangladeshi Government has delivered voice messages to mobile subscribers in rural areas with the aim of increasing utilization of community clinic health services for primary healthcare [29].

The barriers to mHealth implementation in the South East Asian region of WHO are: policy, knowledge, technical expertise and cost [30]. To conduct meaningful evaluation of mHealth programs it is important to understand the acceptability of mobile technologies to the general population, in the context of health service and health promotion interventions. Akter et al. examined user perceptions of service quality of a mHealth platform in Bangladesh and found that satisfaction with the services and intended continued future use [31]. However, the perceptions of available mHealth services among the wider population are not known and are needed to guide strategies to improve uptake of mHealth services in Bangladesh. It is important to understand how the community is currently using mobile phones for healthcare; the factors related to their use

for healthcare (mHealth), and the related technological issues and interactions with the user. It is unclear whether mHealth services and associated benefits are equitably accessed and used by community members, particularly the underserved and disadvantaged.

It is important to identify the needs and readiness of the community to adopt eHealth [32]. Readiness assessment needs to consider the technological appropriateness and sociocultural sensitivity of mHealth solutions. The predominantly sociotechnical theories that underpin readiness often include social, infrastructure, political and organizational determinants of success [33], as well as a comprehensive assessment of end-user needs in the home and work environments. The Technology Acceptance Model (TAM), a widely reported model in the information technology/system (IT/S) literature, mainly considers the attitudes, perceived usefulness and perceived ease of use [34]. Unlike the sociotechnical approaches prevalent in health informatics implementation science, it does not consider the influence of human factors, the internal resources of the user or the external environmental and ecological factors such as, barriers to technology adoption and the policy and economic environment. Jimoh et al. asserts the importance of endemic barriers and human factors such as end-user preferences to be considered in developing ICT implementation strategies [35]. This study systematically assessed the factors determining the readiness of communities to adopt mHealth in developing countries. Factors that determine access to eHealth programs include: appropriateness of technology, affordability, capacity, relevant content, integration of technology with existing services, socio-cultural factors, trust, legal and regulatory frameworks, and political will [36].

We identified seven categories of readiness: core readiness, technological readiness, engagement readiness, societal readiness, policy readiness, learning readiness and motivational readiness [33,37,38]. Jannet et al. defined eHealth readiness in rural and remote Canada with three key domains—core readiness, engagement readiness, and structural readiness [33,39,40]. Khoja framed healthcare organizational readiness as core readiness, learning readiness, technological readiness, societal readiness and policy readiness [36]. Li et al. described organizational readiness and pandemic preparedness in China and Australia as motivational preparedness, societal preparedness, engagement preparedness, resource preparedness and technological preparedness [38]. With this background, we formulated a conceptual framework for mHealth readiness in the context of Bangladesh specifically and developing countries generally (Fig. 1). Access to technology depends on socio-demographic factors such as age, gender, socio-economic status, and education [41]. Attitude, intention to use and awareness of the available technologies and services are interconnected [42]. Qualitative studies, including our own (reported elsewhere), showed that trust influences users' perceptions of eHealth services; and health status and information needs can act either as motivators or inhibitors of people's engagement with eHealth services [42–44]. This conceptual model acts within an environment of community resources and prevailing policies and regulations. This model guided the development of our survey instrument.

Our mHealth readiness conceptual model includes three dimensions as follow:

1. Technological readiness: mobile phone access (availability and affordability), technological capabilities ability to operate mobile phones such as the ability to send and receive text messages, listen to voice messages and use mobile phone internet capabilities.
2. Motivational readiness: previous use of mHealth, trust in the mHealth services, intention to use mHealth in the future.
3. Resource readiness (human resource): socio-demographic determinants (age, gender, socio-economic status education) and awareness of mHealth services.

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