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# mHealth: A new vision for healthcare

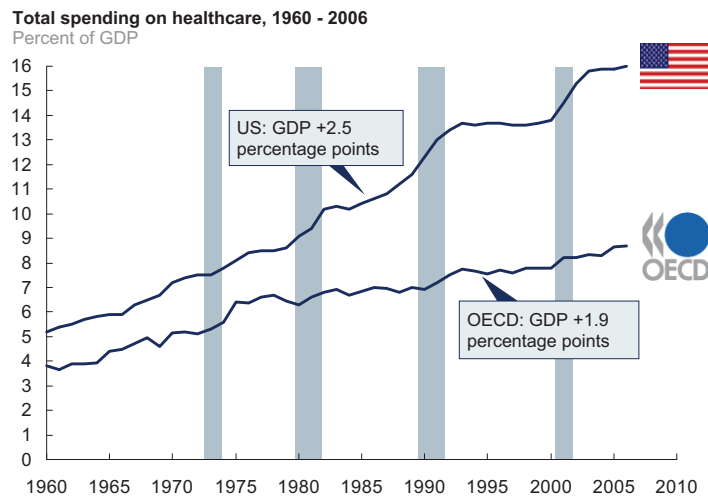




# mHealth: A new vision for healthcare

Most countries aspire to deliver effective, safe, and affordable healthcare to their citizens. Healthcare systems – defined as providers, payors, and input suppliers (pharmaceuticals, medical equipment, and personnel) overseen by a national or regional authority – exist to realize this aspiration and command large and growing budgets. By 2011, it is expected that global annual spend on healthcare will reach about USD 6 trillion.<sup>1</sup> Over the last 50 years, healthcare spend has outpaced GDP growth by about 2 percentage points a year in most OECD countries and there are few signs that this trend will slow (Exhibit 1).

## OECD countries have seen healthcare growth exceed GDP by nearly 2 percentage points a year, with the US as a clear outlier



1 OECD median excluding US; sample size increased from 12 countries in 1960 to 29 in 2006  
SOURCE: OECD Health Data 2008

Exhibit 1

McKinsey & Company has examined global healthcare in detail and our research indicates that under current trends, the larger developed economies could end up spending nearly 15 percent of their GDP on healthcare within the next two decades.<sup>2</sup> Unless something changes, and significantly, this figure could double in the US by 2040 and across OECD countries by 2070 (Exhibit 2).

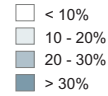
1 Analysis of WHO National Health Accounts.

2 The Healthcare Century, Health International Number 7 (2008).

**If the trend continues, healthcare will consume an ever-growing and unsustainable proportion of the developed nations' wealth**

**Projected healthcare spend**  
Percent of GDP<sup>1</sup>

OECD countries	2005	2030	2050	2070
▪ US	15.3	24.9	36.7	65.6
▪ Switzerland	11.6	18.8	27.8	49.8
▪ France	11.1	18.0	26.6	47.6
▪ Germany	10.7	17.4	25.6	45.9
▪ Greece	10.1	16.4	24.2	43.3
▪ Canada	9.8	15.9	23.5	42.0
▪ Netherlands	9.2	14.9	22.0	39.5
▪ Denmark	9.1	14.8	21.8	39.0
▪ Italy	8.9	14.5	21.3	38.2
▪ UK	8.3	13.5	19.9	35.6
▪ Turkey	7.6	12.3	18.2	32.6
▪ Mexico	6.4	10.4	15.3	27.5



Healthcare spend would reach 30% of GDP in the US in 2040 and 30% of the median OECD GDP by 2070

<sup>1</sup> Linear extrapolation; assumes healthcare continues to grow at +2.0 percentage points above GDP  
 SOURCE: Forecast model assuming real GDP growth of 2.0%, healthcare spend growing at 0.95/1.9 percentage points above; OECD Policy Implications of the New Economy 2000 - 2050 (2001); Global Insight WMM 2000 - 2037

Exhibit 2

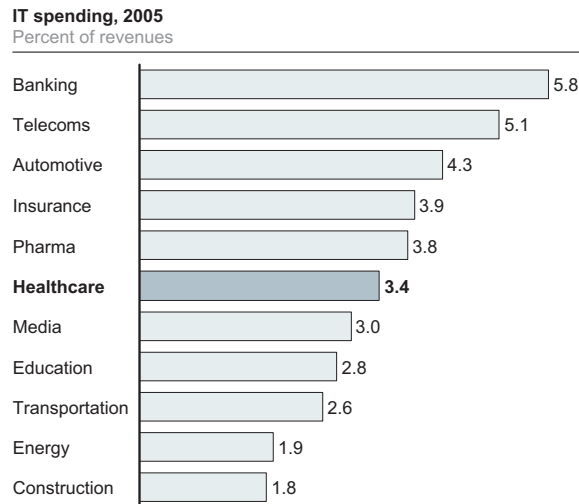
And healthcare challenges are not restricted to developed economies. Many emerging markets find it difficult to provide broad access to healthcare and guarantee minimum standards of quality and safety.

To overcome these obstacles around cost, access, and standards, healthcare systems must be highly innovative and inventive in their approach to delivering services. One way is to leverage the experience of other sectors that have used technology to improve their processes. For example, financial services and telecommunications have been using technology intensively and investing significantly in IT development and IT-enabled innovations (Exhibit 3).

An area of innovation with the potential to make a huge difference is mHealth – the utilization of mobile communication technologies to deliver healthcare services. Examples of existing mHealth innovations are:

- SMS alerts that remind patients to take their prescription drugs at the appropriate time
- Remote diagnosis and even treatment for patients who do not have easy access to a physician
- Remote health monitoring (RHM) devices that track and report patients' conditions.

**To innovate its delivery model, healthcare could learn from experiences of industries that have seen a much higher level of technology adoption**



SOURCE: Gartner Consulting Worldwide IT Benchmarks

Exhibit 3

Such services could have a major impact on healthcare outcomes and costs. For example, RHM alone has the potential to reduce the growing cost burden of chronic diseases at the system level (approximately two-thirds of total healthcare costs in the US today according to the US Department of Health and Human Services' Agency for Healthcare Research and Quality) by up to USD 200 billion in OECD and BRIC (Brazil, Russia, India, and China) countries.

This document briefly describes the state of the global healthcare sector, illustrates the methodology we used in our recent mHealth-related research, identifies ways in which mobile technology might play a role in innovating healthcare delivery systems and healthcare system cost management, and lays out the requirements for implementing RHM – one of the applications with the highest impact potential – in a scalable manner.

## Healthcare: A sector in need of innovation

Unless the cost growth trend described is curbed, the share of GDP devoted to healthcare in several OECD countries is forecast to amount to over 15 percent by 2030. In the US, it could reach 25 percent. This growth trend is likely to prove unsustainable and could put significant pressure on fiscal balances, consumer spending, and employer liabilities.

Chronic disease management accounts for 80 percent of this cost growth; in the US, it is already responsible for two-thirds of all direct healthcare costs.<sup>3</sup> Research suggests that four major factors drive cost increases worldwide:

**Aging populations.** In 1950, one in twelve Americans were over 60 years old; by 2050, this ratio is expected to rise to one in five.<sup>4</sup> Other developed countries show similar trends with an associated increase in the prevalence of chronic disease, as such conditions are often age-related. Chronic diseases also tend to be affected by lifestyle choices, long-lasting, and costly to manage. Developing markets are also seeing an increase in the chronic conditions historically found only in richer economies, in addition to the illnesses they are accustomed to treating.

**Medical procedure costs.** Surprisingly, as medical knowledge and technology become more sophisticated, the complexity and cost of hospital procedures seem to increase unless significant innovations in delivery models are applied. A recent McKinsey study revealed that the growing complexity of medical procedures raised (US) hospital costs by 7 percent between 2003 and 2006 alone.<sup>5</sup>

**Resource constraints.** Healthcare resources are not unlimited and not equally distributed. For example, physicians in developed markets seem to be increasingly choosing more lucrative career specializations over generalist primary care practice. In the US, there is a shortage of 12,000 generalists<sup>6</sup>, raising the average unit cost of physician-assisted treatments significantly. In developing markets, physicians are often in short supply, with experienced specialists unevenly distributed and more experienced physicians tending to be found in major urban centers.

**Patient empowerment.** Particularly in markets with broad Internet access, available in-depth information on medical conditions and their treatment has enhanced patients' knowledge, generating an increasingly consumerist attitude toward medicine and higher expectations regarding treatment.

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3 Jimison, H. et al., Barriers and Drivers of Health Information Technology Use for the Elderly, Chronically Ill, and Underserved. Evidence Report/Technology Assessment No. 175, AHRQ Publication No. 09-E004, Rockville, MD: Agency for Healthcare Research and Quality (November 2008).

4 US population projections 2005 - 2050, Pew Research Center (November 2008).

5 Accounting for the cost of US healthcare, McKinsey Global Institute Report (December 2008).

6 The complexities of physician supply and demand: Projections through 2025 (November 2008); GAO testimony on primary care professionals (February 2008); Health Leaders Media Web site.

These factors combined are putting mounting pressure on developed and developing countries' already strained healthcare systems. Unless innovative ways to manage them are developed quickly, societies could find themselves unable to provide the healthcare services their populations need and demand.

#### Innovation is a crucial lever for controlling costs

Healthcare organizations around the world are experimenting with new approaches to managing costs. Recent McKinsey research examined innovations in a range of healthcare delivery systems and identified four common trends:

**Franchising.** Using approaches similar to those found in the retail sector, some healthcare delivery models focus on delivering highly standardized flows of information, products, or services to patients across a larger number of locations. These models seek to harness the talents of local entrepreneurs, lowering distribution costs and improving adherence to clinical protocols through standardization. For example:

- VisionSpring aims to bring quality, affordable eye care to communities in several countries across Asia, Africa, and Latin America by offering its entrepreneurs a “business in a bag.” This contains all the products and equipment required to accurately diagnose and correct presbyopia with affordable eye glasses.
- Greenstar offers packaged integrated village center services and has established itself as a trusted brand, enabling its many thousands of franchisees to offer high-quality family planning, for example, in Pakistan.

**Production specialization.** Well established in many other industries, specialization introduces “lean” thinking to healthcare. Services aim to standardize clinical protocols and operating processes (e.g., preparing patients for surgery), eliminate waste (e.g., reducing unnecessary steps in preoperative evaluation), and dramatically reduce the cost of complex care, from cardiac surgery to cataracts.

**Technology-enabled networks.** Technologies such as mobile communication and call centers adapted for healthcare service delivery allow providers to overcome the imbalance of resources among regions and offer access to people in remote locations. For example, Medicall, a healthcare service provider in Mexico, has more than one million subscribers who access medical care over the phone. Patients are either advised directly over the phone (in 62 percent of the cases) or referred to a network of physicians and clinics for diagnosis and treatment.

These asset-light models exploit existing infrastructures, centralize medical talent to raise utilization, offer access to remote areas, and follow existing patterns of patient behavior. By enabling an effective and economically sound dialog with patients in remote locations, some companies are beginning to deliver long-distance care, thereby increasing access and reducing costs. Remote physician operations, such as Medicall, have been able to resolve two-thirds of patient enquiries over the phone, reducing the need for in-person visits to physicians and clinics, and therefore any associated costs.

**Integrated care.** In the face of the enormous challenges of managing chronic diseases, delivery innovations appear to have the most impact when multiple parties (e.g., physicians, nurses, payors) interact seamlessly to provide the best possible patient care over an extended period of time. Such integrated models have the potential to reduce costs dramatically, while increasing patient satisfaction and clinical quality. This was achieved in a pilot in Valencia, Spain, which realized a 25 percent differential in per capita patient management costs as well as enhanced patient satisfaction and clinical quality.

We believe that mHealth applications share many features of these successful approaches and could prompt widespread innovation in healthcare delivery. Their potential advantages are clear: they offer better services to a larger number of patients; leverage the advanced communication and processing technology already available to a large part of the world's population; could standardize care (e.g., diagnostic algorithms used in telemedicine centers) through centralization and IT developments; and allow several parties to collaborate and provide integrated care by sharing patient data to all parties involved in best treating the patient.



## Innovating healthcare through mobile communication

Mobile is the most widespread communication infrastructure in the world. Most of the world's population has access to some form of mobile communication (at least to a "village phone," if not a personal one) in even the most remote areas of Africa, Asia, and Latin America.<sup>7</sup> This infrastructure offers societies the opportunity to transform their healthcare services.

### Mobile can fundamentally innovate healthcare delivery models

#### From traditional healthcare delivery ...

- Patient visits the physician or the ER, taking time off from work when he/she feels serious symptoms
- Physician interviews patient in person and conducts a typical hands-on examination
- Physician prescribes medicine and hopes patient takes it at prescribed times
- Patient gets well and goes back to potentially unhealthy lifestyle
- Chronic shortage of (specialized) medical talent

#### ... to a new world paradigm

- Patient calls caregiver at his/her convenience any time of day/week as soon as symptoms begin
- Physician speaks to patient over phone, relying also on data from biometric sensors (m-stethoscope, smartphone-based ultrasound, etc.)
- SMS reminders ensure that patient takes medicine as prescribed; can report side effects, etc. in real time
- Patient can be monitored remotely and advised if conditions worsen or if lifestyle elements negatively impact the situation
- Patient can access global medical expertise in a connected world

SOURCE: McKinsey

Exhibit 4

mHealth services are already being used in many markets. They range from basic informational SMS-based services to more complete remote physician services (Exhibit 4). For example:

- mPedigree in Ghana offers an SMS authentication service to verify prescribed medications (e.g., malaria treatments) and fight the plague of counterfeit drugs. It reaches up to 50 percent of current usage with significant economic and social impact.
- The Pill Phone, a mobile medication reminder in the US, tells patients when to take their medicine based on the information provided by the physician or pharmacist.
- Medicall in Mexico offers phone consultations with physicians to remote populations for a flat fee of USD 5 per month and already has a customer base of one million families.

<sup>7</sup> The Economist: Mobile Marvels – special report on telecoms in emerging markets (September 2009).

- Vitaphone in Germany provides 24-hour healthcare advice, telemedical monitoring, e-chart production, and remote ECG analysis.

mHealth services have the potential to further improve quality and access to care as well as reduce costs in both developed and emerging markets. Of these mobile-enabled services, we believe that RHM could have the greatest impact on chronic disease management.

#### Remote health monitoring offers up to a USD 200 billion opportunity worldwide

Chronic diseases cannot be completely cured or eliminated, and tend to require lengthy and often expensive treatments involving complex, ongoing care. Examples include diabetes, hypertension, heart failure, many cancers, and Alzheimer's.

Remote monitoring services are likely to deliver the greatest benefit in chronic disease management in terms of improved disease evolution, patient lifestyle, and treatment costs by allowing providers to improve:

- Disease diagnosis, complication management, and intervention ahead of acute phenomena, e.g., predict impending heart failure through non-intrusive remote monitoring. This is likely to create significant savings by lowering hospital admissions and utilization.
- Treatment compliance by reminding patients and prompting caregivers to intervene in cases of non-compliance, e.g., insulin dosing or TB treatment, in order to improve treatment effectiveness
- Quality of care by giving patients and caregivers tools to manage disabilities associated with chronic diseases, e.g., locator devices for dementia patients
- Patient data collection and analysis and acceleration of medical research innovations in order to better manage disease, e.g., variance in drug dose response within patient demographics
- Quality of life by keeping patients out of hospitals and nursing homes, and allowing them to lead happier lives with less constraints.

To illustrate the potential impact of RHM, we modeled its economic benefits for chronic diseases. We collected medical evidence on disease conditions in which remote monitoring has shown to be effective. Based on this review (summarized by Litan in 2008<sup>8</sup>), we focused our detailed analysis on three major conditions that together represent about one-third of the total spend on chronic conditions: diabetes,

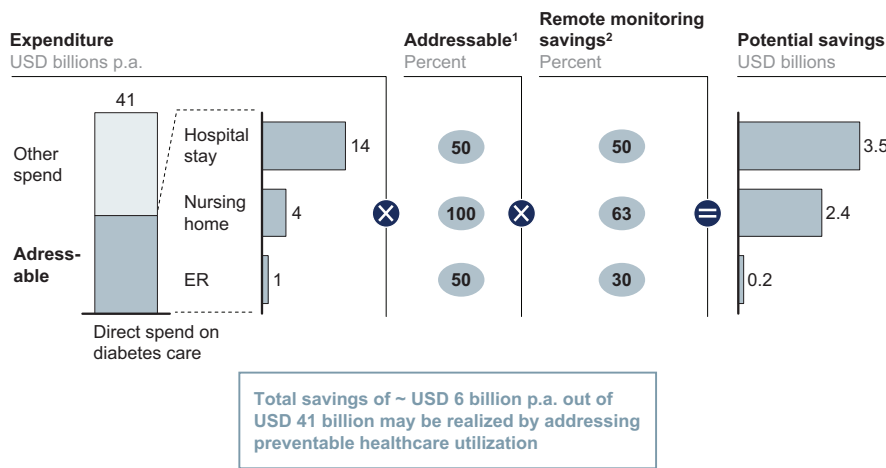
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<sup>8</sup> Vital signs via broadband: Remote health monitoring transmits savings, enhances lives. Report available at [www.betterhealthcaretogether.org/study](http://www.betterhealthcaretogether.org/study).

congestive heart failure (CHF), and chronic obstructive pulmonary disease (COPD). Across the board, we found that savings came mainly from reducing the number of emergency room visits, cases of hospitalization, and the need for management in nursing homes, i.e., more patients could be supported at home. We quantified the savings for each disease and found that, for instance, using RHM in the treatment of diabetes could save up to 15 percent of costs (Exhibit 5).

**Approximately 15% of healthcare utilization costs could be saved through remote monitoring**

US CASE STUDY ON DIABETES



<sup>1</sup> Remote monitoring addresses preventable visits to the hospital; estimates vary by source  
<sup>2</sup> Multiple case study consensus estimate  
 SOURCE: AHRQ; Remote health monitoring transmits savings, enhances lives (Litan, 2008); McKinsey

Exhibit 5

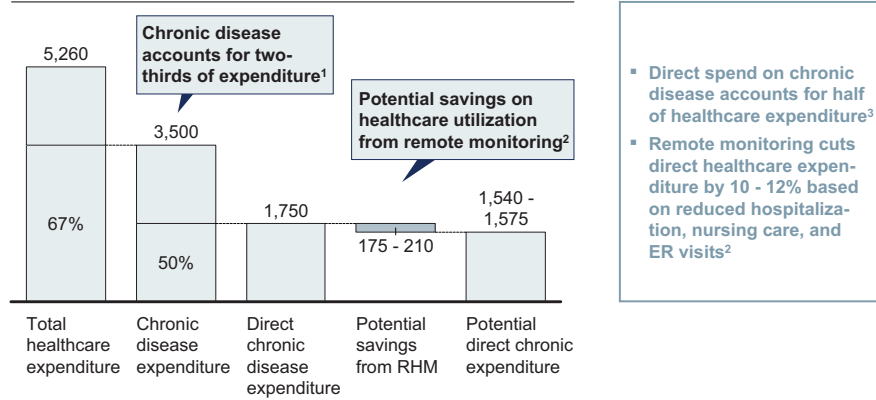
For all three diseases, we found that the average savings could reach up to 15 percent of the direct spend on treatment. However, we conservatively assumed a 10 to 12 percent savings, as capturing the higher potential for all chronic diseases would require additional innovation even on the clinical protocols.

We focused our analysis on the US market, where medical studies and literature are widely available. When we applied this methodology to the overall direct spend on chronic diseases in OECD and BRIC countries, we found that based on 2007 expenditure data, potential savings could range from USD 175 to 210 billion, and this is the opportunity payors and telecoms operators could tap into (Exhibit 6)

Remote monitoring also offers considerable benefits in other areas as well. For example, World Health Organization (WHO) data reveals that there are one billion overweight adults worldwide. Given that obesity is a primary risk factor for many chronic diseases, remote monitoring solutions could help overweight adults seeking ways to avoid obesity – for example, by tracking activity levels and nutrition intake.

**Potential cost savings in OECD and BRIC countries for chronic diseases from mHealth is USD 175 - 210 billion**

**Potential healthcare savings, based on 2007 actual expenditure**  
USD billions p.a.



<sup>1</sup> Agency for Healthcare Research and Quality, US Department of Health and Human Services  
<sup>2</sup> Based on case studies in diabetes, chronic heart failure, and chronic obstructive pulmonary disease  
<sup>3</sup> Includes provider visits, hospital inpatient stays, nursing care, home health, prescribed medication  
 SOURCE: AHRQ; EIU World database; McKinsey

Exhibit 6

Cost savings and health benefits will be realized across the overall healthcare ecosystem; we are not making specific assumptions on how benefits will be allocated among the various players in the system. On costs, this will vary by market. In most developed countries, beneficiaries will typically be either the government or health insurance system (“payors”). In emerging markets, they are likely to be a mix of government/insurance agencies and consumers, who currently pay out of their own pockets.

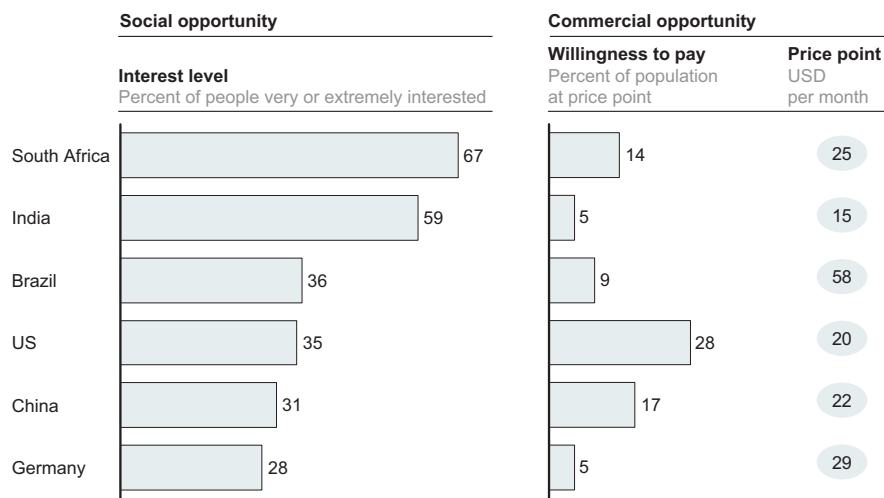
The time required to realize the savings is also important. The time frame is driven by the life cycle of each disease and for most conditions, it is likely to take months (if not years) before tangible cost savings are realized. This means that perhaps entities with a longer time horizon (e.g., national government payors) are more likely to invest in remote monitoring and capture the lion’s share of the related economic opportunity. To do this, they will require an efficient, functioning remote monitoring market, with proven healthcare outcomes, healthy competition, clear regulations, stable policies, and reliable, resilient, scaled solutions.

While tapping into the payor-led opportunity might prove larger, in the short term, directly reaching out to consumers through mHealth products could already generate significant demand. The consumer-led market is driven by short-term needs and the demonstration of concrete value to consumers and physicians.

In 2009, McKinsey conducted a market survey of 3,000 people in the US, China, Germany, South Africa, India, and Brazil. Participants were asked about their willingness to adopt and pay for mHealth services, specifically SMS medication reminders, remote medical advice, phone-prompted drug delivery, and health watch (remote monitoring of factors such as blood pressure and pulse).

The survey revealed that a sizeable proportion of consumers were willing to pay USD 15 to 58 a month for a remote monitoring solution (in the survey the health watch), with interest in both emerging and developed markets. If the results are extrapolated to OECD and BRIC countries (considering the different populations), we can estimate an untapped consumer-led market potential of up to USD 30 to 35 billion (Exhibit 7).

**Consumer interest levels and willingness to pay for a remote monitoring solution vary globally**



SOURCE: McKinsey mHealth World Survey 2009

Exhibit 7

## Capturing the mHealth opportunity

The key to capturing this opportunity is to fully understand the evolving RHM ecosystem, which is complex and requires interactions across several industries (Exhibit 8).

### The mHealth ecosystem is complex, with multiple stakeholders playing critical roles

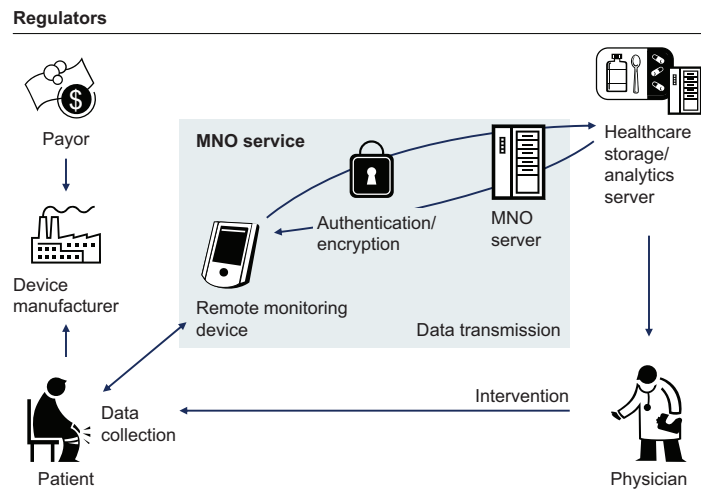


Exhibit 8

SOURCE: Expert interviews; McKinsey

To function effectively, an RHM market must facilitate interactions between all players – device manufacturers, mobile network operators (MNOs), software platform providers, healthcare providers, payors, and regulators.

Mobile customers are accustomed to a seamless experience across devices, geographies, and networks, so the emerging RHM field must satisfy this expectation. To effectively perform in providing healthcare services, the ecosystem requires:

- Highly efficient and accurate patient authentication; errors could have serious medical consequences
- Proper encryption to preserve the confidentiality of patient data, a matter already regulated in some developed markets (e.g., the US has strict HIPAA<sup>9</sup> laws that regulate how patient information can be transmitted) and clearly of paramount importance in any healthcare system

<sup>9</sup> Health Insurance Portability and Accountability Act.

- Back-end data analytics service providers that can store and analyze patient data, often in real time. If millions of patients enroll in the service and multiple devices are sending frequent transmissions, the systems could collapse unless they are designed to deal with large volumes of data
- Analysis results that loop back to the patient and the physician to deliver the optimal benefits of monitoring and ensure that the right interventions are made.

#### The need for adoption of open standards

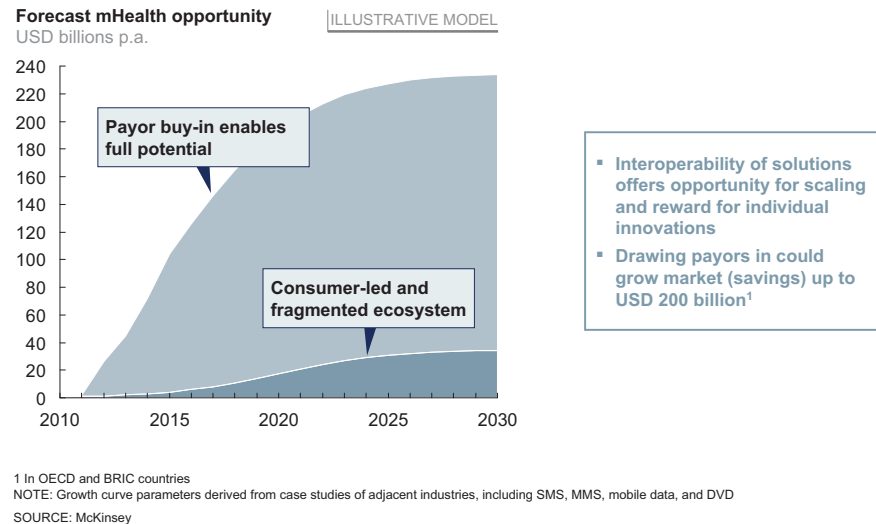
Recognizing the extensive requirements mentioned, it will be crucial to have widely accepted technical standards or an open architecture relating to patient information. This will help ensure that a variety of devices from different manufacturers can use multiple networks to access different back-end analytics providers, who in turn could connect with the patient. The more widely accepted the standards, the more critical mass the RHM market is likely to gain, presumably with increased user adoption to occur and greater potential rewards for successful innovators.

Another important element is payor involvement. As discussed, payors typically have longer time horizons than many private businesses and are likely to be the major beneficiaries of cost savings. However, it could prove difficult for payors to deal with a plurality of smaller pilots and services, making it challenging to participate in a fragmented market.

We looked at other industries in search of comparisons to illuminate the dynamics of well-accepted standards, global markers, and fragmentation risk. In several industries, fragmentation leads to inefficiencies and suboptimal systems. For example, in European air traffic control (ATC), fragmentation into 38 state-controlled vertically integrated monopolies compared to a single agency as in the US leads to higher staffing levels (around 54,000 employees managing 60,000 movements per day versus 35,000 employees managing 50,000 movements), substantially higher costs per ATC service (EUR 800 per flight versus EUR 400 in the US), and longer flight paths (30 percent longer route extension in the EU than in the US).

Next, we examined the growth of industries closer to RHM – for example SMS, MMS, mobile data, DVD adoption. We modeled how the RHM market might evolve in two scenarios: a consumer-led out-of-pocket model and a payor-led model. Applying such growth curves to RHM services suggests that the presence of widely accepted standards is likely to accelerate market growth and increase the total value pool (Exhibit 9).

## Widely accepted standards could substantially increase remote health monitoring value to society and the industry value pool



### Exhibit 9

#### Some orchestration is needed, and telcos are well positioned to kick-start the RHM market

The mHealth sector is still in its infancy and telcos are uniquely positioned to shape how the ecosystem develops as they have most of the core assets required. In fact, they could:

**Develop global scale to reduce RHM service costs and create a vibrant, competitive market.** The mobile communication industry knows how to deliver innovative technologies at scale (2G voice, 3G data, smartphones) and adapt them to different countries in a highly competitive market. It has “cracked” the level of standardization required to create scale through interoperability, while leaving sufficient room to generate innovation and fierce competition in individual markets. This has enabled the industry to leverage its scale and deliver a voice phone for under USD 15 to the less wealthy in the population and at the same time engaging in fierce competition around highly sophisticated smartphones for other customers.

**Tailor the mHealth business model to local situations and regulations.** The industry is global, but operators must comply with local regulations and legal frameworks, from telecoms licensing to spectrum auctions. Customer preferences are also dependent on location and operators tailor their business model accordingly – from prepaid distributed by informal trade to company-owned stores selling subsidized postpaid smartphones.

**Enable global usability of mHealth services.** Mobile customers are used to communicating (almost) wherever they are by simply switching on their phones thanks to multiple interoperability standards, commercial interconnection and roaming



agreements, and global reach. Telecoms operators could leverage some of these assets, processes, and capabilities to allow patients to use their RHM devices, interacting with providers and analytical tools anywhere in the world in a completely transparent manner.

**Develop a secure, trusted service that patients will use.** Given the levels of mobile phone penetration and service reliability, operators could provide “industrialized” mHealth services to much of the world’s population, potentially leveraging widely recognized brands.

**Leverage their infrastructural assets,** such as mass distribution, billing systems and collection processes, established customer care systems, recognized brands associated with technically easy-to-use services, authentication and secure communication services, platforms for centralized data storage, and processing.

\* \* \*

mHealth could prove a major step-change opportunity in improving the quality of healthcare and lifestyle of patients suffering from chronic diseases and other conditions, while reducing the cost of care delivery. Telecoms operators are in a unique position to enable the development of this opportunity, leveraging their assets and “convening” power both in specific geographies and on a global scale.

Operators can start developing clear strategies on how to initiate the new mHealth ecosystem, leveraging their assets, promoting globally accepted standards to ensure wide participation and effective rewards for innovation, and engaging payors while capturing short-term economic benefits from the consumer-led market.

## About the GSMA

The GSMA represents the interests of the worldwide mobile communications industry. Spanning 219 countries, the GSMA unites nearly 800 of the world's mobile operators, as well as more than 200 companies in the broader mobile ecosystem, including handset makers, software companies, equipment providers, Internet companies, and media and entertainment organizations. The GSMA is focused on innovating, incubating, and creating new opportunities for its membership, all with the end goal of driving the growth of the mobile communications industry.

## About McKinsey & Company

McKinsey & Company is a management consulting firm. For more than 75 years, its mission has been to help clients achieve distinctive, substantial, and lasting improvements in their performance. From its most senior leader to the newest consultant, McKinsey works with its clients to realize their performance potential.

McKinsey helps companies worldwide define their strategies, strengthen their organizations, and improve their operations. Its clients include more than half of the world's top 200 companies, as well as companies with the potential to reach the top. McKinsey also helps a diverse range of government institutions and non-profit organizations with their management challenges.





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