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mHealth: Can mobile technology improve health in low- and middle-income countries?

Summary

- There are 7 billion mobile phone subscriptions (and counting) worldwide and in the developing world, mobile penetration is at 90%.

- mHealth is the use of mobile technology to improve health at an individual, population or systems level.

- As a tool, mHealth does not work in isolation and should be understood as part of a broad approach to improving health and health systems.

- Pilot mHealth initiatives exist, but few have gone to scale. Taking pilots to scale with in-built evaluation is essential to ensuring robust evidence based policy.

- Public and private investment is needed to ensure that skills are available to conduct large-scale mHealth evaluations.

- Governmental support for the inclusion of proven mHealth initiatives within national health provision is fundamental to the success of countrywide initiatives.

What is the 'm' in mHealth?

mHealth is the use of mobile technology to improve health at an individual, population or systems level. 2015 figures produced by the International Telecommunication Union[1] put mobile phone subscriptions at more than 7 billion worldwide and over 90% penetration in low- and middle-income countries. The proliferation of mobile technology over recent years has generated the potential for mHealth to improve the health of the world's poorest populations by overcoming factors such as low-level literacy, geographic distance to services, social marginalisation, unskilled medical personnel, and lack of financial resources.

Noting the potential for mobile phones to remind HIV patients to take their medication, to offer advice to pregnant women, to collect data on mortality within communities for example, governments are expressing interest in mHealth as a complementary strategy for strengthening health systems and achieving post-2015 health and development targets in low- and middle-income countries. The potential for mHealth to improve access to health services in these countries is also attracting investment by foundations and multi-lateral and bilateral aid agencies. **To improve mHealth strategies, governments, foundations, agencies, corporations and researchers should work in partnership to bridge knowledge and implementation gaps.**

[1] http://www.itu.int/en/ITU-D/Statistics/Pages/facts/default.aspx

Why mHealth is more than just a phone call: penetration, reach and system delivery

The penetration of mobile phone networks in many low- and middle-income countries surpasses other infrastructure such as paved roads and electricity, and often dwarfs access to fixed line internet. Mobile tools are being used to strengthen different parts of the health system through voice, text and data access. These different modes offer the possibility of direct channels of communication with patients via phone calls (personal, automated, or through a free phone number), text messages (including personal text reminders or mass texting for community mobilisation), data transfer for health record tracking or clinical decision support, and mobile telemedicine devices for patient monitoring or diagnosis.

MHEALTH INITIATIVES FROM AROUND THE WORLD

mHealth initiatives are used to **strengthen health systems** and **deliver frontline services across low- and middle-income countries**:
- In rural Malawi, mHealth initiatives were deployed to strengthen the home-to-facility journey of maternal, newborn and child healthcare.
- In Zambia, mHealth initiatives were designed to strengthen health services for mothers and infants, addressing early infant diagnosis of HIV and postnatal care.
- In Bangladesh and India, mHealth has been used to collect data on vital events, such as births and deaths.
- In Uganda, an mHealth project (mTrac) has enabled health workers to text health ministries when essential drug supplies are running low.

mHealth initiatives can also be used to address **behaviour change:**
- In Cambodia, Mobile Technology for Improved Family Planning used a mobile phone based intervention to support behaviour change in post-abortion family planning.
- In India, mobile phones have been used to deliver an audio-visual job aid to educate front line health workers about maternal and child health.

Harnessing mHealth for improved health outcomes

There are a wide range of potential ways in which mHealth in low- and middle-income countries could be harnessed to improve health outcomes at different stages of healthcare provision. These include:

- as a source of data exchange to help answer questions such as 'What is happening at a community level? Are health workers reaching new parts of the community?'

- to check stock levels of essential commodities (e.g. drugs, emergency supplies) and to improve supply chain performance

- to improve the ability to diagnose and track diseases

- to support the performance of health workers based in rural areas through dissemination of clinical updates, learning materials, and reminders

- to expand access to on-going medical education and training for health workers at convenient locations.

Although mHealth has the potential to deliver health services remotely, **commitment to ensuring appropriate investment in**

the human and financial resources required to train, equip and incentivise qualified providers to work in low- and middle-income countries is required.

There are a number of **challenges** for mHealth interventions, including:

- a lack of national policies to inform decision making

- a lack of mHealth initiatives at a national scale

- limited integrated partnerships between national governments and commercial organisations

- limited attention on how to tackle ethical issues around consent, privacy and data protection

- the separation of mHealth interventions from existing health systems.

What evidence is there for mHealth's success?

Evidence base and evidence gaps: mHealth is still a relatively novel phenomenon in low- and middle-income settings. The majority of mHealth initiatives are small-scale feasibility and pilot projects. Moving beyond pilots can help build a robust evidence base. The priority for evidence development should be a focus on impact and implementation processes. The markers of success and benchmarks for evidence are likely to differ depending on the type of health intervention. Nevertheless, **all pilot studies should be designed with subsequent large-scale interventions, which have next steps for evaluation, in mind.**

Detailed descriptions of the intervention should be available to policymakers and clinicians in order to identify **not only what works, but *how* and *why* it worked.** A concerted effort to promote the importance of evaluation and sharing of results can help better determine how to take projects to scale and if there is cost-effectiveness in doing so.

It is important that public policy engages with developments in mHealth. Failure to fully engage with the mHealth culture already underway risks policies for health stagnating, with the potential for broad impacts on healthcare significantly reduced. To limit the risks there are a number of issues to be addressed:

Partnerships are key: Competing health system priorities are seen as one of the greatest barriers to increased adoption of mHealth solutions. One important obstacle is the relationship between stakeholders. Governmental and commercial (e.g. mobile phone

companies) buy-in from the outset and integration of an mHealth strategy into national health policy often increase the success of mHealth initiatives. For example, mobile phone companies can increase the financial viability of mHeath projects.

Embedding mHealth initiatives into national health strategies can help generate wider reach and increase success rates. Making nationally integrated health systems a reality will require stronger government capacity and national policies around mHealth. A strong foundation requires aligning health and ICT policy, linking government programmes with research, telecommunications regulation, building a framework for data protection and privacy, guiding interconnection and open data standards, considering data security and building partnerships between governments, health implementers, technology providers, mobile network operators and others.

Regulation: Industry has, in the main, been driving the technological revolution and mobile applications for healthcare may be the next big trend for venture capital investments. This raises important regulatory challenges to ensure that vulnerable people have access to safe and effective medical advice. To mitigate the risks, efforts are required to:

- make certain that the medical profession plays a major role in ensuring quality of service

- develop regulatory frameworks that respond to the needs of society and do not simply maintain professional monopolies

- ensure transparency to maintain the quality of information provided, reduce potential conflicts of interest between providers of medical advice who also supply pharmaceuticals, and protect privacy and ownership of personal and medical data.

Collaborative discussions with policymakers, private and public stakeholders, patients, researchers and charities on the challenges and opportunities for mHealth will help to define mutually beneficial regulatory agendas and generate appropriate health interventions.

Security and ethical concerns

"Data security is a particularly important issue to address within the area of policy. Policymakers and programme managers need to be made aware of security issues in the mHealth domain so that appropriate policies and strategies can be developed and implemented." [2]

Ethical concerns around patient privacy, confidentiality and consent also pose unique challenges, especially in light of global cultural diversity. According to a 2011 World Health Organization report[2], governments cite issues related to data privacy and security as two of the top barriers to the expansion of mHealth. Protecting personal health information that is collected and transmitted over mobile devices is essential for bringing mHealth to scale, but so is ensuring that patients and the integrity of mHealth projects are not compromised. **Policymakers and programme managers should be aware of security issues in the mHealth domain and appropriate safeguarding policies and strategies need to be developed and implemented.**

Conclusion

With the vast majority of the world's population having access to mobile communications, opportunities for this technology to be part of health services and their delivery, particularly in low- and middle-income countries, is increasingly recognised. Although not a panacea, mHealth programmes have the potential to make a serious and cost-effective contribution to improving health access and outcomes.

To advance mHealth, the discussion needs to move away from one that is narrowly focused on the feasibility and acceptability of mHealth as a technological innovation, to one in which the concerns that the mHealth field seeks to tackle (e.g. disease surveillance, medical supply issues, health worker training, behaviour change) are understood to be part of a broader conversation around health and health systems and how those can be improved at scale. In short, mHealth should not be ghettoised. It needs positioning in the mainstream, with mHealth as one of a plethora of tools used to address important systemic health issues.

Next step recommendations

mHealth offers a wealth of possibilities for improved health data and outcomes in low- and middle-income countries. The UCL mHealth symposium offered the following policy recommendations:

- Quality evidence should be derived through methodologically rigorous research.

- Scaling up successful pilots for evaluation and subsequent inclusion into national health programmes should be a priority for future mHealth initiatives.

- An mHealth practitioners network should be established to facilitate collaboration in the implementation and evaluation of mHealth initiatives; this could be led by the World Health Organization.

- National government policy should align policies on health and ICT laws, regulations and standards regarding the protection of patient privacy in mHealth technology.

[2] The World Health Organization, mHealth: New horizons for health through mobile technologies (2011), at
http://www.who.int/goe/publications/goe_mhealth_web.pdf