International Journal of Humanities
and Social Sciences (IJHSS)
ISSN (P): 2319-393X; ISSN (E): 2319-3948
Vol. 6, Issue 5, Aug - Sep 2017; 139-148


International Academy of Science,
Engineering and Technology
Connecting Researchers; Nurturing Innovations

# ROLE OF MHEALTH TECHNOLOGIES: NEW SKYLINES FOR MATERNAL HEALTHCARE IN INDIA

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## ABSTRACT

The World Health Organization ranked India's health care system at 112 out of 190 countries in the World Health Report, 2000.While the opportunity to enter the market is much ripened; India still spends only around 4.2% of its national GDP as against 18% of the US towards health care goods and services. Further, there is a wide gap between rural and urban people in the health care system of India. This is the most worsening scenario. An astounding 70% of the population, yet lives in rural areas which has no or limited access to hospitals and clinics. As a result, the rural population mostly depends on alternative medicine and government programs in rural health dispensaries. mHealth - the use of mobile and wireless technologies, is the latent possibility to transmute the façade of health service delivery, around the globe in support of achieving the health objectives. The speedy advances in mobile applications and technologies, an upsurge in new opportunities for e-health services, the unrelenting growth of mobile cellular networks are the key elements in driving this change. Developed markets have 100% mobile spread and in Africa, Asia-Pacific and Latin America it is expected to rise to a range of 82% to 119% in 2014. The smart phone adoption as well as the 3G and 4G networks provide a major boost for the use of a mobile platform for extending health care services. In this context, this paper brings the relevant concepts together to describe the opportunities and challenges in optimally using mobile telephony for maternal healthcare in rural India.

**KEYWORDS**: Healthcare, Mobile Phones, mHealth, ICT Media, Health Service Delivery

## INTRODUCTION

In spite of the progresses in medical technologies and an overall increase in income levels, health care continues to face trials of affordability, convolution and access across the world. The rising occurrence of lifestyle driven chronic diseases and ageing populations led to the rise of per capita health care expenditures in developing countries as against to the income levels and inflation rates over the past decade. Yet, there have been analogous improvements in the quality of health care delivery in many countries. In contrast, developing countries basically face the challenge of providing health care access to their citizens. Presently, health care challenges in developing markets are ominously different from developed markets. Although developed markets are primarily challenged with mounting health care costs, poor health care delivery infrastructure constitutes the major constraint in developing countries. Developing countries face the double whammy of managing the rising occurrence of chronic diseases and traditionally prevailing contagious diseases.

There is a noteworthy discrepancy between developed and developing markets in terms of health care access to people. Developing countries have a significantly lower dispersion of hospital beds, physicians, nurses and midwives per 10,000 persons as equated with developed markets. For instance, the number of physicians per 10,000 people in Africa and

Southeast Asia was 2.3 and 5.4 respectively in 2010. In contrast, the corresponding value was 33.3 in Europe and 22.5 in the Americas. The condition is akin when the availability of hospital beds was compared. In 2009, there were -62 hospital beds per 10,000 people in Europe; however, there were only - 9 hospital beds per 10,000 people in Africa.

**Indian Healthcare Scenario**

The World Health Organization ranked India's health care system at 112 out of 190 countries in the World Health Report, 2000.While the opportunity to enter the market is much ripened; India still spends only around 4.2% of its national GDP as against 18% of the US towards health care goods and services. Further, there is a wide gap between rural and urban people in the health care system of India. This is the most worsening scenario. An astounding 70% of the population, yet lives in rural areas which has no or limited access to hospitals and clinics. As a result, the rural population, mostly depend on alternative medicine and government programs in rural health dispensaries. The National Urban Health Mission is one such government program which pays individuals for health care premiums, in collaboration with various local private partners and is also proven ineffective to date. Reversely, the urban centers have numerous private hospitals and clinics that provide quality health care. These urban clinics have better doctors, access to preventive medicine, and quality centers, which are a result of better profitability compared to the non-profitable rural areas.

Apart from the rural, urban gap, additional key aspect of India's healthcare scene is the high expenditure paid out of pocket. This indicates that most Indian patients pay for their hospital visits direct and for doctor's consultations straight up cash with no alternative arrangements for payment. Only 5 percent of Indians are covered by health insurance policies as according to the National Commission's report on Macroeconomics of the World Bank. This low figure is out of the burgeoning health insurance market available only for the urban, middle and high income people. Positively the permeation of the health insurance market is increasing over years and is one of the fastest growing segments of business in India. The Government of India is playing a vital role in making many safe health insurance programs for high risk population and takes regulatory action on the private insurance markets. Such programs include Community Health Insurance program for the people below the poverty line and LIC Policy for senior citizens. Despondently, quality sanitation is available to a small percentage of the population and is a key concern to be fastened. Only 30% of the total healthcare share is spent towards basic health care, which is a tiny part of the figures of the US and UK. The doctor-to-patient ratio in rural India stands at 1:30,000, as per the Health Ministry statistics, well below the WHO's recommended 1:1,000.

The health and wellbeing of citizens are perhaps more important than anything else to emerge as a global power. The effective and comprehensive health care system ensures such a vision. However, assessments about India's healthcare—widening of access, spending, and capacity—are often austere. Yet there has been renewed attention within India to health reform and universal health coverage in particular. Among other suggestions to improve care, companies should control information technology (IT) to create patient-centric healthcare systems that can improve response times, reduce human error, save costs and impact the quality of life.

**What is mHealth?**

mHealth - the use of mobile and wireless technologies is the latent possibility to transmute the façade of health service delivery around the globe in support of achieving the health objectives. The speedy advances in mobile applications and technologies, an upsurge in new opportunities for e-health services, the unrelenting growth of mobile cellular networks

are the key elements in driving this change. Developed markets have 100% mobile spread and in Africa, Asia-Pacific and Latin America it is expected to rise to a range of 82% to 119% in 2014. The smart phone adoption as well as the 3G and 4G networks provide a major boost for the use of a mobile platform for extending health care services. 70% of low and middle income countries are going to form in the major chunk of 7 billion wireless subscribers as according to International Telecommunication Union (ITU). The viability of mobile device is higher than ever in supporting health care. Mobile health using mobiles for communicating and providing health care services or attaining health outcomes – stances a significant inflection point.

mHealth is largely viewed as the delivery of healthcare services and information, through and with mobile. But the services available in the global markets vary in their level of sophistication. An all-encompassing and inclusive healthcare management beyond face to face contact is provided by health care providers apart from stagnant information about the disease in some cases. Developing countries have long established the need for using suitable ICT interventions in solving problems in the healthcare sector, mobile telephony is an adoptive gadget with speedy growth. The launch of mHealth – the combination of mobile technologies into health care and the delivery took its humble beginning with the ubiquity of mobile technologies. mHealth is groundbreaking and fast growing area that has an imminent effect to redress certain public health trials in the developing countries, where the use of mobile phones is booming.

The GSM Association reports commercial wireless signals cover over 85% of the world's population, extending far beyond the reach of the electricity grid. For the first time the World Health Organization's (WHO) Global Observatory for e-Health (GOe) has sought to determine the status of mHealth in Member States; its 2009 global survey contained a section specifically dedicated to mHealth. Completed by 114 Member States, the survey, renowned for analysis four facets of mHealth; adoption of initiatives, types of initiatives, status of the evaluation, and barriers to implementation. Fourteen categories of mHealth services were surveyed: health call centers, emergency toll-free telephone services, managing emergencies and disasters, mobile telemedicine, appointment reminders, community mobilization and health promotion, treatment compliance, mobile patient records, information access, patient monitoring, health surveys and data collection, surveillance, health awareness rising, and decision support systems (WHO, 2011).

The survey shows there is an upsurge of activity. The majority of Member States (83%) reported offering at least one type of mHealth service. However, many countries offered four to six programs. The four most frequently reported mHealth initiatives were: health call centers (59%), emergency toll-free telephone services (55%), managing emergencies and disasters (54%), and mobile telemedicine (49%). With the exception of health call centers, emergency toll-free telephone services, and managing emergencies and disasters, approximately two thirds of mHealth programs are in the pilot or informal stage. Consistent with eHealth trends in general, higher-income countries show more mHealth activity than do lower-income countries. Countries in the European Region are currently the most active and those in the African Region the least active. mHealth is more easily incorporated into processes and services which historically use voice communication through conventional telephone networks. This would elucidate why the majority of countries is already offering health call centers, toll-free numbers and emergency services using mobile communications. The least frequently seen is the use of mHealth in surveillance, raising public awareness, and decision support systems. These require enhanced capabilities and infrastructure to implement, and therefore may not be a health priority in Member States with financial constraints.

In India, Telecom Regulatory Authority of India (TRAI) preserves and publishes data on telephone subscriptions. According to TRAI, India has some 976 million mobile subscribers by the end of May 2015, compared to944million the previous year. In a country of 1.29 billion people, this annual growthof48per chant means 43percenttele-density in rural India. Mobile telephony has covered a substantially higher number of rural households even though this coverage appears to be low. The mobile phone coverage is already comparable to that of popular media like radio and television, which have been used for dissemination of health awareness for many decades now. For many years to come, mobile telephony will remain perhaps the most accessible ICT media in rural India.

Speedy espousal of mobile telephony in rural India and non-existence of other information and communication technology, media; have driven the social sector to make use of mobile communication as a steady and effective ICT media. The efficacy and all-round role of mobile communication in the health sector is apparent in many intervention studies and projects in low resource settings of developing countries. Particularly, the delivery function of public health programs can be better enhanced by using prompts and reminders through SMS and voice calls for the health workforce. In Orissa, mobile videos were influential in recuperating the quality of counselling among the community health workers. These messages have been successfully used in assisting the beneficiaries attain their health behaviour goals. Improvement in quality and timeliness of data can help the health system vigorously manage the delivery and promotion functions.

**Maternal Mortality in Focus**

According to World Health Organization (WHO), around 830 women died every day from the problems in pregnancy and Childbirth in 2015, of whom only 5 women are from high income countries and the rest of the women lived in low income countries. In 2000 UN development agenda commitment was made to achieve the Millennium Development Goals and the Member States pledged to work towards reducing three quarters in 1990 maternal mortality ratio by 2015. This objective along with achieving universal access to reproductive health formed the target for improving maternal health. In this direction, a number of initiatives were established to galvanize efforts towards reducing maternal mortality. While 85% of pregnant women access antenatal care with skilled health personnel at least once globally, only 6 in 10 i.e., 58% receive at least four antenatal visits. Very few women received at least four antenatal visits in the regions of highest rates of maternal mortality like sub-Saharan Africa and South Asia.

Population, health and development have strong relationships with each other. The largest population is not the problem in magnitude of India's health challenges, but they are intricate due to diversity, the unceasing poverty and inequality. The inter-state variations and cultural diversity are at different phases of demographic conversion, epidemiological transition and socioeconomic development. The prevalence of communicable diseases and high maternal mortality in some parts of India are the old problems which need to be addressed with the emerging issues like the threat of non-communicable diseases, HIV AIDS and health issues of the growing aging population. Speeding demographic changeover is not only necessary for the population stabilization, but it is closely related to health targets. Mortality reduction perceptibly depends on the morbidity diminution and is closely allied with the success of the health programs. Improvement of health of women and children is more possible with the reduction in maternal mortality, infant and child mortality through slower population growth with the use of contraceptives and fertility reduction.

Every day in 2015, about 830 women died due to complications of pregnancy and child birth. Almost all of these deaths occurred in low-resource settings, and most could have been prevented. The primary causes of death are

haemorrhage, hypertension, infections, and indirect causes, mostly due to interaction between pre-existing medical conditions and pregnancy. Of the 830 daily maternal deaths, 550 occurred in sub-Saharan Africa and 180 in Southern Asia, compared to 5 in developing countries. The risk of a woman in a developing country dying from maternal-related causes during her lifetime is about 33 times higher compared to a woman living in a developed country. Maternal mortality is a healthy indicator that shows very wide gaps between rich and poor, urban and rural areas, both between countries and within them. The number of women dying due to complications during pregnancy and childbirth has decreased by 43% from an estimated 532000 in 1990 to 303000 in 2015. The progress is notable, but the annual rate of decline is less than half of what is needed to achieve the Millennium Development Goal (MDG) target of reducing the maternal mortality ratio by 75% between 1990 and 2015, which would require an annual decline of 5.5%. The 44% decline since 1990 translates into an average annual decline of just 2.3%. Between 1990 and 2000, the global maternal mortality ratio decreased by 1.2% per year, while from 2000 to 2015 progress accelerated to a 3.0% decline per year. The advance is largely due to key government interventions such as the Janani Shishu Suraksha Karyakaram (JSSK) scheme, which encompasses free maternity services for women and children, a nationwide scale-up of emergency referral systems and maternal death audits, and improvements in the governance and management of health services at all levels. However, adolescent and illiterate mothers and those living in hard to reach areas still have a much greater chance of dying in childbirth. Adolescent girls outside Indian cities are especially vulnerable as teenage marriage and pregnancies are very high in rural and remote areas of the country (UNICEF, 2015). Government of India is committed to the goal of 'Health for All'. The obligation of the Government to ensure the highest possible health status of India's population and access to quality health care has been recognized by a number of key policy documents.

E-mamta is the project of Gujarat government, which aims to minimize mother and infant death rate by providing vital health services at Pre and post- delivery time. The Gujarat government has created an E-mamta software, to help the National Rural Health Mission (NRHM) and National Informatics Centre (NIC). This software will register and keep a track of pregnant women and children between the age group of zero to six. It will also track pre and post-delivery check-up of mothers and vaccination and growth charts of children. Parents will be informed about their next action in prior through SMS. The District Medical &Health office (DM&HO), Hyderabad initiated a project to track maternal and child health outcomes in slums of Hyderabad using mobile phones. The Centre for Good Governance (CGG) has developed a mobile phone based maternal and child health outcome tracking system (mHealth) which is used by ANMs to register Antenatal Cases (ANCs) and track the pregnant woman through the entire chain of events involving ANC checkups, delivery, Postnatal Checkups (PNCs), and all the immunizations over the entire15 month period. The project was launched officially in June-2012 and is currently being implemented in 32 UHPs (Urban Primary Health Centers) in the Hyderabad district. Despite these promises, certain technological and programmatic challenges impede the adoption of mHealth in a large scale across the health system. There are many areas of research and development opportunities for organizations to collaborate.

**Appetite for mHealth in India**

There is an increasing demand for mHealth in India evidentially proven in a study undertaken by Wipro and the Internet and Mobile Association of India (Wipro and IAMAI Research, 2012).Most of the health programs normally consist of three common functions namely – i) ***delivery*** which engages the medical practitioners and health workers for

conducting diagnosis and provide care, ii) ***promotion*** to create knowledge among the target audience and help them adopt objective healthy behaviours and iii) ***monitoring and evaluation*** to improve the delivery and promotion functions.

**mHealth Transforming the Face of Health Service Delivery**

Mobile technology leaves dramatic influence on the way health care is delivered to both rural and urban communities. Recognized as mHealth, it has incredible potential to strengthen health care systems in low and middle income countries by providing better access to knowledge and information, enhanced service delivery and less response time during crises. eHealth initiatives have received a big boost nowadays, through the rapid explosion in mobile technology, especially in India through mobile networks and devices. There is a lot of improvement in the situation in many developing countries where the lack of stable internet and the telephone network hampered a decade back on the use of eHealth programs. The diffusion of mobile phone networks in lower and middle income countries improved other infrastructural facilities like roads, electricity and cable internet deployment.

The Timeliness, coverage and qualitative diagnosis, care help in improvement of delivery quality. The NGOs working in this area were able to use a computerized database of beneficiaries who are unable to receive main services of maternal health care such as family planning, child health and personal hygiene. These lists are very much helpful for the health supervisors and workers to reach out those beneficiaries in the State of Gujarat. A similar method is used in Tamil Nadu also in Pregnancy and Infant Cohort Monitoring System, which is a web-based data bank helped in the presentation of social, health and maternity benefits for the pregnant women and infants in the State. The data procured through this method is used to provide a cash benefit to the eligible families in benefit scheme. But the follow-up action is not taken up in this case by the health workers. The adoption of the beneficiary tracking system encourages the country's national health ministry across the country. This system should also generate actionable information for the health workers and supervisors on the due dates for delivery. This program in order to give maximum coverage, an authenticated mechanism is used to collect data with the use of mobile tools by health workers.

The Government of India recognizes the value of Community Health Workers owning mobile phones and some states are purchasing mobile phones for these workers. The Government of Madhya Pradesh distributed SIM cards to nearly 80,000 ASHAs (Accredited Social Health Activists) and ANMs (Auxiliary Nurse Midwives). Similarly the Government of Uttar Pradesh distributed a basic mobile phone with a SIM card to all ASHAs and ANMs in its state.

## PROMOTION

Apart from various fundamental rights, health care is the most significant right of individuals. But due to lack of qualitative amenities, infrastructure, shortage of qualified medical personnel and access to life saving medicines and facilities only 60% of the population in India could avail this right and the remaining 700 million population lives in rural areas in awful medical conditions. Having understood these disparate facts, there is an essential need for new practices and processes to extend quality and timely health care to reach underprivileged areas of the Indian villages. There are lots of gaps in the implementation of various policies and programs of the government to ensure the success and effectiveness. The Primary Health Care Centres are limited in number and many of them do not have sufficient staff, technical assistants and pharmacists in rural areas. The statistics indicate that India accounts for the largest number of maternal deaths and especially in rural areas where miserable maternal health care is prevalent and it is so with the private sector as well which is only confined to family planning and antenatal care. They are refraining from the critical services

such as labour, deliver and survival complications. Further, due to these insufficient facilities, private health sector became the first preference and 92% of health care visits are recorded to private providers rather than public hospitals run by the government. The private initiative in this regard is highly expensive, unregulated, unreliable and unaffordable for the low income groups. Thus the low quality health care, poor access, non-accountability is the main challenges to be taken effectual care to control the spread of diseases. There are successful communication initiatives; in helping smokers quit, in increasing fruit and vegetable intake and promoting breastfeeding for many decades. The mass media tools such as newspapers, radio and TV are highly helpful in behavioural change communication, for a long time. In developing countries, folk media are powerful and are rampantly used for the promotion of health awareness. The media promotional messages only carry information on the importance of a good healthy practice, but it is not possible to explain the place and time of immunization. Mere providing awareness is not sufficient to motivate for the adoption of a healthy behaviour.

Some vital health practices such as breastfeeding and chronic health care, etc. require a change in the perception. The mobile phone messages through SMS, alerts and calls have proved to be effective in convincing the target group towards self- support, social benefit and quality care. In a context, mHealth can be blended with the strategies of interpersonal communication which constitutes out to be a very effective method to match the traits of beneficiaries. There is a proven research at the field level with the implementation of mobile communication for the behaviour change in many developing countries including India. The research team of the University of California developed many mobile videos for the help of community health workers in suggesting the pregnant women in rural areas of Orissa. They presented the message to convince pregnant women to go for the best health practices, encouraged ASHAS to provide appropriate counselling to access health related services. The videos were technologically viable to impressively show on the dangers of anemia used with animated actors and in the form of lectures from credible resource persons on the consumption of iron, vegetables and fruits. The videos are converted with multimedia tools for the availability in the mobile phones (Nokia). The mobile video project set out an effective tool in behaviour change and delivery in the state of Orissa.

**Appraisal and Assessment**

In order to monitor the progress of the health care system, the customary way of data collection and analyses is through Health Management Information Systems. The National Rural Health Program in India used to record the health care information in paper based formats which were not of effective use. In this context mobile devices will be of use in data collection and reporting through improvement in quality data, faster collection of information and service delivery to help the users. The usage of mobile phone has been started in Tamil Nadu and Gujarat in India for HMIS.

**Key Drivers of mHealth Projects in India**

As part of the e - Government Program, mobile communication in the form of SMS and calls are being used by different government departments in many public service delivery projects all over India. Especially, in Gujarat, Tamil Nadu, Chhattisgarh, SMS is wide used to inform beneficiaries of public distribution system. In Bihar also, various government schemes have been implemented on the SMS Based system for sending daily progress. In spite of these achievements in blending mobile phone for various government schemes, mHealth progress is rather not up to expectations. Many mHealth projects began around 2008. But the large scale use of mobile technology for health is not in place due to the main barriers like poor network coverage, security and privacy of healthcare information about

individuals, literacy issue to understand the message. The health workers are also to be convinced to collect data using SMS and other mobile forms. Hence, further research is required to completely and optimally use mobile technology in health care promotion in rural areas. The basic challenges in the proper implementation of mHealth are integration of medical devices, adoption of a multidisciplinary approach, capacity building in health research institutions so as to design and implement mHealth strategies in the fields.

**Challenges of mHealth Remedies**

Despite growing demand, there are important challenges which need to be focused. It is essential to ensure the security and safety and confidentiality of personal data, keeping in view the Health Insurance Portability. There is a need for proper regulations to ensure high accountability. There is a problem with the poorly developed and executed mobile apps and if the users are held up while using the mobile application, they lose interest in utilizing the service. The market instability, change of consumer choices, change of market trends are some of the associating problems with the usage of mobile technology. There is a need for carrying out innovations for the widest participation of consumers. The existing health IT systems are to be integrated with the mobile apps by reducing all the loop holes.

## OPPORTUNITIES & CONCLUSIONS

There is a possibility of undertaking research and development in allied areas of health care such as medical devices, data collection, confidentiality, privacy maintenance and language. The Cheap, low cost, mobile medical conditions be made available to rural people involving educational institutions, students, professionals, mobile app developers, R&D organizations. The health behaviour studies, cost effective interventions can be tried through social science methods. The cost effective data security concerns be deployed to safeguard the patient data.

Thus mHealth has the potential of transforming the health care landscape in rural India, which is more composed of underprivileged sections of the population.

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