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How mHealth can revolutionise the Indian healthcare industry





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Introduction

A mobile phone is a multipurpose and powerful device capable of performing a number of tasks that are beyond its primary purpose of communication. There is a lot of hype around mobile technology, especially smartphones, and a number of new and innovative functionalities and/or apps which are capable of addressing needs in new areas are being launched daily. People have started using mobile phones for a large number of activitiesbanking; shopping; communicating; watching games, movies and videos; listening to music; surfing for news, travel information, etc. Clearly, the impact of mobile technology on our day-to-day lives is growing every day. Smartphones and mobile apps are a powerful combination that has made it very easy and convenient to perform various routine to complex tasks.

Mobile technology is making huge inroads even in the healthcare space. mHealth (or mobile health) is commonly defined as the provision of health services through mobile technologies. mHealth is about leveraging mobile and wireless devices to improve health outcomes. The service could be as simple as using the mobile's SMS function to send alerts and reminders or leveraging inbuilt mobile sensors or apps to capture and interpret clinical data.

In India, there is considerable potential to leverage mHealth as an alternative healthcare delivery channel. Structural, financial and behavioural factors have created a significant need for such a channel. The structural issues are basic. The Indian patient base is rising and distributed. Access to even basic healthcare is a challenge because the supporting infrastructure and resources are inadequate. Financial constraints like rising healthcare costs and limited budget allocation for healthcare by the government further constrain the healthcare ecosystem in India. Behavioural factors such as change in lifestyle have resulted in newer types of diseases which require access to specialists who are few in number and cannot be reached through traditional means of healthcare delivery. Also, the population is getting more tech-savvy and demanding easier and convenient means to receive care.

Structural	
Rising patient base with limited access	Inadequate healthcare resources
Financial	
Rising healthcare costs	Limited budget allocation
Behavioural	
Changing disease types	Changing patient behaviours

Alternative healthcare delivery through technology interventions like mHealth

Source: PwC analysis

The scope for leveraging mHealth as an alternate delivery channel in India is substantial. As of January 2017, the global average for mobile Internet traffic as a percentage of the total web traffic is 50%. India ranks second on this parameter at 78%.1 Clearly, more and more Indians are accessing the Internet on their mobile phones. This significant behavioural change is an important factor for mHealth adoption.



Mobile traffic is growing very fast year on year and is expected to grow seven-fold from 2016 to 2021, globally as well as in India. Indians have started spending more and more time on their mobile phones. An average Indian spends around three hours on his/her smartphone daily.² Mobile technology has the potential to impact every aspect of our lives, including health and wellness.



'Globally, mobile data traffic will grow 7-fold from 2016 to 2021, a compound annual growth rate of 47%. In India, mobile data traffic will grow 7-fold from 2016 to 2021, a compound annual growth rate of 49%.'

Source: CISCO, VNI Mobile Forecast Highlights, 2016-2021

This report explores the applicability of mHealth in the Indian context by looking at the barriers to, relevance and feasibility of mHealth. It also provides pointers on how mHealth can be leveraged to improve care outcomes in India

¹ Statista (https://www.statista.com/statistics/430830/share-of-mobile-internet-traffic-countries/)

² Mobile Marketing Association. (2016). Kantar IMRB & MMA smartphone usage and behaviour report [overview] – India, 2016-17. Retrieved from http:// www.mmaglobal.com/files/documents/mma_kimrb_smartphone_report_overview.pdf

Relevance of mHealth in India

Need for newer means of providing quality care

India needs newer and innovative ways like mHealth to provide care and compensate for the deficiencies of the healthcare workforce and infrastructure. The country does not meet the minimum WHO recommendations for healthcare workforce and bed density. A large segment of the population resides in rural areas, where the numbers are even worse. In particular, the low-income group lacks access to quality healthcare.



Source: PwC analysis

Additionally, there are some worrying statistics on the Indian healthcare ecosystem. In fact, a large segment of the population is deprived of even primary healthcare

Snapshot of Indian healthcare ecosystem



Indians do not have access to primary healthcare facilities.



India's healthcare infrastructure is limited to the top 20 cities.

of the global

Source: PwC, "The healthcare agenda" (2015)

21%

30%

Indians fall below the poverty

line each year because of

healthcare expenses.

-0

India accounts for 21% disease burden.



Interest in leveraging mHealth as a means to improve health outcomes

Unless there is an interest or demand, mHealth is unlikely to succeed. According to data gathered from Google Trends, a tool which helps understand the relative interest in a particular search term, India ranks among the top five countries for search terms like 'mobile health', 'health apps', 'medical apps' and 'mHealth'. This confirms that the Indian population is interested in mHealth.



Source: Google Trends (June 2017)³



³ Source: Google trends. 2017. Note: A higher value means a higher proportion of all queries, not a higher absolute query count

Factors driving providers and patients to leverage mHealth



India Emerging countries (excluding India)

Source: PwC analysis based on EIU research (2012)

Top drivers for providers to adopt mHealth in emerging countries and India

Lower overall cost of care for for patients Reach previously unreachable patients Reduction in administrative time



India Emerging countries (excluding India)

Source: PwC analysis based on EIU research (2012)



60%

Current challenges for mHealth adoption in India

mHealth has impacted the healthcare ecosystem in emerging countries and it can be expected to yield positive results in India too. This technology can help in improving accessibility, reducing healthcare costs and increasing the healthcare workforce productivity in India. However, a number of barriers are limiting the impact of mHealth in the Indian healthcare sector.



Source: PwC analysis

Huge volume and fragmented market

More than 1,65,000 mHealth applications are available across the iTunes and Android app stores.⁴ Many mHealth apps are of dubious origin and abandoned by the developer after an initial release or one update. The applications may or may not work from both a clinical and technical perspective. There is no way for a prospective user to know which apps can be trusted. The number of downloads can be a parameter, but it is definitely not a reliable one as most mHealth apps are not able to retain their users. Further, most mHealth app reviews are provided by users in the app store. Thus, ratings tend to be based on personal impressions (e.g. ease of use and intuitiveness of user interface) rather than on clinical performance determined by clinical trials, evidenced-based outcomes or even professional reviews. The user reviews rarely assess technical considerations such as frequency of updates and bug fixes, interoperability, and adherence to technology, privacy, and security standards.



The number of mHealth apps exceeds 165,000, with 40% of the apps having fewer than 5,000 downloads.

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Source: IMS Institute for Healthcare Informatics (September 2015)

Lack of awareness

mHealth has made a huge difference in countries similar to India. Also, a number of existing mHealth apps have the potential to make a difference. The Government of India has launched a few mHealth initiatives. However, lack of awareness is a huge deterrent. The need of the hour is to make the population, including patients and providers, aware of this new channel and its benefits.

Poor infrastructure and security concerns

Lack of good infrastructure is a major challenge in India. Even basic infrastructure is missing in many places. The rural population has very poor network connectivity. Most of the poor population cannot afford to buy a decent smartphone which will give them access to mHealth. In addition, if the infrastructure is present, then security and privacy are major concerns. In the case of mHealth apps, there is no way to know if the app developer has taken appropriate measures to ensure security and protect his/her app against malicious attacks.



India's rank among the 138 participating countries: • 120th on ICT use

- 68th on infrastructure
- 95th in health and primar
- 85th in health and primary education
- 117th on Internet bandwidth

Source: World Economic Forum, The Global Competitiveness Report, 2016-17

Low expectations

The key stakeholders in the healthcare community are unable to appreciate the potential of mHealth as there is no large-scale successful precedent in the Indian context. So, the resistance to change and adopt new technology is huge. Even the patient population loses interest if they have an unpleasant experience with an mHealth app. Moreover, a large segment of the population is only interested in fitness apps. The low expectations can also be attributed to a lack of understanding of the huge cost benefits. The Indian government has started looking at mHealth apps as a means to improve care outcomes. The website of the National Health Portal, set up by the Ministry of Health and Family Welfare, Government of India, lists a number of mHealth apps that the population can benefit from.

⁴ IMS Institute for Healthcare Informatics. (September 2015). Patient adoption of mHealth. Retrieved from http://www.imshealth.com/files/web/IMSH%20 Institute/Reports/Patient%20Adoption%20of%20mHealth/IIHI_Patient_Adoption_of_mHealth.pdf

Manual intervention

Be it the use of SMS, apps or audio/video consultations, a lot of manual intervention is necessary in the case of mHealth, which makes it unattractive. This is a big deterrent and the main reason most users drop out. There are ways to automate certain aspects and reduce manual intervention. Mobile integration with external devices, sensors and systems can play a big role here. mHealth app developers need to develop APIs/interfaces to extract and capture data automatically wherever possible.

As per a PwC study⁵ conducted in 2012, the top barriers for providers are lack of interest among key users, culture of medical professionals and lack of information on mHealth.



On the other hand, patients find cost, lack of relevant applications and provider's unwillingness to use mHealth to be the top barriers to adoption.



India Emerging countries (excluding India)

Source: PwC analysis based on EIU study



How to drive the adoption of mHealth in India

In order to improve mHealth adoption in India, several structured interventions are required from policymakers and providers.

1. Take advantage of favourable environmental factors.

When it comes to leveraging the power of mobile to improve healthcare outcomes, there hasn't been as much development as was expected. However, this is clearly the right time for healthcare leaders and providers in India to take stock of the situation and invest time and effort in identifying how best they can leverage mobile technology to improve the healthcare outcomes for their doctors and patients. A collective effort will have to be made by all stakeholders in the Indian healthcare ecosystem to achieve wider adoption of mHealth in India. Doctors and leading hospitals will have to lead by example. Patients will have to be diligent in capturing and sharing their clinical data in the right way. The government should support mHealth initiatives by either making resources available or providing incentives.

Environmental factors that support mHealth



mHealth has the potential to positively impact the healthcare ecosystem in India. The benefits of leveraging mHealth are numerous.

A 2013 report by PwC revealed that: 6

- mHealth could provide an additional 28.4 million people with access to the healthcare system in Brazil and an additional 15.5 million people with access in Mexico without adding a doctor.
- By adopting mHealth, total healthcare spend (public and private) could be reduced by 14 billion USD in Brazil and 3.8 billion USD in Mexico while ensuring the same care impact.
- The above savings would be enough to treat an additional 4.3 million patients in Brazil and an additional 2.3 million in Mexico.
- Enhanced productivity could add 4.6 billion USD and 8.4 billion USD to the GDP of Brazil and Mexico respectively through increased wages and taxes.



⁶ PwC (2013). Socio-economic impact of mHealth: An assessment report for Brazil and Mexico. Retrieved from https://www.pwc.in/assets/pdfs/consulting/ strategy/socio-economic-impact-of-mhealth-brazil-and-mexico.pdf

2. Make stakeholders aware of the enabling technology.

There are a number of cases across the globe of governments and foundations leveraging the basic SMS facility of mobile phones to improve health outcomes. Smartphones have several inbuilt features to help capture and transfer a variety of data.

Leveraging mobile phone features for mHealth

- List of key features on a mobile phone:
- Accelerometer 1.
- 2. Temperature
- 3. Gyroscope
- 4. Light
- 5. Magnetometer
- 6. Pressure
- 7. Proximity
- 8. Humidity
- 9. Rotation vector
- 10. Multi-touch display
- 11. Global positioning system (GPS)
- 12. Microphone 13. Camera/video

- 1. Measures the acceleration force applied on the device.
- 2. Measures the ambient room temperature.

- 6. Measures the ambient air pressure.
- 8. Measures the relative ambient humidity.



Source: Android developers



Android developers. API Guides - Sensors Overview. Retrieved from https://developer.android.com/guide/topics/sensors/sensors_overview.html

3. Learn from existing applications of technology

There are some great examples to understand the power of the sensor technology in smartphones. There are opportunities to make significant strides in the leveraging of mobile devices as a diagnostic tool to address several real-life challenges.

Parkinson mPower study app by Sage Bionetworks⁷

- Living with Parkinson's disease means coping with symptoms that change daily. Yet, these daily changes are not tracked frequently enough. Parkinson mPower is a personal tool and research instrument to track symptoms of Parkinson's disease, review trends and share this information with researchers.
- The Parkinson mPower app uses questionnaires, sensor data from your phone and optional wearable device data to help you track your condition 24x7.
- Key features:
 - Innovative activity-based measurements of Parkinson symptoms that include a memory game, finger tapping, voice recording, and walking.
 - Share insights and partner with researchers
 - Get educated about symptom variations
 - Import daily physical activity measurement though Apple Health app

Source: iTunes



⁷ iTunes (https://itunes.apple.com/us/app/parkinson-mpower-study-app/id972191200?mt=8)

Autism & Beyond study 8

- Autism & Beyond is a study of young children's mental health that seeks to better understand and identify risks for development. Autism & Beyond is a groundbreaking new study of childhood mental health powered by Apple's ResearchKit. The study aims to test new video technology that can analyse a child's emotion and behavior. We hope that this technology may one day be used to screen young children in their homes for autism and mental health challenges, such as anxiety or tantrums.
- The app was developed through a partnership between Duke Medicine and Duke University. This study is designed for children who are at least 1 year old and not yet 6 years old. The study has two types of activities:
 - Video activities: Your child will watch four short videos while the iPhone camera records your child's responses.
 - Surveys: You will be asked to complete short surveys about your child and yourself.

How it works

Your child will watch four very short videos. The camera in the iPhone will record your child's reactions to the videos. We automatically locate key features of the child's face so that we can measure emotions and head position.

Source: Autism & Beyond website



8 Autism & Beyond website (https://autismandbeyond.researchkit.duke.edu/)

Approach to test and identify relevant use cases for mHealth

India can benefit significantly from mHealth. Identifying relevant use cases to target by leveraging the available technology is key to driving mHealth adoption and improving care outcomes. As outlined below, this approach will be iterative.

Approach for arriving at relevant mHealth use cases and implementing them in the Indian context

Ideate

- · Define patients' current journey and their current issues/challenges.
- Identify experiences in the current journey to improve upon by leveraging mHealth.
- Discover case studies from other countries, and explore app stores to identify apps that are currently available to improve care outcomes.
- Explore the possibility of leveraging inbuilt sensors, integration with wearables and different information systems.
- Discuss the findings obtained with key stakeholders and finalise the use cases to focus upon.

Design

- Define the contextual future user journeys with the improved outcomes after leveraging mHealth technology and/or integration with wearables and other information systems.
- Identify improvements and/or modifications in the existing examples and available mHealth apps.
- Define success criteria for the user's future journey (i.e. post app deployment).
- Discuss the high-level timelines and estimates with stakeholders and finalise a project plan for deployment.

Construct and deploy

- Develop or refine the identified use case as a proof of concept.
- Start recommending the chosen/developed mHealth use cases/apps to small sets of patients.
- Evaluate periodically against the defined success criteria.
- Obtain patients' feedback on the new use cases/apps.
- Evaluate the mHealth outcomes against the success criteria.

Refine and expand reach

- Leverage findings and feedback from patients, providers and other key stakeholders to improve upon the deployed use cases.
- Keep reviewing the use cases against the defined success criteria to identify opportunities for improvement.
- Slowly but steadily start prescribing the app to all patients.

Approach for arriving at relevant mHealth use cases and implementing them in the Indian context

Source: PwC analysis



Providers are very critical to identifying key use cases, critical challenges and possible benefits. They will also have to play the role of influencers to their respective patients. Although the time and effort that they need to invest may seem like a burden, providers are bound to reap huge benefits for themselves and their patients.



Source: PwC analysis

Illustration of the ideate phase for maternal care and childcare

During the 'ideate' phase, the right ideas and scenarios for mHealth solutions are developed. There are several fields where mHealth can play a critical role in improving outcomes—maternal care and childcare, cardiology, diabetes management and stress management, to name a few.

There is potential for mHealth adoption in maternal care and childcare as a pregnant woman and her family would want to leverage all the available tools to ensure a safe journey and delivery. Moreover, India has very poor infant mortality and maternal mortality rates. The government wants to improve on these aspects, as is evident from initiatives like the Pregnancy Aid Yojana Scheme.

Define the user journey.

As part of ideation, the first step is to define a woman's journey and the various experiences she encounters from the time she gets married and wants to prevent pregnancy to the time she has delivered a baby and has started taking care of it. This should also include the key challenges that she faces during this journey. Further, the key touchpoints and corresponding problems in the overall journey should be identified.

Identify the experiences to improve.

In this case, the experiences that can be targeted for improvement are pregnancy guidance (prevent pregnancy, plan pregnancy, pregnancy guidance), visits by frontline health workers (FHWs)/accredited social health activists (ASHAs) during pregnancy, diet guidance, labour and post childbirth.



Illustrative as-is journey in the maternal and childcare space with key experiences and corresponding challenges

Identify the apps currently available to improve care outcomes.

At this stage, successful case studies or initiatives in a similar context are identified and investigated in order to learn from them. In the case of maternal care and childcare, there are several useful examples from around the world of mHealth technology being implemented with substantial improvement in care outcomes:

- India's Ministry of Health and Family Welfare launched a mobile health service named Mobile Kilkari.⁹ Under this programme, pregnant women and mothers are contacted on their mobile phones and given crucial health information related to their stage of pregnancy or their infant's age.
- Leading foundations have collaborated with each other and with telecom operators to leverage mobile phone services to provide pregnant women with detailed health information about pregnancy across the globe.

⁹ Press Information Bureau, Government of India. (2016). Press release dated 15 January 2016.Retrieved from http://www.pib.nic.in/newsite/PrintRelease. aspx?relid=134503

It is important to identify the relevant success stories, understand the core needs of the ecosystem and then work with the right partners to implement these use cases in India.

App stores should also be explored to find existing and relevant mHealth apps which are capable of improving individual experiences and the overall journey. Popularity and reviews can be used as criteria to identify apps for further investigation.

We found a number of mHealth apps targeted at maternal care and child care. The features available in these apps can help improve individual experiences and the overall journey.

Providers may find the identified applications and their features relevant for their patients or they may want to develop new apps with improved features.



PwC analysis of features available through various mHealth apps that can help improve the maternal care and childcare experience

Note: The information provided here is meant for illustrative purposes only. Thorough due diligence with providers and other key stakeholders must be performed to identify apps that are relevant to the Indian context.

The final step would be to conduct detailed workshops with the providers and validate if the available apps and their corresponding features are good enough, if there is a need to build new apps with some improvisations or if there is a need to build apps on completely new use cases.



The road ahead

While there are huge opportunities for mHealth in theory, realising them will not be easy. The first step is to create awareness about the various possibilities, available technology, successful implementations, as well as the possibility of partnerships with foundations, government organisations, telecom operators, etc. There is also a need to acknowledge the fact that collective and collaborative efforts by the stakeholders in the healthcare industry will be necessary to make mHealth a success in India..

Providers have to lead from the front.

Providers can play an important role in making the mHealth story a reality in India. While there are cases where providers have taken the lead in implementing mHealth initiatives and the results are encouraging, there is a lot of room for growth.

Patients need guidance from their providers to decide which mHealth apps to use. Given the sheer variety of mHealth apps and the lack of clear criteria to determine their reliability and appropriateness, patients are likely to get confused and give up on health apps. Also, there is a risk of patients perceiving mHealth apps as a waste of time if they encounter average, if not bad, apps. Therefore, as domain experts, providers can play the role of influencers and promote mHealth adoption by helping patients to identify the right apps.

Patients are ready to adopt mHealth faster than the health industry itself.

Patients have become more proactive in taking care of their health. Technological innovations will help them overcome the existing barriers and become the demand centres for mHealth. With rising costs, they have started demanding convenience and accessibility through mHealth from their providers. This should serve as an incentive to other stakeholders to focus on innovative ways of leveraging the mHealth technology.

The government is sponsoring and promoting mHealth initiatives.

The government is serious about improving healthcare outcomes in the country by leveraging new and innovative ways like mHealth solutions. A number of mHealth initiatives have been started by the government. It is also collaborating with leading healthcare institutions and foundations to develop solutions for improving the healthcare ecosystem in India.

The Ministry of Health and Family Welfare has notified electronic health records (EHRs) standards for India¹⁰ in consultation with stakeholders. The government will look at providing tax benefits or financial incentives to providers who adopt and then demonstrate the benefits of the mHealth. This will help in increasing mHealth adoption.

Foundations and NGOs will leverage the global experience and means.

There are several cases examples across the globe of foundations and NGOs financing and/or implementing mHealth initiatives successfully. They are sources for first-hand information about the findings and learnings of such initiatives. These organisations are collaborating with providers, the government and consulting firms to drive mHealth adoption in India. The providers who are willing to collaborate will benefit from their expertise and also get financial support.

Telecom operators will leverage mHealth as a new source of revenue.

Finding new revenue sources has been a challenge for telecom operators. Stiff competition has forced them to look at new and innovative ways of generating revenue. Globally, there are a number of examples where telecom operators have collaborated with various institutions and government bodies to push for mHealth. These operators provide mHealth solutions as value-added services. The sharing and transferring of clinical data will also help them increase the data usage on their Internet plans.

Insurance companies are promoting better health through greater patient involvement in care.

Insurance companies have developed apps for patients to record and track their health. Patients who demonstrate improvement in health earn rewards in the form of discounts on premiums.

Technology and consulting firms will facilitate mHealth adoption through innovation.

Finally, it is the technology and consulting firms who need to keep innovating in order to exploit the full potential of mHealth. There are a number of success stories where the basic features of mHealth like SMS and manual capturing of data have resulted in great benefits. There is still huge scope to leverage advanced technologies like sensors, integration with other devices and information systems, and IoT. The task of identifying and implementing the relevant use cases is not an easy one and these firms can help providers in this endeavour.

¹⁰ EHR Standards for India. (2016). Retrieved from https://www.nhp.gov.in/ehr-standards-helpdesk_ms

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PwC India's Healthcare team offers Advisory services in the healthcare sector covering multiple domains such as strategy, business planning, market scan, commercial due diligence, feasibility study, operations improvement, cost reduction, health IT, digital and technology, internal audit and PPPs.

The Healthcare Advisory team of 25 members combines over 40 years of operational experience in setting up and managing hospitals, and over 60 years of healthcare consulting experience. This enables the team to deliver granular strategy and market and operational insights of the highest quality. The team works with leading healthcare providers, medical technology companies, central and state governments, diagnostic players, insurance companies and private equity players on projects both in India and overseas.

Our Social Sector Advisory Services, a division within the GRID practice also works with several government (national and state) departments, IFIs, private players in the social sector on health and nutrition, education and skill development, livelihood, governance, local community development based in urban and rural areas, and women and child development. All these sectors and sub-sectors are multi-dimensional in nature and intricately interconnected through various aspects including grass-roots community development.

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