



# MOBILE HEALTH

*Who Pays?*

**ATKEARNEY**



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# Introduction

Mobile health is big news in the telecoms industry. Although there is little consensus on the size, or even scope, of the global market for mobile health, several sources predict a market in the United States on the order of \$4.5 billion within the next two to three years, and this has been extrapolated to a global market in excess of \$30 billion. Other estimates are even higher<sup>1</sup>. However, while mobile health has huge potential to both improve healthcare delivery and provide revenue for service providers, achieving broad uptake and monetizing this potential has proved difficult to achieve.

This report, commissioned by the GSMA and delivered by global management consultancy A.T. Kearney, seeks to shed light on this critical issue and to define the steps that operators need to take to build a sustainable mobile health business. The report has been developed through a comprehensive search of available literature and interviews with a range of operators from Europe, the United States and Asia.

The report starts by describing the challenges faced by both established healthcare systems and less well-developed countries, and how mobile health can help address them. It describes the practical difficulties of gaining reimbursement for mobile health solutions and discusses alternative customers and value propositions. The paper discusses potential roles for mobile operators and commercial models, and outlines key success factors for building a scale mobile health business. Finally, the paper summarises the trends the industry should be seeking to encourage to influence the creation of a favourable environment for mobile health solutions.

<sup>1</sup> Parks Research, CSMG, McKinsey.

## Executive Summary

Delivering affordable healthcare is one of the most intractable challenges faced by any government. In countries with well-developed health systems, the challenge is to meet the rising expectations of citizens while controlling costs to a manageable level. In the developing world, the challenge is to build a health infrastructure that is able to deliver an acceptable quality of healthcare to the mass population.

Mobile health has enormous potential to lower the cost of health interactions all along the patient pathway, especially for chronic conditions. Mobile health applications that are able to address conditions such as diabetes, respiratory, and cardiac disease, and the risk factors that cause them, are likely to be most popular. “Open system” platforms that can connect multiple remote monitoring devices to address the needs of patients with multiple conditions will be especially valuable. However, healthcare is an extremely conservative industry, and the pace of uptake of new technologies is very slow when compared to the mobile industry.

The vast majority of global health spend is incurred in the established health systems of the developed world and is reimbursed by healthcare payers, either governments or insurers. If mobile health is to reach its full potential it will have to move into this environment, as it is unlikely that consumers in established markets will be major buyers beyond low-cost mobile health services. Reimbursement systems are very complicated and not always compatible with mobile health solutions, and operators will need to understand in detail how reimbursement systems work in each country and to identify the most appropriate customers and value propositions. At least

in the medium term, the greatest opportunities are likely to be in selling to healthcare providers rather than payers directly. Social care is another substantial market, and in this case customers include both government agencies and carers.

Outside of the major established health systems, the situation varies widely from the poorest countries with only rudimentary health infrastructures to rapidly developing markets which do not yet have mature health systems.

For the poorest countries, the challenge is to provide the general population with access to basic health services. Customers of mobile health services are often non-governmental-organisations (NGOs). While revenues are likely to be small in the short term, in the long term mobile health is more likely to emerge as a mainstream consumer health proposition.

For wealthier countries seeking to build a modern health system, the opportunity is to position mobile health as an alternative to investment in more conventional health infrastructure. In these developing systems there is higher reliance on self-pay, and the “*professionally recommended*” consumer segment may emerge as an important market.

To gain significant revenues, operators will need to move beyond connectivity to providing value-added services which might range from traditional telecom services of security and data management right through to clinical services. Solutions will need to be scalable, addressing multiple applications across global markets, though these solutions will need to be developed step-by-step as the value of each application is proved. Operators will need to understand and manage the regula-

tory and clinical risks inherent in providing these services. Partnering will be absolutely essential to success, and this is likely to take the form of strategic partnerships at a global level with companies like medical device manufacturers, and local relationships with insurers, healthcare companies and pharmacies for clinical services and distribution.

To communicate the benefits of mobile health, operators should show how solutions can address pressing health needs. Benefits need to be expressed in “currencies” that will resonate with healthcare payers and health providers. Robust proof of efficacy consistent with medical standards will be required.

There are several paths that operators can follow to build a substantial healthcare business. Successful mobile health businesses will require a dedicated organisation with global product development and local commercial exploitation. New capabilities will be required to understand how diseases are treated and how each specific healthcare system works. New channels and distribution models will be required, and uptake of new technologies will not happen without substantial investment in active marketing and sales, and in local proof of efficacy.

To achieve real growth in this market, it is important that mobile and healthcare industries work toward interoperable solutions that enable global scale. Healthcare systems are wary of proprietary platforms and expect technology solutions to have a long life, and the emergence of an open platform will accelerate widespread adoption.

There is also a role for policy makers to stimulate innovation and uptake in this area through adoption of international healthcare coding standards and common approaches to management of clinical data. Reimbursement regimes are currently not designed with mobile health solutions in mind, and should be adapted to encourage remote interactions between patients and carers.

Overall, mobile health is an emerging technology and the next few years are likely to be dominated by experiments and pilots. Over time specific applications will become established into mainstream healthcare delivery. In the longer term, it is likely that a number of significant players will emerge to provide mobile health platforms, and these companies will need to make long-term commitments to this market. However, the eventual prize could be substantial for the winners.

# 1. The challenges of healthcare

Delivering affordable healthcare is one of the most intractable challenges faced by any government.

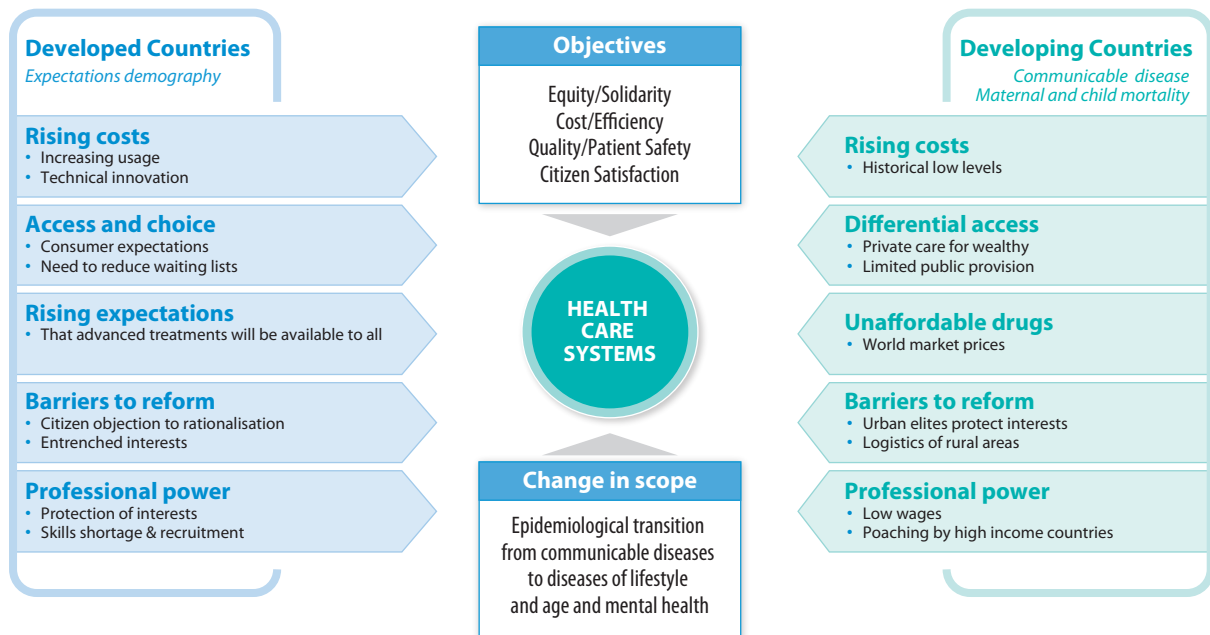
Worldwide, total healthcare spending exceeds \$4.2 trillion, consuming an average of 10% of GDP in OECD countries and increasing at an average of 5% every year. However, this spend is highly skewed. The top 20 healthcare consuming countries contain 16% of population, yet spend nearly 90% of every one of those \$4.2 trillion. The US alone, with 5% of the population, spends over 45%. The “have-nots,” on the other hand — the remaining 84% of the people on the planet — share 11% of health spending, but suffer from nearly 95% of the diseases while devoting around 5% of GDP to health.

This wide disparity in spend means that challenges faced by health systems are somewhat different in the developing and developed world.

## DEVELOPED WORLD CHALLENGES

In countries with well-established health systems, the overwhelming challenge is to meet the rising expectations of citizens while controlling costs to a manageable level. This situation is made more challenging by chronic conditions such as diabetes and heart disease, which are increasing in prevalence due to an aging population, changes in behaviour, eating habits and lifestyle (figure 1).

Aging populations pose some specific challenges to health systems. While an older population does not increase medical expenditure directly<sup>2</sup>, it does influence the ratio of people who are paying into the system against those who are consuming healthcare, so limits affordability of the overall system. It also influences the type of health challenges. While medical science has been extremely



Sources: “Health Policy Reform” (2005), OECD Health Data, A.T. Kearney analysis

Figure 1: Challenges of healthcare systems in the developed and developing world

<sup>2</sup> Longevity and Health Care Expenditures: The Real Reasons Older People Spend More, Zhou Yang et al., Journal of Gerontology: SOCIAL SCIENCES 2003, Vol. 58B, No. 1, S2–S10



effective at prolonging life, it has been far less effective in maintaining mental health into old age. A recent report in the UK concluded that the true costs of dementia total over £23 billion<sup>3</sup>, equivalent to nearly a quarter of the costs of the health system. The rise in the number of old, frail and confused individuals, and the failure of past generations to build a sufficient financial cushion to look after them, is a problem whose dimensions are only now becoming evident.

Across the developed world there are also still huge issues of inequality of access to healthcare, as it is the least well educated and poor — who are least able to afford healthcare and least engaged with the system — who most need it. This is causing a widening gap in life expectancy between rich and poor.

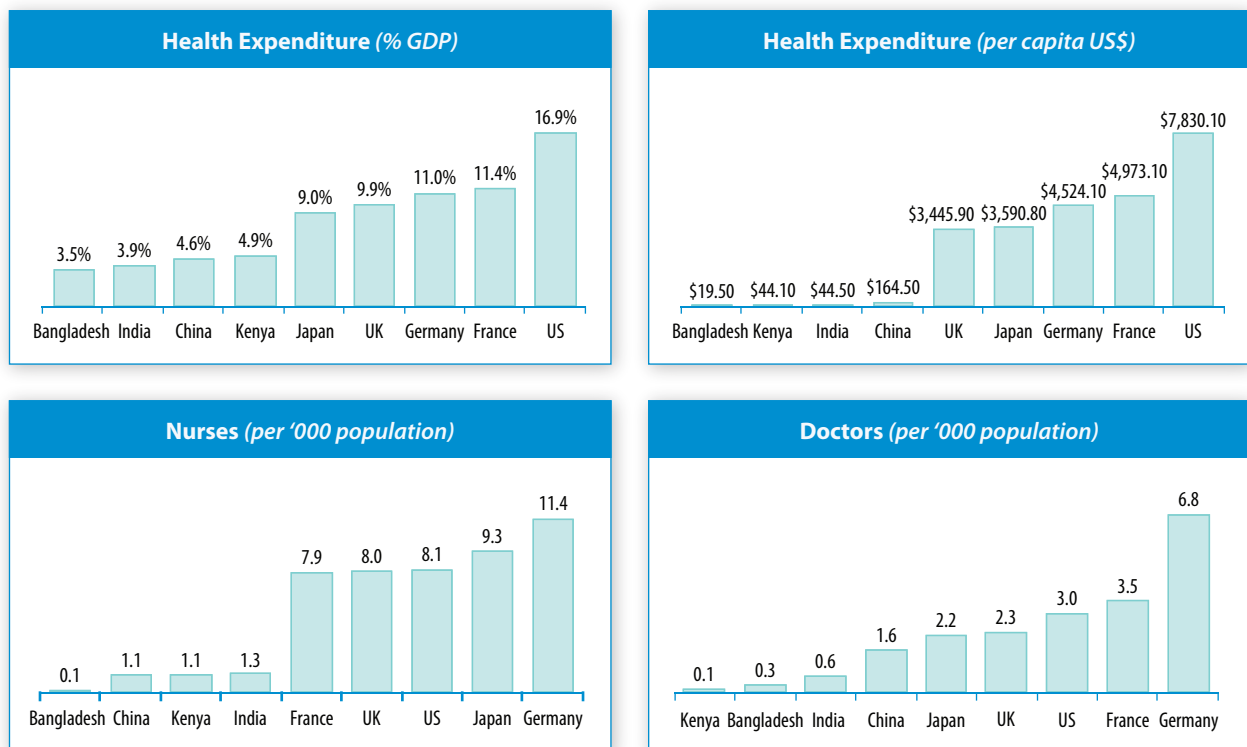
Much of the increase in health expenditure has come from changes in medical practice and increases in benefits and technology<sup>4,5</sup>. It seems strange that in virtually every other industry, technology has reduced costs, yet in health it has had

the opposite effect. However, traditional laws of supply and demand don't work in healthcare. Most healthcare is paid through some form of insurance, and the poor are cross-subsidised by the wealthy, so consumers have little incentive to limit consumption. New technologies are usually more expensive than old ones are and often add to existing treatments.

As a result, most health payers put in place mechanisms to control consumption. Mobile health will need to ensure that it is seen as a cost-effective approach which is worthy of funding in preference or in addition to more traditional health services, rather than yet another technology for beleaguered health payers to try to afford.

### CHALLENGES OF LESS WELL-ESTABLISHED MARKETS

Outside of the established healthcare systems of the developed world, circumstances vary widely. However, a common theme is enormous disparities of health provision, and a far greater role of consumer payment.



Source: World Health Organisation, Espicom

Figure 2: Comparison health spending and resources — selected countries (WHO, Espicom)

<sup>3</sup> *Dementia 2010. The economic burden of dementia and associated research funding in the United Kingdom*; Health Economics Research Centre, University of Oxford for the Alzheimer's Research Trust; Ramon Luengo-Fernandez, Jose Leal, Alastair Gray

<sup>4</sup> *Why Have Health Expenditures as a Share of GDP Risen So Much?* Charles I. Jones, Department of Economics, U.C. Berkeley and NBER; 2004

<sup>5</sup> *Who's Going Broke? Comparing Healthcare Costs in 10 OECD Countries*, Christian Hagist, Laurence J. Kotlikoff, NBER; 2005

In the poorest countries, the challenge is to build health infrastructure that is able to deliver an acceptable quality of healthcare to the mass population whilst meeting the growing aspirations of the emerging middle class. While the rich generally have access to world-class healthcare through self-pay or private insurance, the poor have little or no access to services that would be considered a basic human right in most developed countries. Against the OECD average of 10% of GDP, the bottom third spending countries invest an average of 5.6% GDP in health and suffer from poor infrastructure, poorly informed population and lack of health professionals, made worse by poaching by richer countries (*figure 2*).

For countries with large rural poor populations, mobile phones have an important role to play in providing access to basic healthcare, including information about avoidance and treatment of contagious diseases. Examples here include remote dermatology diagnosis, avoidance of infant mortality, reminders for tuberculosis therapies, and warnings of the emergence of diseases such as cholera as a result of natural disasters.

As wealth increases, disease prevalence (epidemiology) changes — from diseases of poor sanitation and education such as tuberculosis, HIV and diarrhoea to diseases of the wealthy such as cancer and diabetes (*figure 3*). For example, in 2000, there were estimated to be about 45 million diabetics in developed countries, or about 4% of the total

population of those countries<sup>6</sup>. A recent UK study estimates that by 2005, prevalence had increased to nearly 10%<sup>7</sup>. In India today, there are 35 million diabetics, a number that will increase to 80 million by 2030. If India were able to find a way to manage diabetics for a tenth of the cost required in the US today, the bill for treating diabetes in 2030 would still be equal to the entire Indian healthcare budget for 2009.

The countries of the Middle East present a particular challenge and opportunity. The countries of the Gulf Cooperation Council (GCC)<sup>8</sup> are suffering a dramatic rise in chronic disease, with over 40% of those over 60 suffering from diabetes and higher rates of cardiovascular disease than Europe or the United States. Health systems are developing rapidly but have not yet matured. There are enormous opportunities for investment in new technologies and approaches that address these issues better than conventional health system structures do.

For some less well-developed countries, the impact of an aging population is even more severe than it is in the developed world. For example, China is aging rapidly, and by 2030 will have broadly the same age distribution as most Western European countries. Despite the fact that the Chinese save at over four times the rate of the United States, with little in the way of any safety net, it is hard to see how it will deal with the upcoming wave of frail and elderly.

<sup>6</sup> Global Prevalence of Diabetes Estimates for 2000 and Projections for 2030, "Diabetes Care" Wild et al., volume 27, number 5, May 2004

<sup>7</sup> Trends in the Prevalence and Incidence of Diabetes in the United Kingdom 1995-2005, Gonzales et al., Journal of Epidemiology and Community Health (online February 2009)

<sup>8</sup> Saudi Arabia, Qatar, UAE, Oman, Bahrain and Kuwait

High-income countries	Deaths in millions	Middle-income countries	Deaths in millions	Low-income countries	Deaths in millions
Coronary heart disease	1.34	Stroke and other cerebrovascular diseases	3.02	Coronary heart disease	3.10
Stroke and other cerebrovascular diseases	0.77	Coronary heart disease	2.77	Lower respiratory infections	2.86
Trachea, bronchus and lung cancers	0.46	Chronic obstructive pulmonary disease	1.57	HIV/AIDS	2.14
Lower respiratory infections	0.34	Lower respiratory infection	0.69	Perinatal conditions	1.83
Chronic obstructive pulmonary disease	0.30	HIV/AIDS	0.62	Stroke and other cerebrovascular diseases	1.72
Colon and rectum cancers	0.26	Perinatal conditions	0.60	Diarrheal diseases	1.54
Alzheimer's and other dementias	0.22	Stomach cancer	0.58	Malaria	1.24
Diabetes mellitus	0.22	Trachea, bronchus and lung cancers	0.57	Tuberculosis	1.10
Breast cancer	0.15	Road traffic accidents	0.55	Chronic obstructive pulmonary disease	0.88
Stomach cancer	0.14	Hypertensive heart disease	0.54	Road traffic accidents	0.53

- All income groups
- High and medium only
- Medium and low only
- Limited to one income group

Source: World Health Organization

**Figure 3:** Causes of death, by high- middle- low-income countries

## 2. The mobile health promise

### THE ADVANTAGE OF MOBILE TO A HEALTH SYSTEM

Healthcare, unlike many other industries, is almost entirely delivered by physical interaction between patients and health professionals. Furthermore, the complexity and specialisation of healthcare means that many diseases will require multiple professionals to be engaged in diagnosis, treatment and follow-up. This means that either patients have to periodically travel to areas where all the health professionals practice (hospitals and clinics) or professionals have to travel out to see patients. Both are expensive and inconvenient for at least one party.

This need for co-location is manageable for episodic healthcare interactions like surgical operations. However, for chronic diseases which require constant monitoring, this is not only inconvenient but also incredibly expensive in time of scarce profes-

sionals, which explains why it often does not take place. For example, in the US and UK, only two-thirds of cardiac patients received adequate rehabilitation. The promise of mobile health is to achieve co-location through the technology solution, allowing patients and health professionals to interact without the need to be in the same place. Even when a health professional is with the patient, he or she can interact with other parts of the health system remotely, accessing diagnostic tools, other health professionals, images and prescribing drugs without needing to be in a hospital. This has enormous potential to lower the cost of health interactions all along the patient pathway, and achieve interactions that would otherwise be impractical (figure 4).

Of course, fixed internet-based technologies can also reach into the patient's home, but mobile health has several overwhelming advantages.

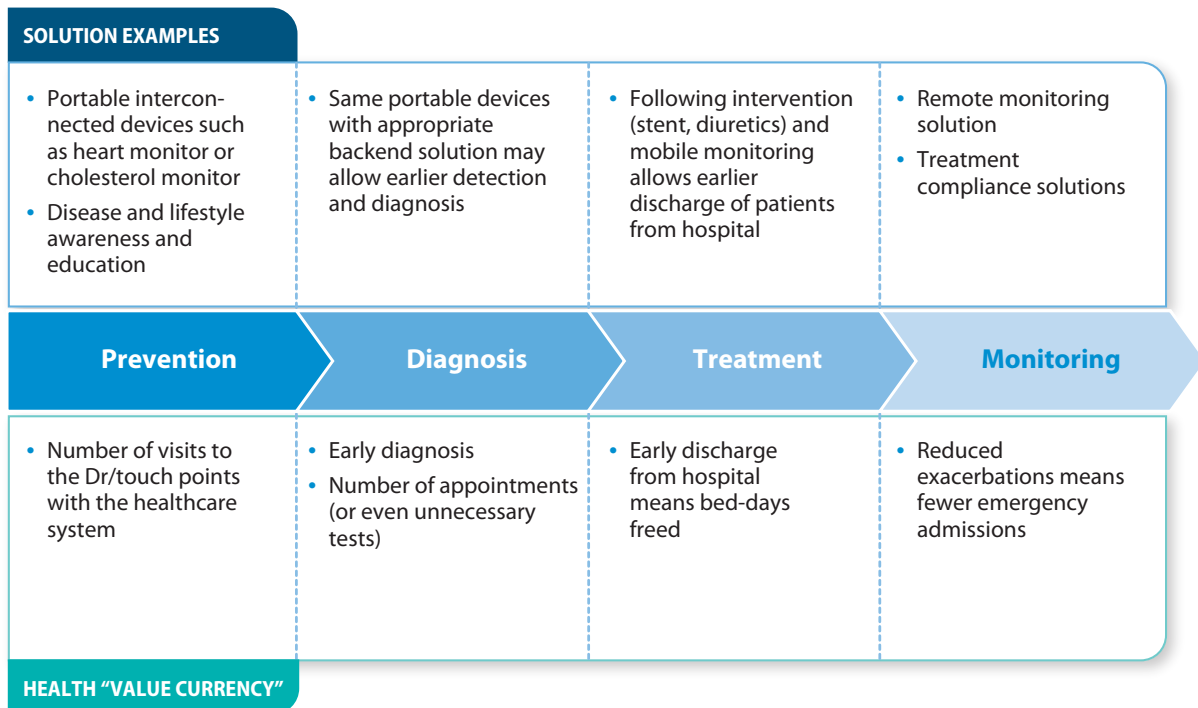


Figure 4: Potential applications of mobile health cardiac monitor along heart failure pathway

Firstly, mobile health is extremely convenient, as it offers a wide range of mechanisms by which patients can transact with health professionals, or systems which act as a proxy for health professionals, wherever they are. These interactions can be quite sophisticated, remote sensors such as heart monitors, smart pill dispensers, RFID tags which can sense when a pill has been swallowed, or “smart pills” that can monitor vital signs as they pass through the body. They can also be very simple, and include voice, video or text-based messages, net-based information resources, or reminders generated by expert systems.

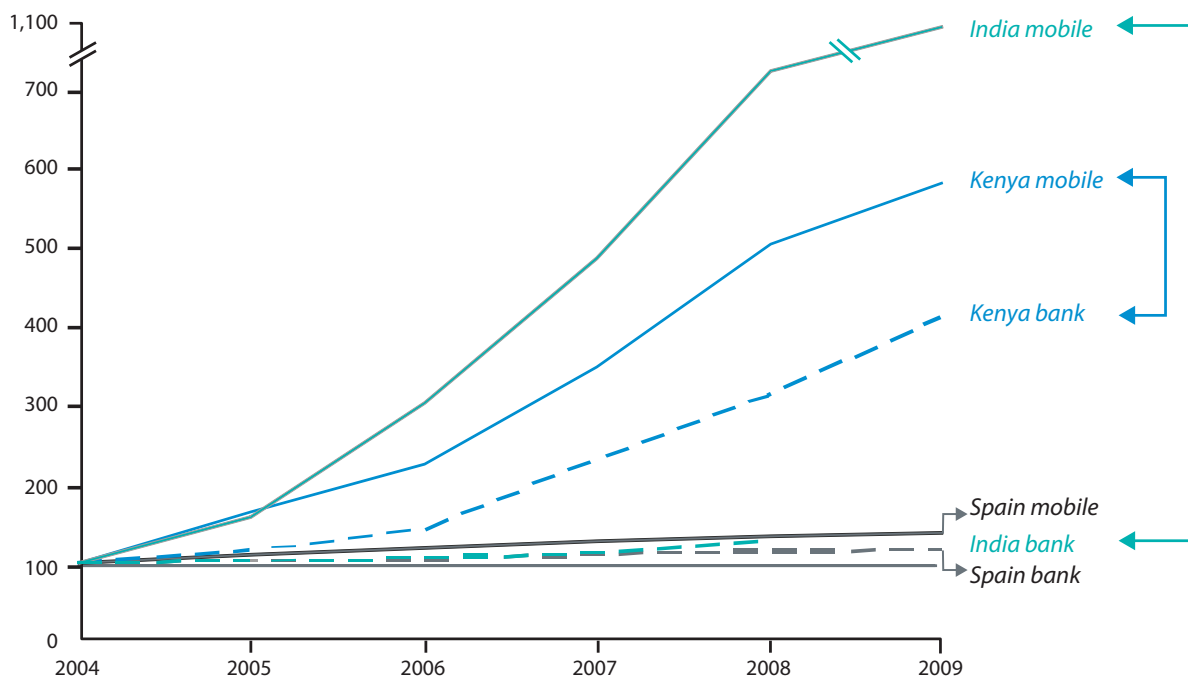
Secondly, it allows continuous interaction without restricting the movements of patients, so is a powerful technology for conditions where such persistence is important, either for diagnosis or post-treatment maintenance, such as diabetes, respiratory, and cardiac disease. In these areas, the opportunity to ask patients to input data about their condition or to connect to remote sensors is particularly important.

Finally, mobile platforms are increasingly ubiquitous. In the UK there are more mobile phones than people. However, this advantage is even greater in the developing world, where lack of conventional internet technology and health infrastructure makes mobile connectivity the only realistic mechanism for citizens to access many services. The power of mobile technology to bring new services to citizens in the developing world is well illustrated by the example of mobile banking in Kenya, where the use of bank accounts has tracked the availability of mobile phones and achieved far higher levels of penetration than in any Western market (*figure 5*).

### WHAT ARE THE WINNING APPLICATIONS OF MOBILE HEALTH?

For established healthcare systems, the biggest opportunities are likely to be in the management of chronic conditions such as diabetes, heart disease, respiratory disease and dementia. For all of these, the ability to monitor vital signs, visually inspect,

Cumulative year-on-year growth (indexed scale)



Sources: Wireless Intelligence; Number of depositors (IMF); A.T. Kearney analysis

Figure 5: Growth of mobile banking and bank accounts — selected countries

locate the patient, promote effective administration of medicines, and provide remote advice are the key interventions that will reduce system costs. All of these diseases tend to have the same risk factors — smoking, diet, exercise — so any application which is proven to address these is likely to be popular. Another emerging area to watch is the use of cognitive therapies to prevent dementia, and again devices that are proven to help in this area are likely to generate interest from both health systems and consumers. Furthermore, by the age of 70 over 30% of people in countries like the UK will suffer from multiple chronic diseases, so solutions that are able to provide remote monitoring and management of multiple co-morbidities are likely to achieve the highest use and uptake. All of these applications will be directly or indirectly reimbursable.

Ultimately it is likely that a relatively few “platforms” will emerge which, like the iPhone, will establish their position not through a “killer app” but through the range of applications available. Such platforms will allow secure connection of multiple devices to data management and storage systems which can be interrogated remotely by health professionals or expert systems. To be successful, connectivity will

be critical, both at the “front end” to multiple devices and the “back end” to clinical systems. There is also a strong move in healthcare toward “open” systems, so it is likely that these platforms will be built around emergent international standards.

In poorer countries, platforms that provide access to primary healthcare and advice stand a chance of becoming the predominant mode of access to healthcare from remote locations in the same way that mobile finance has largely replaced the need for physical banks in Kenya. However, the need for flexibility to address multiple conditions from infectious disease through to advice on contraception and reducing infant mortality will be key to establishing widespread scale.

### THE CONSERVATISM OF HEALTHCARE

However, while mobile health undoubtedly has huge potential, healthcare is a conservative industry. The rate of uptake of innovation is extremely slow and very different from that of the mobile industry. For example, the average development cycle of a new mobile phone is measured in months, while the average development time for a new drug is around 10-15 years.

#### KEY DATES: Mobile Telephony

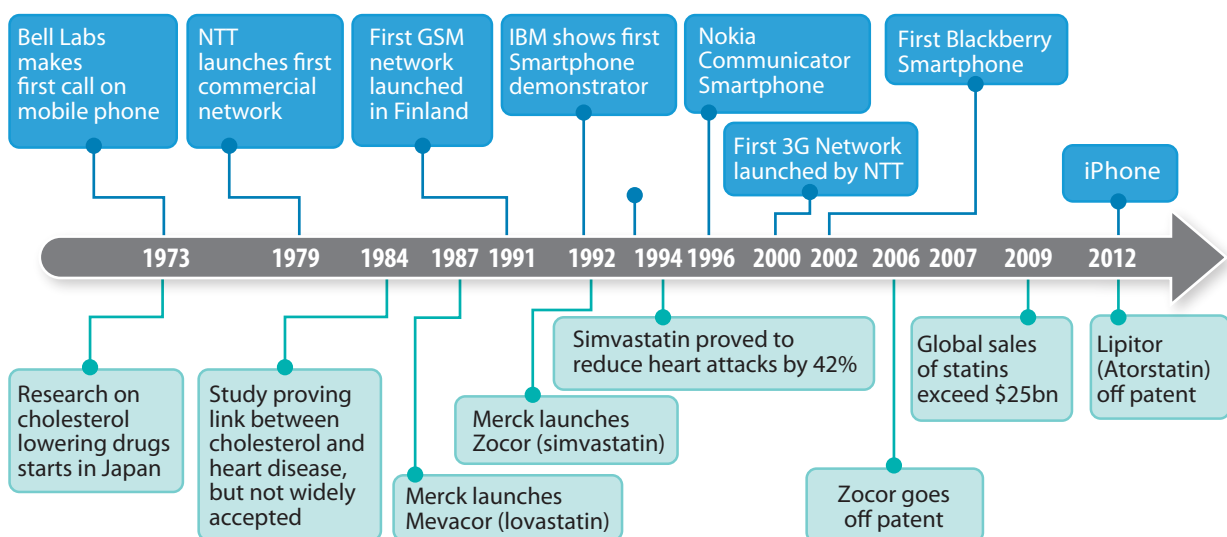


Figure 6: Development cycle of statins compared to mobile telephony

The history of statins, one of the great success stories of post-war medicine, illustrates this development cycle well. Statins are a type of drug that control the level of cholesterol in the blood, resulting in a dramatic reduction in the incidence of heart disease. In the United States alone, 40 million patients regularly take statins, and in 2009 total global sales topped \$25 billion.

While this is a great success story, despite there being overwhelming evidence of effectiveness since 1994 and after two decades and billions of dollars spent on marketing and sales, only half of patients who would benefit from statins in the United States take the drugs.

In fact, the history of statins goes back to 1973, which is the same year as the first mobile phone was demonstrated in Bell Labs (*figure 6*). So a technology which is both cheap and effective and is as

old as the entire mobile industry has still not yet been fully adopted.

Of the many reasons for this slow uptake of technology, an important one is that new technologies are literally a matter of life and death. So the burden of proof that something works and is safe is very high — a burden of proof which has shaped the mindset of the industry.

This conservatism can be frustrating. The principle of “build and they will come” generally does not work, and achieving uptake takes a lot of effort. In the rest of this paper, we will explore how operators can best navigate the barriers to uptake of innovation, in particular the problems of reimbursement and commercial viability. We will start with a discussion about how financial flows work in health systems, then examine different ways in which operators can access the market.

### 3. Who pays for what?

#### DEVELOPED WORLD HEALTH ECOSYSTEMS

Healthcare ecosystems vary widely between countries and are extremely complex, with a wide variety of stakeholders and players (figure 7). While healthcare systems are all different, they fall into relatively few “archetypes” characterised by the way funds are distributed by health payers, and their relationship to the health providers – hospitals, clinics, doctors, nurses and therapists.

- **Free Market:** All healthcare is delivered by private health insurance companies contracting with private or not-for-profit health providers for delivery of services. Premiums are paid by citizens or employers, and in most cases, the state subsidises at least some of the poor, old and disadvantaged populations. This system is largely confined to the United States as it has proven to be difficult to control costs, it is very expensive to administer and it results in a high level of inequality of access, while not delivering particularly

good health outcomes at a system level<sup>9</sup>. Many developing countries have “free market” systems for the rich, but this is generally unaffordable for the poor.

- **National Insurance:** Multiple, highly regulated insurers compete with each other to provide standardised coverage, adjusted so that risk is equalised across the population. Premiums are paid by employers or citizens and often subsidised through general taxation. Participation by citizens is generally compulsory. Both insurers and health providers might be not-for-profits or private. The first system of this type was developed in Germany in the 1890s, so these are often referred to as “Bismarck” systems. They are more efficient and equitable than “free market” systems, but still incur a significant cost in administration. Many developing countries have national insurance-type systems for groups of citizens such as civil servants and armed forces.

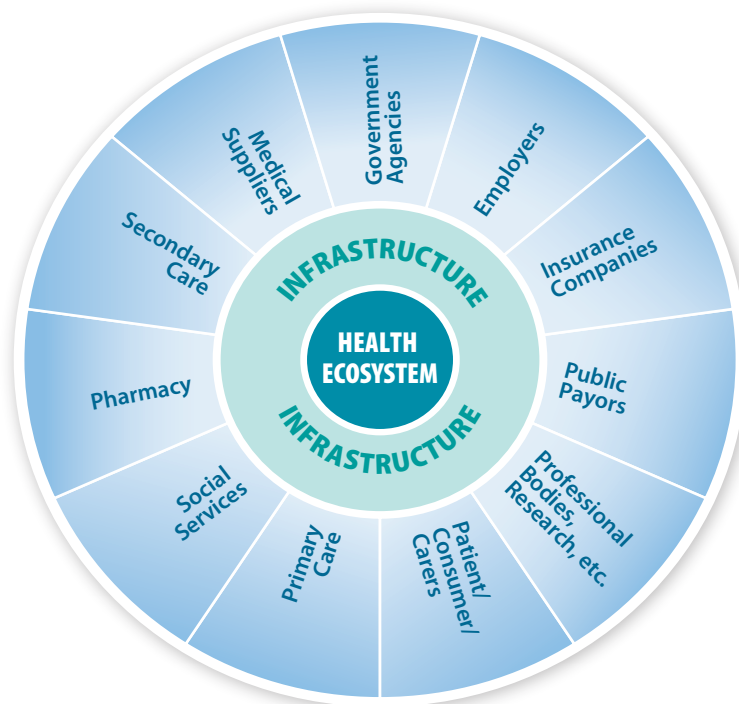


Figure 7: Players in the health ecosystem

<sup>9</sup> *Mirror Mirror on the Wall; An international update on the comparative performance of American Health Care – Commonwealth Health Fund, 2007*



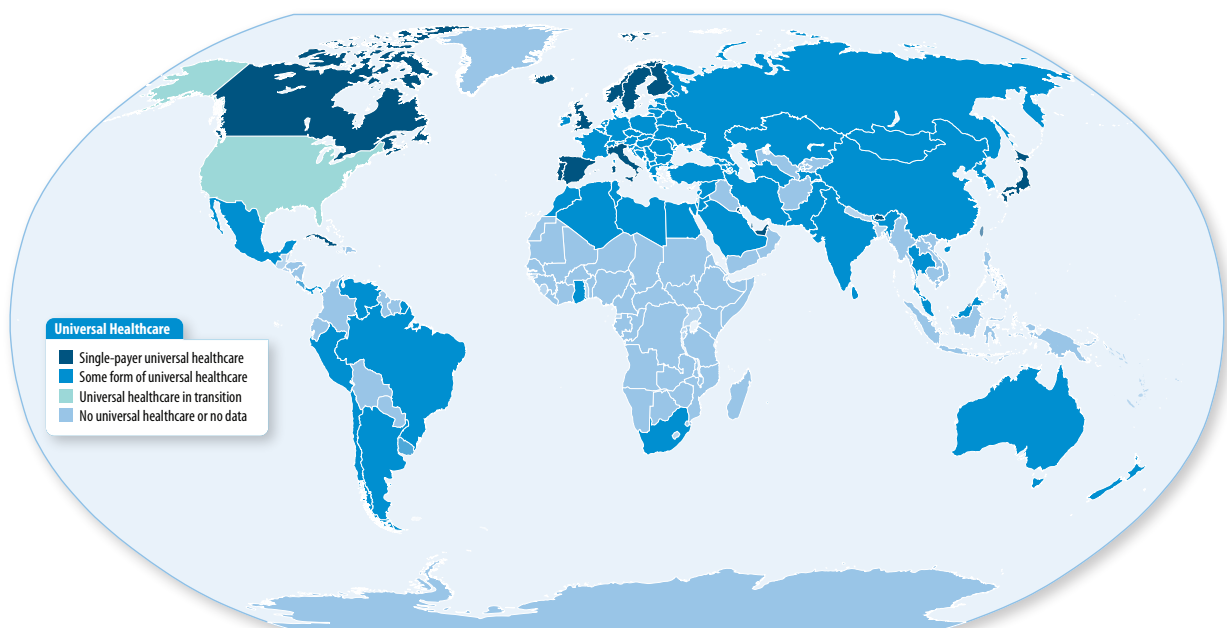
- National Health Systems (NHS):** A single health payer system that provides healthcare to all its citizens, funded through either general taxation or a nominal “national insurance” payment, with the government effectively acting as a monopoly insurer. The first example of this system emerged post-war in the UK, so these are often known as “Beveridge” systems, named for the economist who proposed the system. Health providers are often a mixed economy of state, not-for-profit and private ownership, though the trend is to encourage private sector participation. They are the most cost-efficient of all systems as total expenditure can easily be controlled through fixed budgets, and with no claims to process, administration costs are lower. However, they are not as popular with citizens as insurance systems as they can be unresponsive to customer needs<sup>10</sup>. Many developing countries use a simple “NHS” type system to deliver basic care to the poor, while the rich pay privately.

Within these basic three types of system there are a bewildering number of hybrids and variants.

Furthermore, as health systems seek to control costs and drive up quality, they tend to borrow mechanisms from each other, and, over time, converge in terms of how they operate<sup>11</sup>.

For mobile health solution providers, the architecture of the system is important as it influences who might buy solutions and what health payers value (*figure 8*). In many — but not all — insurance-based systems, patients pay for healthcare and then reclaim from the insurer, so they are more active participants in their choice of healthcare. The focus of health payers is on managing down the cost of claims and establishing competitive advantage against other insurers. As citizens are generally free to change insurers at any time, insurers have limited incentive to invest in prevention of disease or public health.

In NHS systems, healthcare is usually provided free of charge, so mobile health solutions must be sold to health payers or health providers. Patients are often unaware of costs, and may or may not be offered choices of treatment. Payers tend to be more focused on managing system costs, improving access and public health.



**Figure 8:** Healthcare systems by archetype (Source: *chartsbin.com*, various sources)

<sup>10</sup> *Bismarck or Beveridge: A beauty contest between dinosaurs* Jouke van der Zee and Madelon W. Kroneman

<sup>11</sup> *Healthcare Out of Balance — how global forces will reshape the health of nations*, A.T. Kearney 2008.

The boundaries of health systems are often unclear, in particular with social care. Social care is a substantial and growing area of expenditure, usually funded separately from health, often through regional agencies. Of particular interest for mobile health is elderly care, where a basic “safety net” is supplemented by funding from families or individual savings. The growth in dementia in particular is causing a rapid “medicalisation” of long-term elderly care, which most systems are singularly ill-equipped to deal with. While social care is funded separately, it is closely linked to health services, as failures in social care inevitably end up with the individuals being returned to the care of the health system. This distinction between health and social care funding is critical when considering mobile health applications such as a location services for older people.

There are similar overlaps with education in the area of learning disabilities, and with criminal justice in areas of mental health and addiction. Understanding exactly which agency pays for what in any particular country is critical for gaining reimbursement for any new technology.

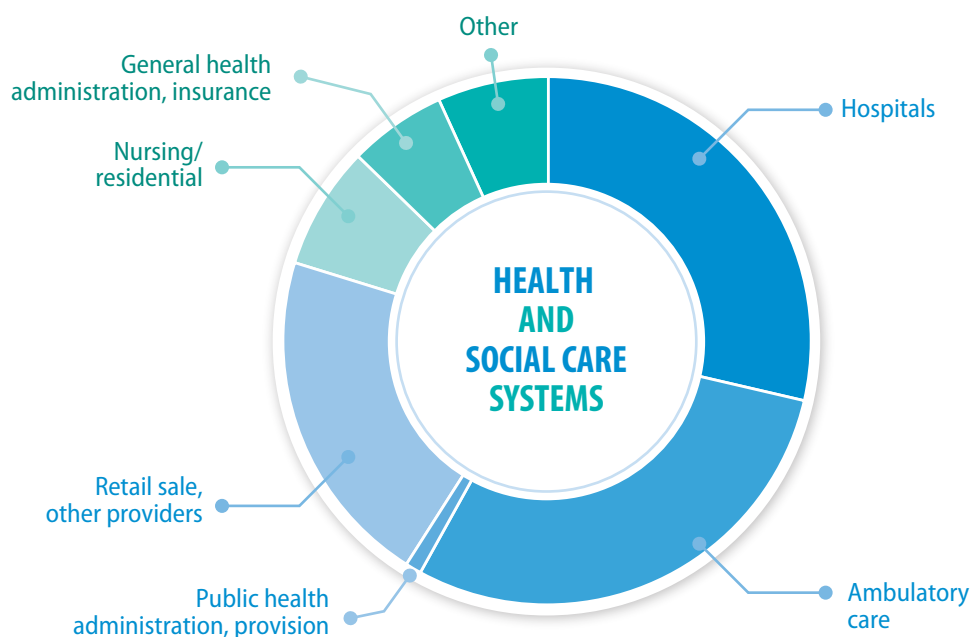
In looking at where the money gets spent, the vast majority of health spend goes to treatment in hospitals and clinics, with a significant expenditure

on elderly care in residential homes (*figure 9*). A major cost lever for health payers is to keep patients out of these expensive institutions, which means that number of admissions and length of stay are important “currencies” in which benefits of a health solution need to be expressed.

### HOW HEALTHCARE IS PAID FOR BY THE SYSTEM

Whatever the system, the most important features of mobile health are the way that payments work between the citizen, the health payer and the health provider, and the reimbursement model.

Payers, through collection of premiums or taxes on citizens, have a risk pool of money from which health and social services need to be paid. However, there is an inequality in power between health payers and health providers, as health providers have far greater expertise to judge what services should be provided to a particular patient. Reimbursement systems are often based on activity, meaning that health providers have few financial incentives to prevent the need for treatment, or to limit how much care is actually delivered. As a consequence, in the United States, where there are few incentives for health providers to be conservative in treatment, there are double the number of



**Figure 9:** Spend breakdown in health and social care systems (Germany, 2007. Source: WHO)

MRI and CT scans compared to the average across OECD countries, double the number of revascularisations and 55% more knee replacements<sup>12</sup>, many of which are interventions of dubious clinical value.

Payers adopt a range of approaches to address the problem. Payers can incentivise citizens to use health resources carefully by asking them to contribute to their care through co-payments. If well designed, these can encourage patients to use cost-effective technologies, look after themselves better and take medicines properly<sup>13</sup>. However, they can also result in patients putting off treatment, which can increase costs in the long term<sup>14</sup>. Payers can also encourage competition and choice between health providers, and specify how care should be delivered.

However, the main tool to control costs is the reimbursement system, which funds specific treatments or not depending on whether they are deemed to be cost-effective, and incentivises health providers to control costs and use the most effective treatment by transferring at least some of the financial risk to them. There is also a trend to align financial incentives with health outcomes, though this proves difficult to achieve in practice.

Social care systems are usually funded separately and vary widely in their scope and generosity. They tend to provide a range of reimbursable services, and vary in the degree to which they are reactive to need or proactive in preventing problems. Social care includes the most mature of all mobile health applications in the form of “social alarms” for the elderly. Uptake varies between countries, with Spain and the UK having the highest penetration in Europe at 15% of eligible population, but with far lower levels of 3% or less in other countries such as Germany and France. Most are provided by social care or housing services, and funding routes vary from public funds in Germany and Denmark, to public financing with user co-payment across the rest of Europe and Japan, and private payment in the United States<sup>15</sup>.

Any health technology which is to be paid for by the health system needs to be compatible with

this reimbursement system. A technology can be directly reimbursed by health payers, or indirectly reimbursed by being bought by health providers, who are themselves reimbursed by health payers. In the next chapter we will look in detail at how this works and its implications for mobile health solution providers.

## HEALTHCARE FUNDING IN LESS WELL-ESTABLISHED MARKETS

Outside of the major established health systems, there are a wide range of circumstances, from the poorest countries with very little in the way of health infrastructure to rapidly developing markets which have not yet created mature health systems (*figure 10*).

Within the poorest countries, healthcare funding comes from individuals, the state and non-governmental-organisations, and focuses on basic healthcare. For example, in Kenya funding is split evenly between households (36%), state (29%) and donors (31%).

As countries become wealthier, they tend to spend disproportionately more on health than on other consumer items. However, state funding of healthcare tends to lag overall consumption, so healthcare in developing countries is much more oriented toward self-pay. For example, between 2000 and 2015, consumer spending on healthcare services is forecast to increase 130% in India, nearly 80% in China, and over 70% in Thailand.

As state funding increases, developing countries start to put in place universal healthcare, either modelled on NHS-type systems (such as in Brazil), compulsory private insurance (as in the GCC) or low-cost social insurance such as that found in China. At the same time, private insurance for wealthy citizens funds investment in private hospitals which can often be “state of the art” and totally unaffordable to the general population.

Providers of mobile health solutions in developing countries will need to decide which segment of the population they are targeting. The rich will have needs similar to those in the developed world.

<sup>12</sup> Mark Pearson, Health Division, OECD; *Why does the US spend so much more than other countries?*

<sup>13</sup> For example: *Evidence That Value-Based Insurance Can Be Effective*; Michael E. Chernew et al; *Health Affairs* February 2010

<sup>14</sup> *Increased ambulatory care co-payments and hospitalizations amongst the elderly* A.N Trivedi et. al *New England Journal of Medicine*, 2010

<sup>15</sup> *ICT and Aging, European Study on Users, Markets and Technologies*, European Commission January 2010

For the poor, applications will need to use simple technologies (e.g., SMS) to address basic health problems, such as tuberculosis diagnosis and treatment monitoring, or education on preventing infant mortality. Many of these programs will be paid for by NGOs.

The needs of the emerging middle class are less clear, but perhaps the most exciting. The way may be open to establish mobile health as a viable alternative to traditional methods of health delivery without any of the institutional reluctance to adopt innovation found in more established health systems.



(1) No separate social security category for Brazil's public health expenditures  
Source: World Health Organization

Figure 10: Growth of self-pay in the developing world

## 4. Getting reimbursement for mobile health solutions

As we have described, the vast majority of global health spend is focused on reimbursed healthcare within established systems. This chapter focuses on the specific challenges of accessing this market.

### CREATING VALUE WITHIN THE HEALTH SYSTEM

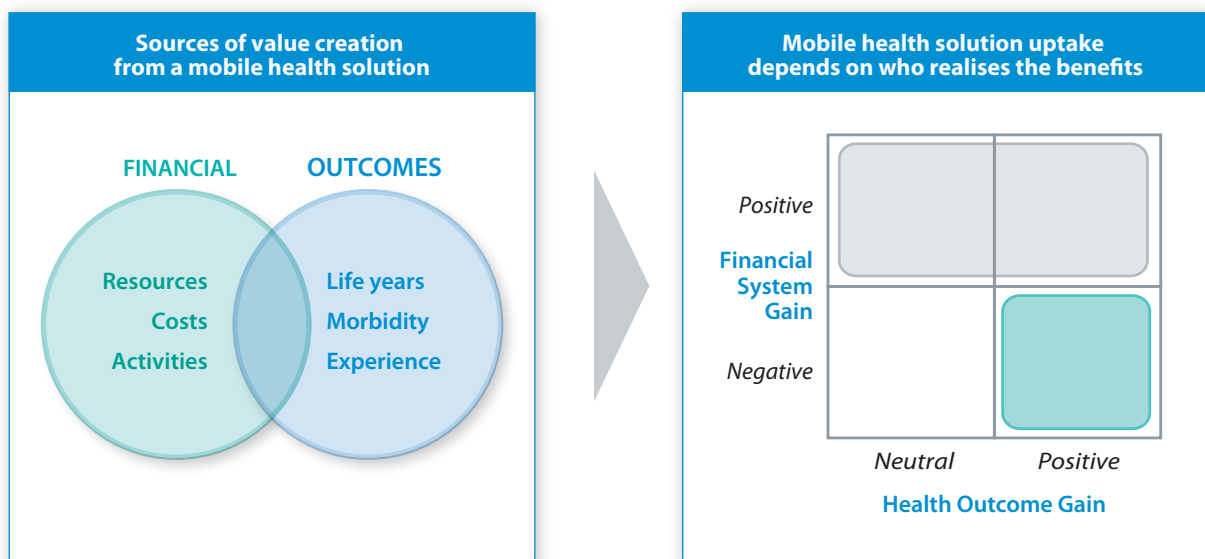
To achieve widespread uptake within a reimbursed system, a mobile health solution must deliver healthcare more cost effectively than existing solutions. It can do this by being a lower cost way of delivering a given health outcome, and in this case it is critical to understand who will realise the financial gain. Alternatively, it can provide additional health outcomes at an incremental cost, and in this case it will need to demonstrate that it is “good value” in health economics terms (*figure 11*).

In practice a number of factors play into the decision as to whether a particular technology will be funded by payers:

- **Willingness to pay:** Is this an area where the system is prepared to invest? While the theory of health economics is that judgements are based on rational trade-offs, in practice every society

and organisation has beliefs about what should be a priority. For example, air ambulances and treatment of many rare diseases have a low economic return, but are often funded nevertheless.

- **Budget constraints:** A technology may be cost effective, but it will not be funded if there is no additional money to pay for it, especially if some up-front payment is required for future returns. This is particularly an issue in budget driven NHS type health systems.
- **Pathway considerations:** Whether the intervention is preventative, curative, or designed for maintenance will determine how important it is seen to be, with investments in treatment typically taking priority.
- **Innovation value:** While health systems are conservative in uptake of technology, most recognize the need for innovation and differentially fund experimental technologies, in particular where there is no existing proven solution. Some health economics valuation methodologies include an “innovation premium”, which can make a big difference in the decision whether to fund or not.



**Figure 11:** Type of value created by a mobile health application

- **Tangible value creation:** Value that can be measured and realised such as costs or lives saved will always have priority over less well defined areas such as broader social value. The more tangible and short term the measure and greater the level of proof, the more likely a technology is to be funded.
- **Funding flows and reimbursement model:** This will determine which party will financially benefit from any potential solution, and therefore who is likely to be interested in buying it.

Of all of these, it is the last two which are both the most important and the most complicated and which will be investigated in more detail in the following sections.

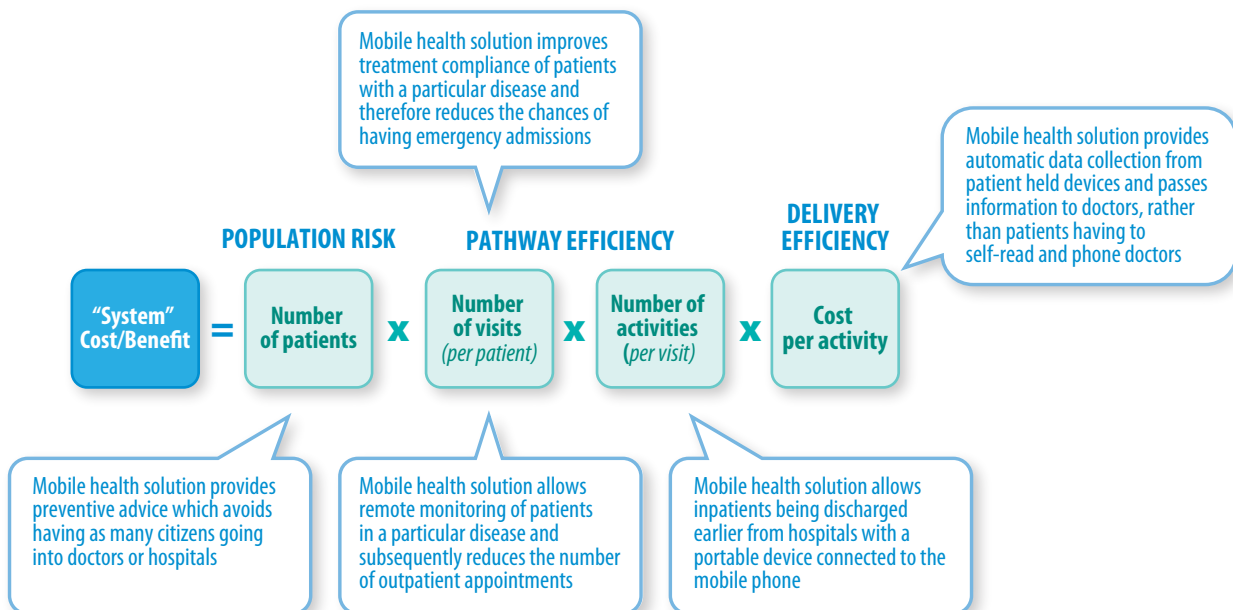
### UNDERSTANDING WHO BENEFITS FINANCIALLY

Reimbursement systems try to align incentives between health payers and health providers to provide the most appropriate care to patients in the most cost effective way. The problem is that each disease has a quite different dynamic in how it is treated, and optimising payment systems for every disease would make reimbursement systems

impossibly complicated, not least because patients often have more than one disease. A consequence of compromises required to build practical reimbursement systems is that the actions of one agency often benefit another agency, and sometimes an agency will need to act against its own interest to benefit the patient and system overall.

For example, rheumatoid arthritis is a difficult disease to recognise, and typically less than half of people with the disease are diagnosed correctly. However, both patients and the overall system benefit from early intervention. One solution is for rheumatologists to train and remotely support primary care physicians to recognise the early stages of disease (an obvious area for mobile health), and indeed when they did this in Spain, diagnosis rates doubled. However, rheumatologists generally practice in hospitals, and are only reimbursed when a patient is severely ill enough to be referred to hospital for treatment — a positive disincentive for treatment in primary care.

At the other end of the disease pathway, mobile health can help with early discharge of patients from hospital after treatment. However, if the hospital



Examples of mobile health solutions

Figure 12: Sources of value

is paid a sum for each night a patient spends in hospital, the health payer and patient benefits, but the hospital loses revenue.

There are two key factors that determine who potentially benefits from any novel technology; how the value is created, and exactly how the reimbursement system distributes risk. Financial value can be created by (figure 12):

1.	Preventing people from getting ill and so reducing the number of patients
2.	Reducing the number of times people interact with the system
3.	Reducing the number of activities which are carried out
4.	Reducing the cost of delivery

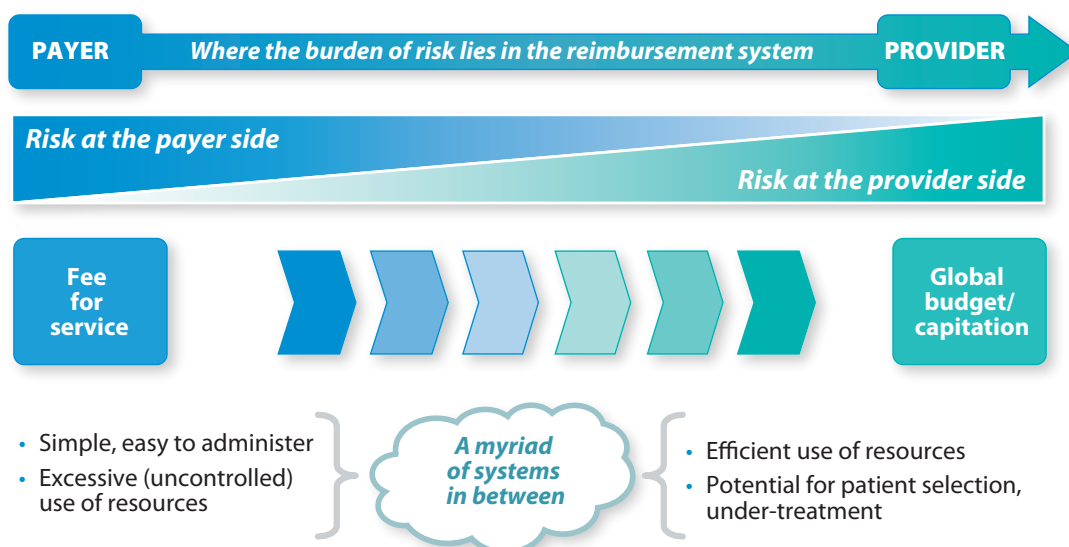
Taking a cardiac disease patient as an example, a mobile health application could help people avoid disease by giving advice on healthy diet, automatically log cholesterol levels so avoiding trips to the doctor, allowing multiple readings to be carried out at the same time (cholesterol, electrocardiogram, blood pressure, heart rate), or allowing early

discharge after an operation. Who benefits from each of these sources of value will depend on the degree to which the reimbursement system associated with that particular disease has passed risk from the health payer to the health provider.

In the simplest systems, health providers are paid retrospectively for the work they do — so-called “fee-for-service” — provided they use reimbursable procedures and technologies (figure 13). This payment system is simple to administer, but requires robust mechanisms to prevent over-treatment, which are often very unpopular with both providers and patients. However, its flexibility means that complex treatments are often reimbursed on this basis.

At the opposite extreme, health payers can pass virtually all the risk for treatment to the health provider by using a prospective payment such as capitated payments or global budgets. Payers give health providers a fixed fee for a group of citizens, and the health providers are obliged to treat them no matter what is wrong with them, using whatever treatment they deem to be most suitable.

The risk here is one of under-treatment, so control mechanisms focus on measuring quality



**Figure 13:** Transferring risk from payers to providers

of outcome and care standards, which are difficult to measure. Some systems such as those in the UK, Germany and France include incentive payments for activities such as chronic disease management. This type of system is often used for primary care services.

### FINDING THE RIGHT CUSTOMER

Determining whether the customer for a mobile health solution is a health payer or health provider will be driven by who bears the risk. Unfortunately, there are a wide range of different ways to distribute risk between the extremes of fee-for-service and capitation, and we have used three examples of such intermediate arrangements to illustrate how value shifts (figure 14):

- **Resource Based Tariff** is a retrospective system that pays an agreed amount to deliver a particular type of treatment, described by Health Related Groups (HRGs) as used in the UK or Disease Related Groups (DRGs) as used in Australia and Germany. The fee is typically calculated on the average cost of treating the disease, reset on an annual basis.

These work best where treatment packages can be well defined, such as elective surgical procedures.

- **Normative Tariff** is a more sophisticated approach which bases the payment on the cost of a “best practice” treatment (typical top quartile) and is limited to treatments where it is feasible to define what “best practice” is.
- **Year of Care** is a prospective system which is emerging as a payment mechanism for chronic diseases. Providers take responsibility for all aspects of care for a group of patients with a particular disease for an annual fee per patient. It encourages health providers to take a more holistic approach to management of the patient, but requires tight definition of outcomes and disease states. This is being experimented with in several European countries.

These two dimensions of “source of value” and “reimbursement mechanism” will define who will benefit from a specific mobile health application. At either end of the reimbursement continuum it is quite simple. Under fee-for-service, health providers

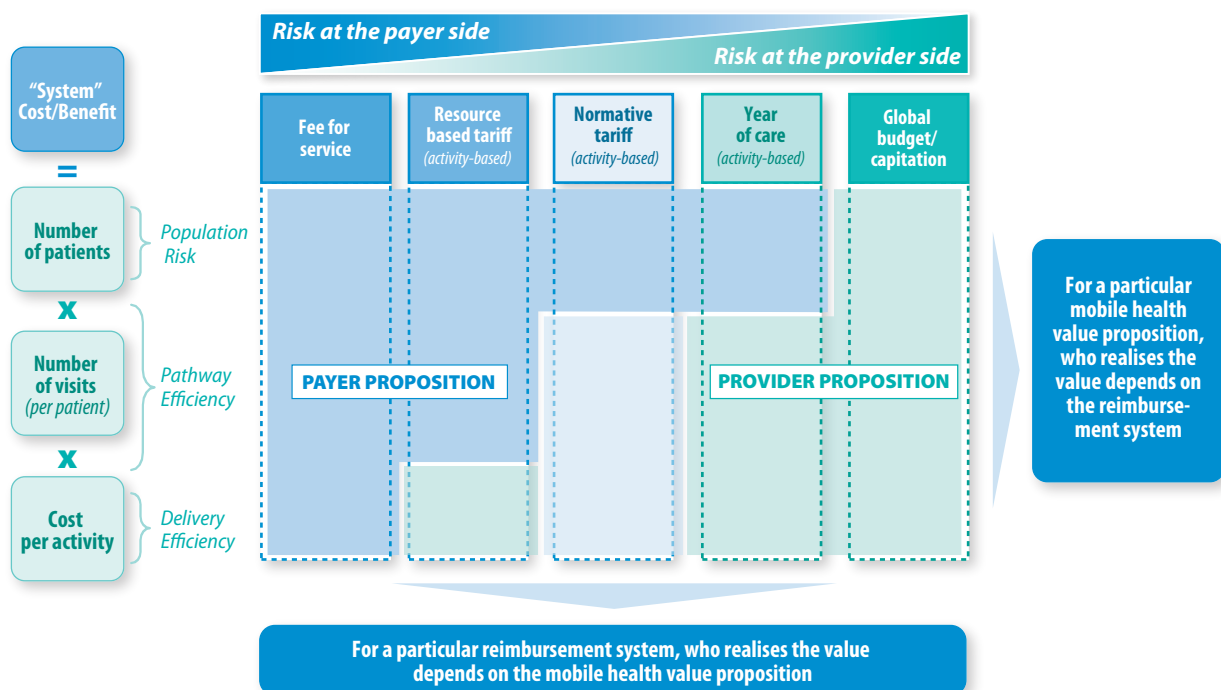


Figure 14: Financial beneficiaries by type of reimbursement system and source of value



are paid for what they do, and will not necessarily benefit from mobile health applications unless specifically identified as reimbursable services, so the health payer is generally the customer. At the other extreme, under capitation systems, risk is transferred to the health provider, so they are the ones that benefit financially from any improvements in efficiency and effectiveness. However, between these two extremes of risk transfer, it becomes more nuanced with a shift toward a provider proposition as risk is transferred.

To address the limitations of traditional fee for service and tariff-based systems, health payers are starting to introduce specific tariffs for electronic interventions to encourage their uptake. The US is taking a lead in this. For example, in May 2010, the American Medical Association (AMA) House of Delegates passed a resolution stating that insurers should reimburse for email consultations. There are now 12 states in the United States that require insurers to pay for telehealth consultations. It is likely that more and more systems will introduce such tariffs, though the speed of uptake will vary by country.

In general, the more comprehensive and flexible the reimbursement system, the easier it will be for novel technologies to achieve uptake. It is quite noticeable that the largest truly integrated health system in the United States, the Veterans Administration, has probably the largest and most integrated example of telehealth in the world through its Care Coordination Telehealth, which manages 30,000 citizens with chronic disease. As chronic diseases are increasingly recognised as the key drivers of health expenditure, reimbursement systems are likely to shift more and more risk to integrated groups of primary and secondary care providers, meaning that in the longer term, mobile health is likely to become an increasingly health provider-focused proposition.

**MEASURING VALUE OF A MOBILE HEALTH SOLUTION**

Solutions which purport to improve health outcomes must prove value for money against existing treatment approaches. The robustness of this analysis and the level of data required varies by country, the type of acceptance being sought, and who the customer is likely to be (figure 15).

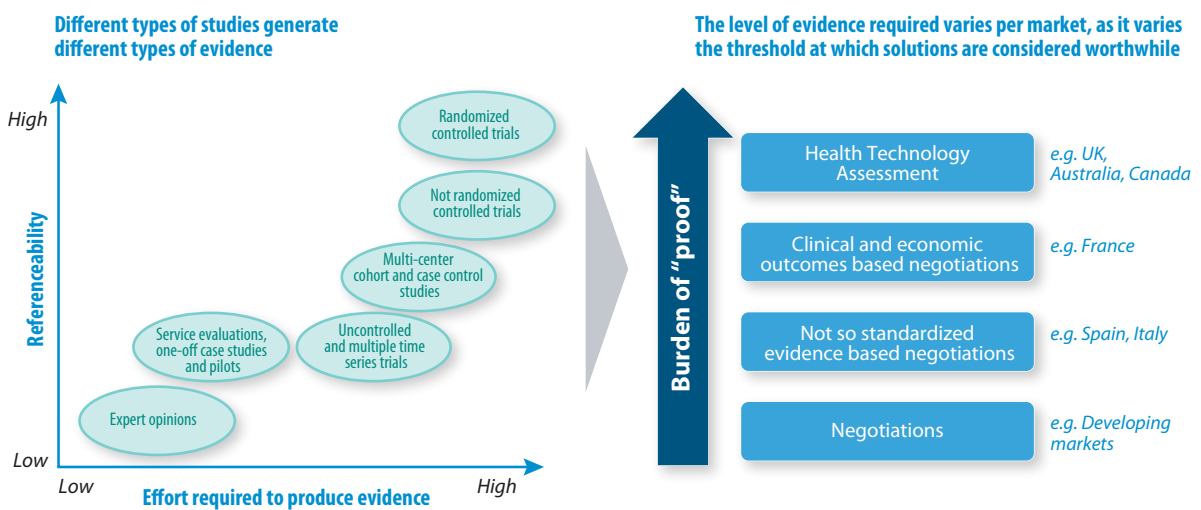


Figure 15: Assessing health value

If the objective is to get a technology reimbursed directly by health payers, then some form of formal health economic assessment is very likely. Countries such as the UK have been pioneers in the science of Health Technology Assessment (HTA), and the UK's National Institute for Clinical Excellence (NICE) has robust and transparent processes to both evaluate the quality of evidence of efficacy, and to assess if a technology represents value for money. The ultimate measure of effectiveness is the cost of providing a Quality Adjusted Life Year (QALY) against existing treatments. Getting a new technology through this process is time consuming and complex, but results in an appropriate adjustment of tariffs and treatment guidelines. Any solution going through such a process will almost certainly be classified as a medical device, so will need to overcome all the regulatory hurdles this entails. Also, most of the evaluative approaches have been developed for pharmaceutical products, and these may not be appropriate for non-chemical interventions.

The approach to value evaluation varies by country. Germany, through its IQWiG institute, has a robust analysis process like the UK, Italy's assessment is strongly weighted on innovation, France uses health economics as an input to a reimbursement decision, while Spain is often characterised by assessments at both national and regional levels. In the United States, HTA is still emergent, and the approach taken varies by health plan. In developing countries, such evaluations are usually somewhat informal.

However, if the objective is to persuade local health payers or health providers to consider the technology as part of their overall approach to delivering care rather than to getting specific reimbursement, the burden of proof is lower. Pilots and demonstrators can be valuable, but it is important that the purpose of such pilots is not just to prove the technology operates successfully, but that the solu-

tion delivers health outcomes and financial benefits in the real world. All such evaluations are best seen as support for marketing of the solutions, and will not by themselves result in widespread acceptance.

The burden of proof required to support widespread uptake of a new technology should not be underestimated, and moving from a pilot to roll-out often proves to be quite challenging. Before starting pilots, it is worth investing time to understand the needs of the authorities and customers who will determine if a new technology is to be used. It is also important to engage appropriate health economics experts to ensure the data collection and analysis is robust, as methodological weaknesses can easily destroy the value of a trial.

#### **WHETHER TO SEEK REIMBURSEMENT OR NOT?**

Gaining reimbursement directly from health payers is a complicated and time consuming exercise. It needs to be addressed application by application and market by market. However, the benefits of doing so are huge. Gaining formal reimbursement status makes the technology widely available and gaining reimbursement in one system makes it much easier to achieve in the next.

However, mobile health solutions do not necessarily need to be accepted by health payers to achieve success in a reimbursed system. Providers will purchase technologies regardless of whether they are reimbursable provided they make commercial sense. Reimbursement systems that are flexible and transfer high levels of risk to health providers are therefore generally beneficial to mobile health.

Ultimately, if mobile health is to realise its full potential, then it will need to be accepted by reimbursed health systems as a mainstream technology. However, there are other potential customers, and these will be discussed in the next chapter.

# 5. Who else buys mobile health solutions?

## OTHER CUSTOMERS IN THE DEVELOPED WORLD

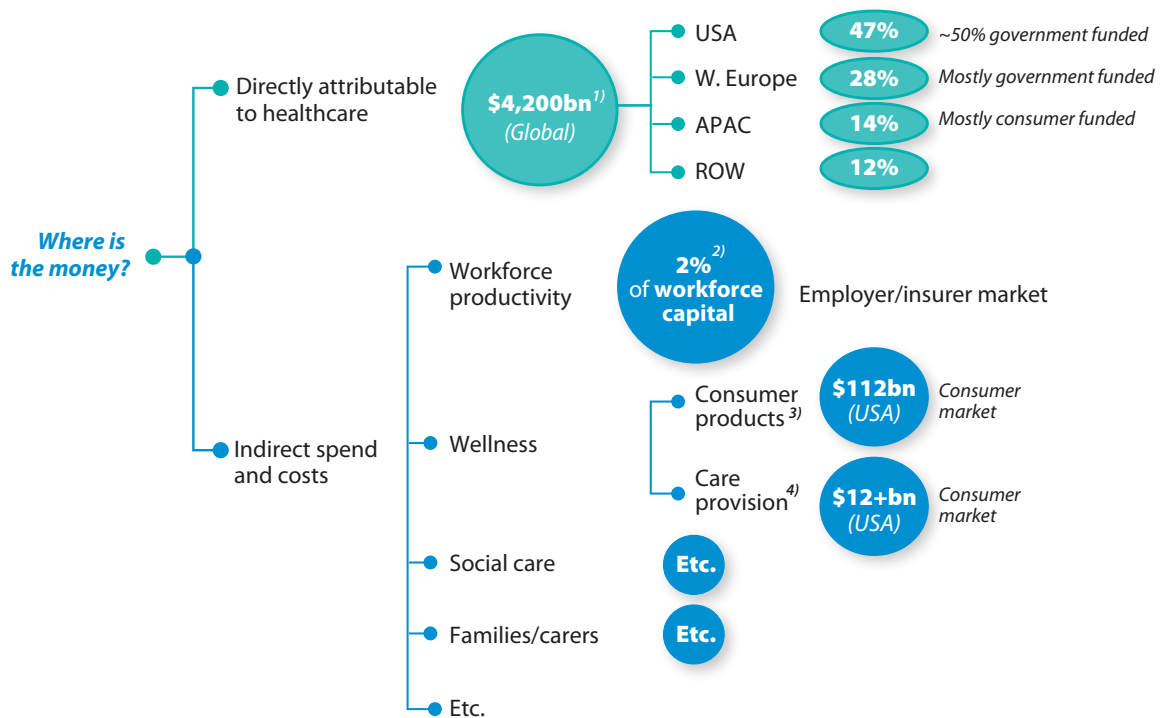
While the majority of healthcare expenditure in the developed world is reimbursed, significant sums are spent outside of the main health system (figure 16).

**Consumers** are becoming increasingly engaged in taking responsibility for their own health, often encouraged by governments. Some 26% of the 65 plus population in the US look for health advice online, with ~110 million North Americans classed as “cyberchondriacs”<sup>16</sup>. As a result, expenditure on “wellness” related products is growing rapidly (figure 17).

When thinking about consumers it is important to distinguish between solutions which are true consumer services, and those which are professionally recommended to consumers by health professionals; doctors, nurses, therapists, dentists or insurance companies.

True consumer solutions in the developed world tend to focus on wellness. Though this seems an attractive market for operators who are familiar with consumer marketing and sales, solutions must compete for “share of wallet” against other wellness categories, and pricing is increasingly conditioned by the ready availability of cheap iPhone apps.

Probably of more interest is the “professionally recommended” segment, where solutions are paid for by customers on the specific recommendation of health professionals, often focused on people who are on the cusp between “well” and “ill”. These “consumer health” markets are increasingly being targeted by consumer goods companies as growth rates and margins are higher than traditional consumer products. Opportunities are greatest in systems where there are high co-pays, or where the scope of services covered by reimbursement



Source s: 1) Espicom; 2) World Economic Forum; 3) Natural Marketing Institute (NMI), 2002 Harris Poll<sup>®</sup>; PLMA, Planet Retail 2007; 4) Credit Suisse

**Figure 16:** Sources of health spending

<sup>16</sup> Results of Harris Poll<sup>®</sup> conducted in 2002

systems is limited. While at the moment in established systems there is still an expectation that “the system will pay”, as governments seek to control costs there may be increasing areas where self-pay becomes more prevalent.

**Employers** are increasingly recognising the cost of poor employee health, with an estimated 2% of capital spent on the workforce lost on employee disability<sup>17</sup> and over 40% of lost work time being accounted for by chronic disease and significant lost time and productivity due to stress. As a result, around half of all multinationals offer some form of wellness program and are potentially prepared to pay for mobile health services<sup>18</sup>.

In some recent work carried out by A.T. Kearney, employers in five European countries were surveyed on their interest in buying a mobile wellness solution for their employees, and over two thirds expressed a willingness to pay for such a solution, with willingness to pay increasing with the “richness” of the solution. Employers saw a range of potential benefits which included the ability to attract employees in a competitive market place, as well as more tangible impacts to change employee behaviour to reduce ill health and absence (figure 18).

There are two major benefits of targeting employers. Firstly, they are often willing to pay for solutions which significantly reduce their business costs. Secondly, they potentially allow access to a large number of consumers with a single transaction. Against this, complex mobile health solutions are likely to be attractive primarily to larger companies, and the range of solutions they are interested in is likely to be quite specific and focused on risk factors which drive productivity and absence.

Accessing employers requires quite a distinct channel strategy. Most health services are bought through insurance companies or benefits consultancies and operators will need to access the HR executives who buy health services.

**Pharmaceutical companies** are very interested in solutions which increase the value of their medicines, in particular by helping to diagnose patients and by encouraging patients to take their medicines. Solutions may be provided to patients and healthcare professionals free of charge, or to be added into service “packages” with the medicine. A brief scan of iPhone applications provided by pharmaceutical companies illustrates their interest in this space (figure 19).

**Health and Wellness Industry**  
Sales (US in \$ billions, growth percentage)



**Figure 17:** Growth in US expenditure on health and wellness consumer products<sup>19</sup>

<sup>17</sup> Working towards Wellness, accelerating the prevention of Chronic Disease, World Economic Forum

<sup>18</sup> Source: Kaiser/HRET Survey of Employer-Sponsored Health Benefits, 2006. USA – Credit Suisse) – A.T. Kearney analysis

<sup>19</sup> Source: Natural Marketing Institute (NMI), 2002 Harris Poll®, PLMA, Planet Retail 2007, A.T. Kearney Analysis

Partnering with pharmaceutical companies has the great advantage that they have access to key medical opinions, health payers and doctors, and have all the systems in place to ensure patient safety. They are also global in reach and familiar with the processes of establishing proof of efficacy. However, many pharmaceutical companies are focused on developing their specific therapies, so may not be that interested in developing broader mobile health applications.

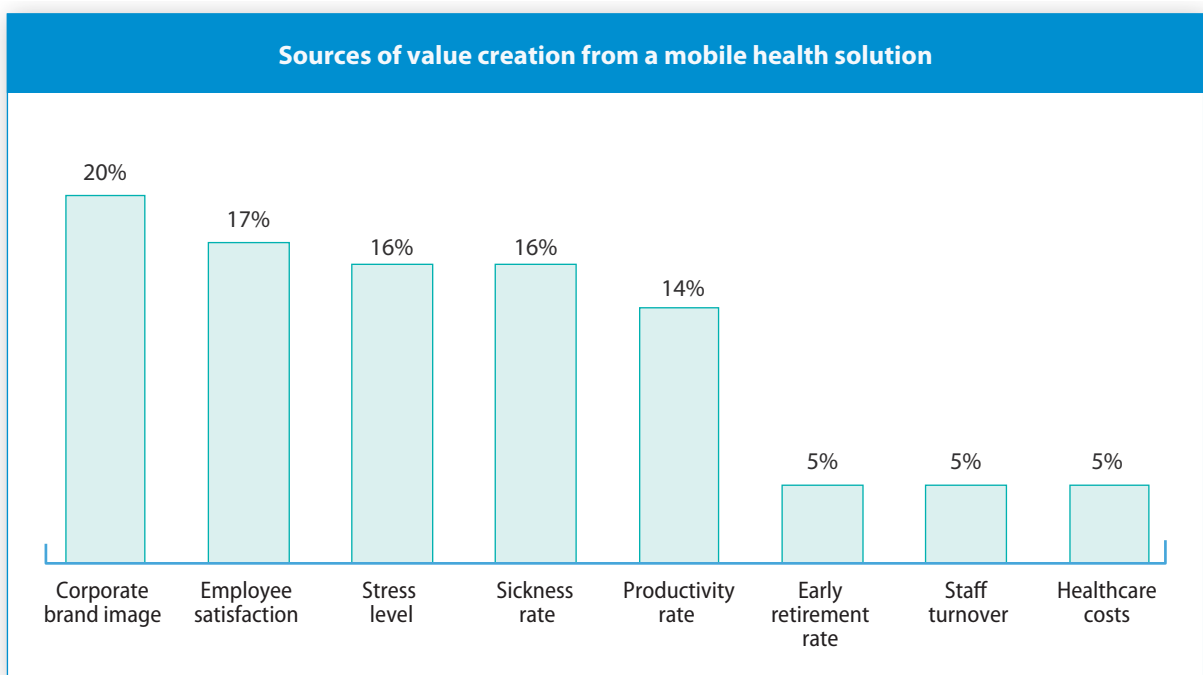
### CUSTOMERS IN LESS WELL ESTABLISHED MARKETS

Much of the discussion in the previous section has been focused on achieving reimbursement in countries with well established health systems. While developing countries account for relatively little spend today, they represent the greatest areas of spending growth.

In poorer countries, NGOs are significant customers of mass market mobile health solutions. These are usually quite simple SMS based solutions addressing basic health needs. While not as directly

rewarding to shareholders, such projects clearly contribute enormously to the health of populations and reflect well on the corporate responsibility of the operators involved. Such projects need a somewhat different commercial approach, and operators will need to expect to share the benefits to help address health inequalities. However, in the longer term, they help establish a powerful mobile brand and position companies well to play a major role in the development of local health systems.

The role of consumers in countries with less well established health systems is potentially more significant than the state dominated health systems of the Western World. The emerging middle class has not been conditioned to expect state payment for healthcare, and may well prove more avid buyers of consumer health solutions. The “professionally recommended consumer segment” is also likely to emerge as a significant market. However, as soon as consumers become wealthy enough to afford insurance then the dynamics are likely to shift toward those of more established markets.



**Figure 18:** Employers’ assessment of potential impact of a mobile health solution

		App Scope		
		General	Disease specific	Product specific
Target Audience	Healthcare Professionals	<ul style="list-style-type: none"> <li>Real-time tracking of lab results</li> <li>Information and news</li> </ul> <p>Johnson &amp; Johnson   Roche</p>	<ul style="list-style-type: none"> <li>Prognosis calculator</li> <li>Risk calculator</li> <li>Information</li> <li>Education</li> <li>EKG readings</li> <li>Decision making tools</li> </ul> <p>Johnson &amp; Johnson</p> <p>Pfizer GSK sanofi aventis Novartis Roche</p>	<ul style="list-style-type: none"> <li>Product dosage calculator</li> <li>Prescribing information</li> <li>Risk calculator</li> <li>Disease progression calculator</li> </ul> <p>MERCK   Shire   Novartis</p>
	Patients		<ul style="list-style-type: none"> <li>Disease awareness</li> <li>Education</li> <li>Patient Diary</li> <li>Treatment tracker</li> <li>Indicators tracker</li> <li>Symptoms tracker</li> <li>Clinical trials locator</li> <li>Specialist search engine</li> <li>Reminders</li> </ul> <p>Johnson &amp; Johnson</p> <p>Pfizer GSK Abbott BAYER MERCK</p>	<ul style="list-style-type: none"> <li>Medication tracker, reminders and connect to healthcare team</li> </ul> <p>BAYER</p>
	General Public	<ul style="list-style-type: none"> <li>Health record / information</li> <li>Food tracker, restaurant locator</li> <li>Vaccination tracker</li> <li>Pharmacy locator</li> </ul> <p>Johnson &amp; Johnson   Pfizer sanofi aventis   Novartis</p>	<ul style="list-style-type: none"> <li>Educational games</li> <li>Specialist locator</li> <li>Disease awareness</li> <li>News and information</li> <li>Message boards</li> </ul> <p>Roche GSK Pfizer Novartis sanofi aventis</p>	

Source: First World, InPharm, A.T. Kearney analysis

Figure 19: Functionalities of Rx iPhone apps by large pharma companies as of July 2010

A roadmap to scaling up mobile health solutions

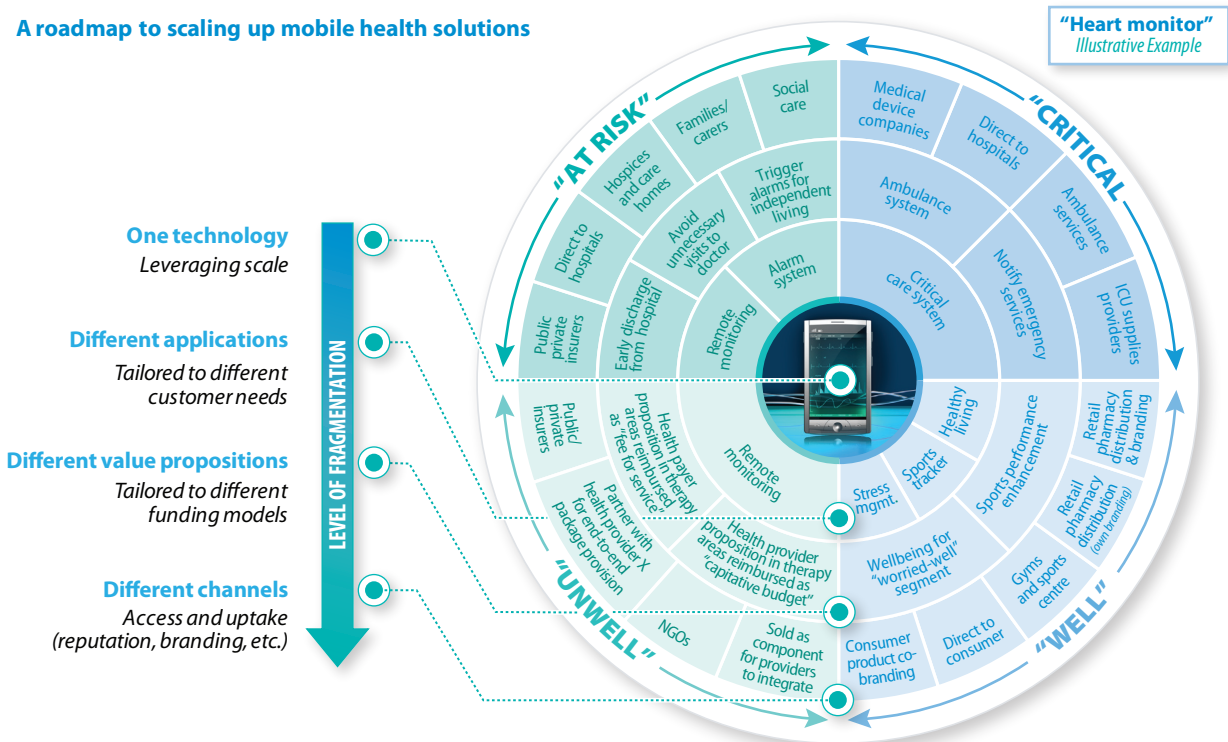


Figure 20: Value propositions tailored to each customer segment

## 6. Building a scale mobile health business

### AN INDUSTRY IN EARLY DEVELOPMENT

Mobile health is still in the early stages of development and it is likely to be years before the industry reaches maturity. Although operators have global aspirations for their mobile health businesses, solutions have not yet reached scale.

- Currently, very few mobile health solutions are directly reimbursed by health payers. Most are targeted at health providers or as consumer products.
- Most services are at the “pilot” stage, or have only a few installations, and few are fully commercially established. Most are limited to the “home” market and have not yet been internationalised.
- In the developed world, few operators provide clinical content or services. Where this is the case, however, services are simple and focused on wellness and consumer-type propositions.
- In the developing world, more clinically intense solutions are being provided. These are generally supplied by healthcare company partner organisations.

Taking into consideration all the factors outlined in this paper, we believe there are six key factors that operators need to consider to build a scale mobile health business:

1.	Building scalable solutions
2.	Deciding the role of the operator
3.	Finding the right partners
4.	Developing appropriate distribution and commercial models
5.	Building the right infrastructure
6.	Defining the right path

### BUILDING SCALABLE SOLUTIONS

A single mobile health technology can have multiple applications, but the approach and commercial model varies by application and by country. Each application needs a clear value proposition, with robust evidence to prove that it works.

The situation is analogous to that found in the pharmaceutical industry. Core technologies have multiple applications called “indications”. Clinical trials need to be carried out to prove each indication in turn before it is licensed for use, and pharmaceutical companies plan to increase the number of indications over time, starting with those which have the highest demonstrated benefit and demand.

Operators should see mobile health in a similar way, as a series of “layered” solutions, where core technologies are linked to a range of applications focused on different customer objectives, with a specific value proposition tailored to the particular customer segment and funding model (*figure 20*). As the solution moves nearer to the customer, it needs to become more specialised and localised, with a wider range of partners and business models.

While the overall approach to scalability should be considered early on, the approach to roll-out will typically need to be done application-by-application and country-by-country, focusing on areas where there are the highest unmet health needs which are most accessible to operators. Most operators we talked to had started with less clinically critical applications, and in their home country.

Each of the applications will need to be supported by robust proof of efficacy, demonstrating that the technologies can address unmet health needs and reduce costs, and operators should pace their expansion plans to build this body of evidence. The technical robustness of the solutions will be an absolute requirement, including the ability to integrate with a wide range of clinical systems of varying levels of sophistication.

This need for proof and robustness has an impact on product lifecycles. Healthcare buyers are unlikely to be interested in the technology itself, and very wary of “cutting-edge technology” which would usually translate as “unproven”. Incremental innovation off a proven platform is likely to be the most attractive positioning. Common standards will be critical to building scalable solutions by enabling interoperability of devices and systems and common solutions across markets. Healthcare providers have an expectation of a fairly long life from investment in technology, and are loath to make major investments in proprietary technology. The uptake of digitised Picture Archiving and Communication Systems (PACS) has been accelerated by the introduction of the DICOM standard for medical images. Similar standards for device connectivity and interfaces to core clinical systems will be important, and operators should ensure that solutions are consistent with emergent standards such as HL7 (a messaging standard for medical devices), ICD10 (which describe disease states) and SNOMED CT (which classifies medical information).

### DECIDING THE ROLE OF THE OPERATOR

In discussions with mobile operators questioned as research for this paper, we discovered a wide range of business and commercial models. To build a significant business they would need to provide value-added services rather than a basic mobile proposition. In talking to operators, services offered fell into several layers:

- **Layer 1: Core Telecoms.** Areas that all operators felt comfortable with providing included traditional services of connectivity, hosting, billing, data management and security. A good example was an operator who had developed a partnership with a medical device manufacturer to provide the communication infrastructure for a remote heart monitor. The medical device company marketed and sold the service.
- **Layer 2: Regulated Health Services.** Some operators were providing services that required specific regulatory approval. One operator was re-selling medical devices. Several operators had

gained registration for holding of clinical patient data in specific countries, which is a significant step both in the investment required and the services it allows operators to provide. Several operators were also planning to develop various “platforms” to enable communication between medical devices and health professionals.

- **Layer 3: Clinical Services.** Most operators were very wary of providing clinical services. However, we came across an example of an operator providing software to guide rehabilitation plans for doctors, though none who had yet hired health professionals to provide advice.

The main issue that prevented operators from delivering “richer” clinical services were concerns not only about core competencies, but also about the risks inherent in providing healthcare services. Indeed, several operators had decided to limit themselves to wellness applications which they saw as lower risk than clinical applications. The ability to manage clinical risk appropriately is an important issue for all healthcare providers. Defensive medicine in the United States costs \$55 billion annually, while even the far less litigious UK sets aside nearly £800 million a year for negligence claims. However, all businesses involve managing risks, and the costs that a system is prepared to pay for a health solution tend to increase with the severity of the condition. Being able to both understand and manage the risks of such services appropriately is an important part of the commercial model.

Generally, risks increase with the severity of the condition suffered by the patient and the consequences of failure of the solution. Similarly, the more the service provider gets involved in providing advice or content, the more risk is incurred. Storing patient level clinical data introduces a raft of regulatory requirements and stiff penalties for breaches in security. Any party providing clinical advice might become medically liable for the health of the patient. As the service crosses the regulatory threshold, more focus needs to be invested in developing appropriate risk management procedures (*figure 21*).



Clinical risk management is a complicated area, as a single mobile health solution might be used for multiple purposes, and there are multiple regulatory regimes which may apply to mobile health. However, there are parties in each country who can advise on local regulatory regimes, and plenty of organisations who currently deliver healthcare services with established clinical governance and risk management regimes who operators can partner with. Similarly, anything that might constitute a clinical “claim” will be subject to regional and local laws, and again should be reviewed by local legal specialists.

It is not surprising that the most clinically intense mobile health solutions are seen in the developing world. The overall regulatory environment tends to be far looser, and in any case the infrastructure and health services can be so poor that any solution is seen as better than none.

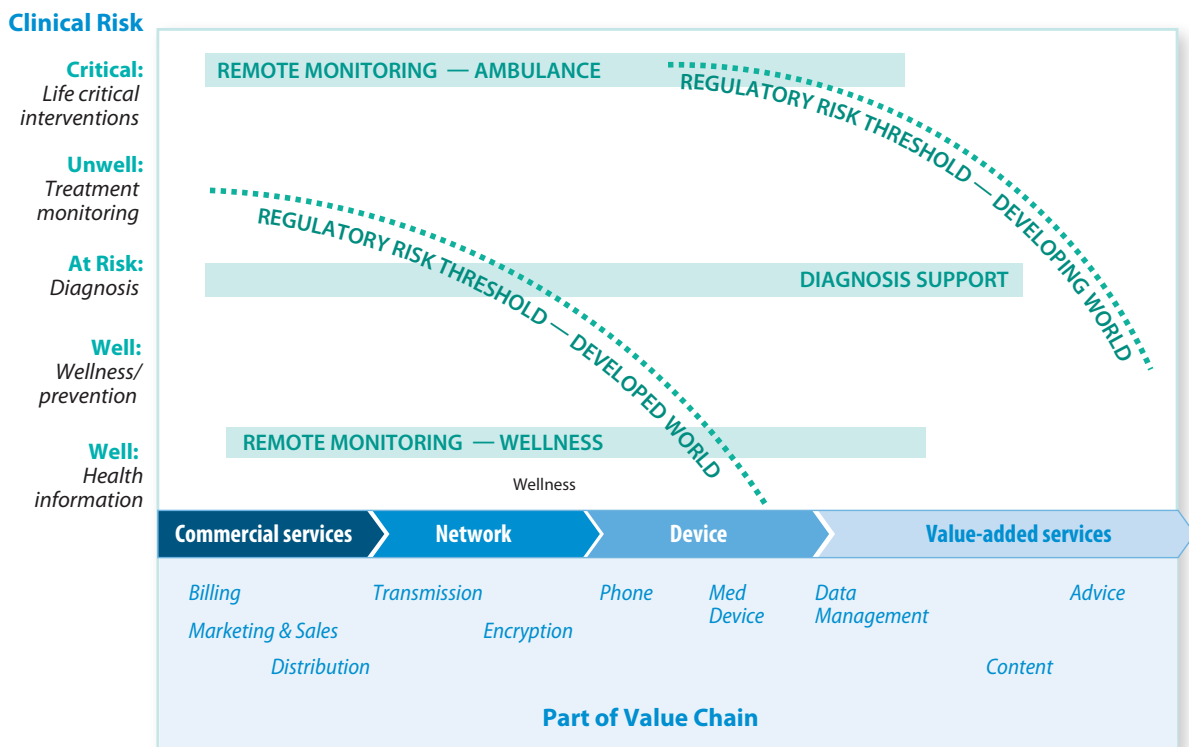
Overall, there is little reason why operators should not expand beyond their traditional range of services to provide large parts of the overall mobile health

solution. However, the more the scope of services expands into “value-added” services and more acute conditions, the more specific the infrastructure required. Anything classed as a medical device needs to be subject to regulatory approval, and as services move into data management, specific rules on how and where clinical data is stored need to be considered. It is likely that operators will wish to partner for both clinical content and advice, as it will be very difficult to acquire this expertise without significant investment. Operators will probably wish to leverage the clinical governance and risk management processes of established healthcare players.

**FINDING THE RIGHT PARTNERS**

Operators will need to work with partners to deliver mobile health services across the value chain. Partners will need to be a mixture of global and local organisations.

- **Medical device companies** are the most obvious partners for operators. Device companies have the brand, devices, contacts, sales and dis-



**Figure 21:** Clinical risk across the mobile health value chain

tribution models, health and regulatory expertise required to sell into these markets. Operators can offer device companies capabilities in communications, data management, customer service support and the ability to bill on a recurring basis. Medical device companies are often global in scope and will be most interested in operators who can provide services in multiple markets.

- **Pharmaceutical companies** may be appropriate partners for mobile health applications aimed at specific diseases such as diabetes. However, this will depend on the precise nature of their portfolio.
- **Healthcare companies** can provide clinical resources and ancillary services. There are almost no hospital operators, insurers or healthcare providers that span more than two or three markets, and all of these have one dominant home country and tend to be organised as a series of national businesses. Even healthcare IT tends to be localised, as eligibility, claims and even clinical coding vary between countries.
- **Pharmacies** are nearly always local, and in around half of European countries must be owned by pharmacists. In many markets, in particular less

well-developed countries and the south of Europe, they play a significant role in health delivery, and are likely to be the most obvious distribution route for consumer-focused or professionally recommended solutions.

- **NGOs and academic institutions** can be powerful partners to establish the credibility and value of the solution. Charities in developed countries can be powerful influencers of policy, and also major funders of projects for the developing world. Organisations such as the World Health Organisation and leading academic centres can add enormous credibility to a solution.

When building a scalable mobile health business, it can be useful to map out the overall value chain to work out what overall partnering arrangements need to look like (figure 22).

### DEVELOPING APPROPRIATE DISTRIBUTION AND COMMERCIAL MODELS

The most appropriate distribution model will depend on the specific application, and will vary by health system. Operators might supply components or the mobile health solution itself.

Part of Value Chain

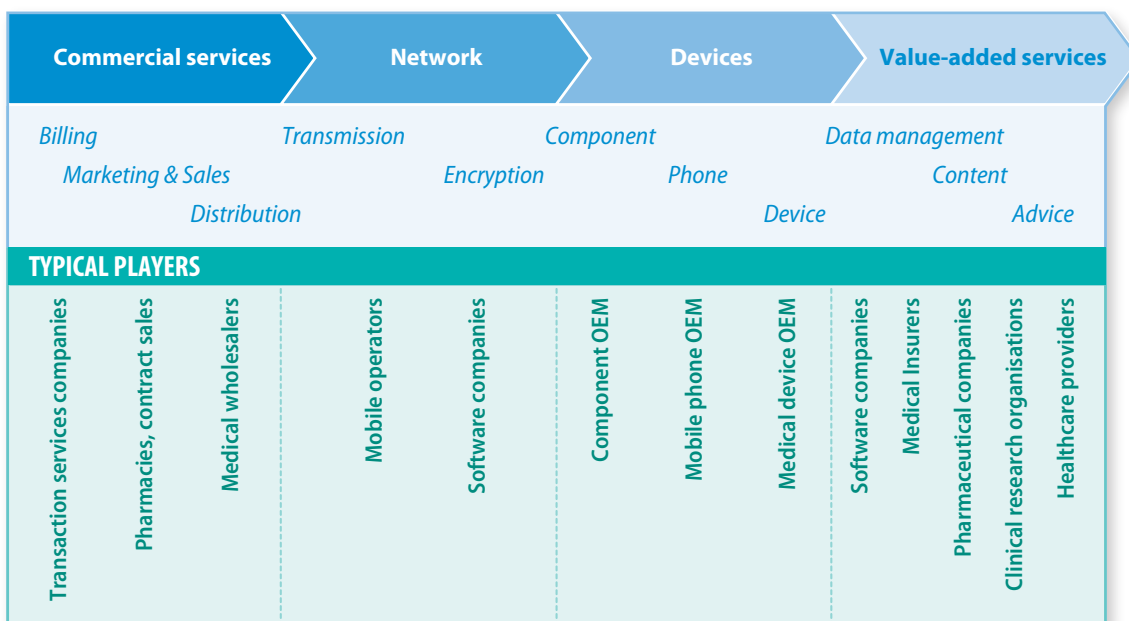


Figure 22: Potential partners along the mobile health value chain

The distinction between consumers and patients is important. Once diagnosed with a disease, the customer for a mobile health solution generally shifts from the consumer to a health payer or provider. So Business to Patient (B2P) has quite a different dynamic than Business to Consumer (B2C).

Solutions focused on patients will generally be distributed through healthcare channels (pharmacies, hospitals, doctors) in developed markets, and might be lent, sold or given to patients (if agreed for reimbursement). There are a range of applications which are borderline between consumer and patient devices (e.g., blood pressure monitors) and could potentially be distributed directly or through consumer channels (*figure 23*).

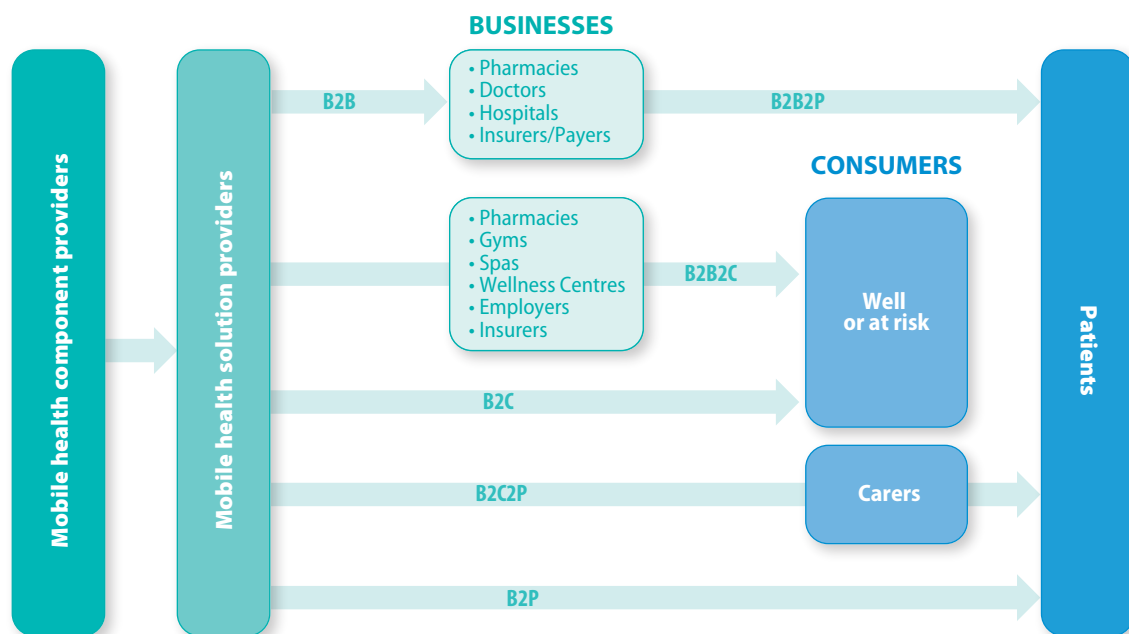
The commercial model will vary by distribution model and application. For virtually all types of solutions, both one-off and recurrent fees are likely to be options. Here however, the structure of the reimbursement system comes back into play. Most reimbursement systems separate capital investment and recurrent costs, and at any one time health providers and health payers might view one or other approach as more attractive. A flexible approach to

the balance between one-off and recurrent costs is therefore helpful.

Operators working with healthcare companies or medical device partners also have the option of various revenue sharing models, in particular for B2B and B2B2P solutions. There is an increasing trend toward “outcome” based payment for health services, though measuring results from healthcare interventions are notoriously difficult to do. This is definitely an area where it is good to partner with someone with quite specific experience.

The level of revenue that can be expected from a particular solution will be closely related to the value it delivers. The fees payable to health providers to treat specific conditions are generally publicly available and will provide a good indication of the potential for value creation. For example, a mobile health solution which avoids an outpatient consultation costing \$200 will need to operate at a fraction of that level per transaction.

In addition to direct payment, there are other potential sources of revenue. Clinical data, in particular on patient reactions to specific therapies, is highly valued and can be a significant source of revenue.



**Figure 23:** Mobile health distribution channels

However, regulations around capture and usage are complicated, in particular for patients undergoing treatment, and it is worthwhile engaging with the local authorities early to understand the specific rules around patient level data in each jurisdiction. For B2C solutions, there is also potential for advertising revenue.

Underpinning the whole discussion of the commercial model lies the issue of brand. Operators are unlikely to be seen as credible suppliers of medical devices or services in established markets, and consumers to date have shown themselves to be extremely reluctant to share clinical information with companies who have attempted to get into the personal medical records market. Operators will nearly always have to team with medical device companies to access the provider market, and insurers or other trusted providers when holding clinical information. The situation in developing markets might be quite different, however, where brand recognition may be far higher than for healthcare organisations and less constrained by consumer and professional expectations.

### **BUILDING THE RIGHT INFRASTRUCTURE**

As can be seen from the structure of a scalable mobile health solution in *figure 20*, the business tends to become more localised as it gets nearer the customers, and core technologies need to be highly customised to specific applications.

A mobile health business will require a somewhat different operating model and competencies from that which most operators have adopted for their core businesses. It is likely that operators will need to set up a specific mobile health organisation to serve this market and the pharmaceutical and medical device industries probably offer the most appropriate models:

- **Product development** tends to be global and built around addressing specific health needs, e.g., cardiovascular disease. These organisations include engineers and scientists, clinicians and commercial experts able to realistically estimate potential sales volumes. Product development is

also increasingly “open” with broad relationships with academic, NGO and niche companies.

- **Commercialisation** is carried out country-by-country, with specialists on the local healthcare and regulatory environment, local business development people, and local partnerships. Gaining proof of efficacy is carried out globally in the early stages of development and locally as the technology gets closer to launch. Where companies do not have strong geographic or therapeutic presence, co-marketing with competitors is common.
- **The interface** between product development and commercialisation is often the most difficult to get right. While solutions are built around common technologies, they must have a strong commercial case and be built on robust understanding of market needs. Pharmaceutical companies have stringent processes to continuously assess both the technical and commercial viability of a technology, and consider very carefully the order in which to launch specific applications and in which country.

For operators, the major capability gaps are likely to be around understanding and building relationships across the local healthcare systems, and learning enough about specific diseases and treatments to ensure that the mobile health solutions are effective. Operators will also need to acquire local business development resources either by building their own or through appropriate partnering. The substantial infrastructure required will need to be supported with significant revenues, implying multiple products across multiple geographies.

The overall financial model is also rather different. Margins will be far lower than the typical levels of 40% EBITDA expected by core mobile business. However, the level of capital required is far less, so probably should be compared on the basis of return on capital.

### **DEFINING THE RIGHT PATH**

While governments and health payers are starting to recognise the potential value of mobile health,

the industry is at an early stage of development. To quote the European Commission's Information Society and Media directorate, commenting on the EC's mobile healthcare policy recently, "*We don't have a policy now*". Healthcare is a very conservative industry, and new technologies take many years to reach maturity.

If the medical device industry is a good indicator of the likely future, a few global players will eventually emerge, with a host of small providers focusing on particular functional and geographic markets.

While it is very difficult to forecast the future in any industry, it is unlikely that mobile health will become a major consumer proposition in developed markets. Operators wishing to build scale businesses will need to play in the reimbursement space and offer a wide range of value-added services with a wide range of global and local strategic partners. While it is sensible for operators to build scale in their home markets first, aspirations should ultimately be global.

The next few years will be dominated by experiments and demonstrations of value. Gradually, a few applications will become commonplace, a few platforms will start to become recognised as emerging standards, and global leaders will emerge. Eventually mobile health will become a mature technology, so a long-term view is required to be successful. We have identified a number of potential entry points and development paths:

- **Focusing on the developing world** has many advantages as discussed in this paper. Where operators have strong local connections and brands, the opportunity is to establish an early presence and brand in mobile health as an alternative to more traditional health solutions. Short term revenues are likely to be limited, but in the longer term there is a real opportunity to become a significant player in the healthcare system.
- **Consumer health solutions with a generally low clinical intensity**, such as wellness and location devices, is another path that can be followed, with the plan to expand into more clinically intense solutions later. While this has the benefit

of low clinical risk and a familiar channel, it is not clear whether consumers will be prepared to pay significant amounts for such services, and there is little evidence of consumer devices being taken up and reimbursed by healthcare systems.

- **Consumer solutions recommended by health professionals**, in particular in developing markets, with an aim to transition to developed countries once proven. This approach is low risk initially, whilst offering a pathway to more "mainstream" health solutions. Most health systems are becoming increasingly focused on prevention and reduction of severity of chronic disease as a way to manage costs and improve health performance. Products here focused on enabling patients to manage their own chronic disease in the home, or the early stage of disease at the cusp of "well" and "ill" such as pre-diabetic, overweight or early stage hypertension. There are increasing examples of such "trickle up" innovations, and this is a good way to prove a concept, as well as exploiting the strong brand position of many operators in developing markets. However, while consumers in developing markets might well be prepared to pay for devices to help manage their health, the expectation in countries with established health systems is more likely that they will be reimbursed. So while the solution might be the same, the business model may be quite different.
- **Wellness solutions to employers** have definite benefits over pure consumer wellness solutions in terms of revenue potential, with more focus on "back office" services such as phone advice and clinical support. The transition to reimbursed services is probably easier as there are many examples of services provided by both employers and health systems, in particular around public health e.g., health checks, stress reduction, weight loss and anti-smoking programmes. However, it is unclear how many employers outside the major multinationals will be prepared to pay for such services in practice.
- **Components of clinical solutions** for sale to healthcare providers were being developed by

several operators. Examples include platforms to allow connection of multiple medical devices to remote monitoring stations, or mobile enabled sensors. Such technologies are not generally reimbursed directly, but are used by health providers who are. These solutions have the benefit of potentially higher revenues, but require high levels of proof and are likely to be captured by medical device legislation. Distribution channels are often unfamiliar to operators, and partner selection is absolutely critical. Such solutions may also be subject to public sector procurement rules.

- **Complete clinical solutions.** A few operators were piloting or considering providing complete clinical services including clinical advice,

invariably in partnership with a healthcare company. Such services clearly have the potential to position the operator as a serious player in the market. However, these services represent a significant shift away from the core operator business model, and require appropriate investment in capability and infrastructure. They carry the highest clinical risk, and must be approached market by market.

The mobile health industry is too immature to say what the “right” path is. However, it is likely that those who approach the market with global aspirations and a commitment to build the capabilities required to deliver value-added services will be the ones who ultimately benefit from the market.

## 7. Influencing the policy environment

To promote the use of mobile health, operators should focus on communicating its benefits in addressing the global health trends outlined in the first chapter of this paper. In established health systems, operators should emphasise the power of mobile health to address the problems of chronic disease management and in particular the ability to reduce system costs by cutting hospital re-admissions and preventing exacerbations. In the developing world, the ability to increase access, to achieve dramatic improvements in health outcomes at low cost are all powerful messages. In

all environments, communications should focus on evidence of cost reduction and health gain.

Unlike other mobile markets, healthcare is a business where the maturity of a technology is more attractive than its modernity. Reliability, simplicity, cost effectiveness when compared with other means of delivering services will all resonate with policy makers, health payers and health providers.

In addition to these general messages, there are some specific health policy issues that the industry should consider actively promoting:

- **Environment which fosters and rewards uptake of innovation.** In particular in the current financial environment, there will be a tendency for systems to focus on cost-cutting measures. Governments should be urged to develop specific policy positions on mobile health and fund and support scale pilots to build evidence of efficacy and cost effectiveness.
- **Explicit reimbursement mechanisms and processes for non face-to-face interventions.** The slow growth of even simple technologies such as email has been severely hampered by rigid definitions of what constitutes a healthcare interaction. The industry should push for adoption of a broader definition of a patient interaction.
- **Reimbursement systems that transfer risk more to health providers** especially for chronic disease will incentivise health providers to consider innovative solutions such as mobile health.
- **Explicit evaluation mechanisms and processes** for non drug or medical procedure value-for-money assessments need to be incorporated in addition to those focused on pharmaceuticals.
- **Established regulatory frameworks for mobile health** which clearly outline positions on registration, licensing, ownership and access to data and medical liability. Establishing common standards on storage of clinical data will enable operators to redeploy solutions across countries.
- **International standards for connectivity and medical coding** will make it far easier to deploy common technologies into multiple markets.

## Conclusions

In reading this paper, operators will probably be struck by the complexity of healthcare. Its myriad variations, complex supply chains, multiple stakeholders and risks. However, this is an industry that consumes close to 10% of global GDP and influences the lives of every person on the planet, so perhaps this should not be surprising.

Healthcare is not an area to be approached lightly. Certainly, of all the “verticals” being addressed by operators, healthcare is probably the most challenging, but it is also potentially the most attractive, in the long term at least.

Those operators who build successful and sizeable long-term businesses will be those who come to terms with its complexity and invest appropriately, over an extended period, to build the capabilities and compelling value propositions that help to address some of the world’s most taxing health problems.









## About A.T. Kearney

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A.T. Kearney is a global management consulting firm that uses strategic insight, tailored solutions and a collaborative working style to help clients achieve sustainable results. Since 1926, we have been trusted advisors on CEO-agenda issues to the world's leading corporations across all major industries. A.T. Kearney's offices are located in major business centres in 36 countries.

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## About the GSMA

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The GSMA represents the interests of the world-wide 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.

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