



mHealth in an mWorld
How mobile technology
is transforming health care



Contents

Introduction	3
What is driving adoption of mHealth?	4
The mWorld is smaller, faster, and smarter	8
mHealth: Mobile-enabled health care in users' hands	11
Our view	14
Implications for stakeholders	15

Introduction

The adoption of mobile technologies in every dimension of life has been phenomenal. In the span of two decades, ever-more sophisticated mobile technology has fundamentally altered the ways in which people communicate and conduct business. The disruptive power of these new technologies and the accompanying waves of innovation they have sparked are transforming the health care industry, propelling stakeholders to reassess and repurpose how they provide services.

Mobile device sales in the U.S. are expected to grow from 172 million in 2009 to 215 million in 2016, a 25 percent increase,¹ while revenue from mobile data usage is expected to surge from \$35 billion in 2008 to \$180 billion in 2016, a dramatic 514 percent increase.² Global mobile traffic has doubled for the fourth year in a row,³ with search queries growing five times in the last two years.⁴ By 2016, there will be a projected 10 billion mobile devices in use worldwide.³ Mobile device users who downloaded at least one mHealth application (mHealth is the practice of medicine and public health, supported by mobile devices) onto their smartphone doubled between 2011 and 2012.⁵

The health care and life sciences industry is recognized as one of the top three fields (along with consumer products and the financial services industry) likely to propel mobile device growth in the next five years.⁶ Transformative trends

in the industry are conducive to remarkable growth in mobile applications - population aging, increasing chronic illness, accelerating health costs, new regulatory reforms and increased consumer demand for health information and self-care will drive mobile solution growth. In addition, the industry is capital-intensive, highly regulated and labor-intensive. Digital technologies, including ubiquitous mobile devices, can play a key role in transforming health care into a more-efficient, patient-centered system of care in which individuals have instant, on-demand access to their medical records and powerful clinical decision support tools that empower them to actively participate in their treatment plans. As applications become more user-friendly and technologies expand their reach to remote populations, they will be seamlessly integral to the provision and financing of health services.

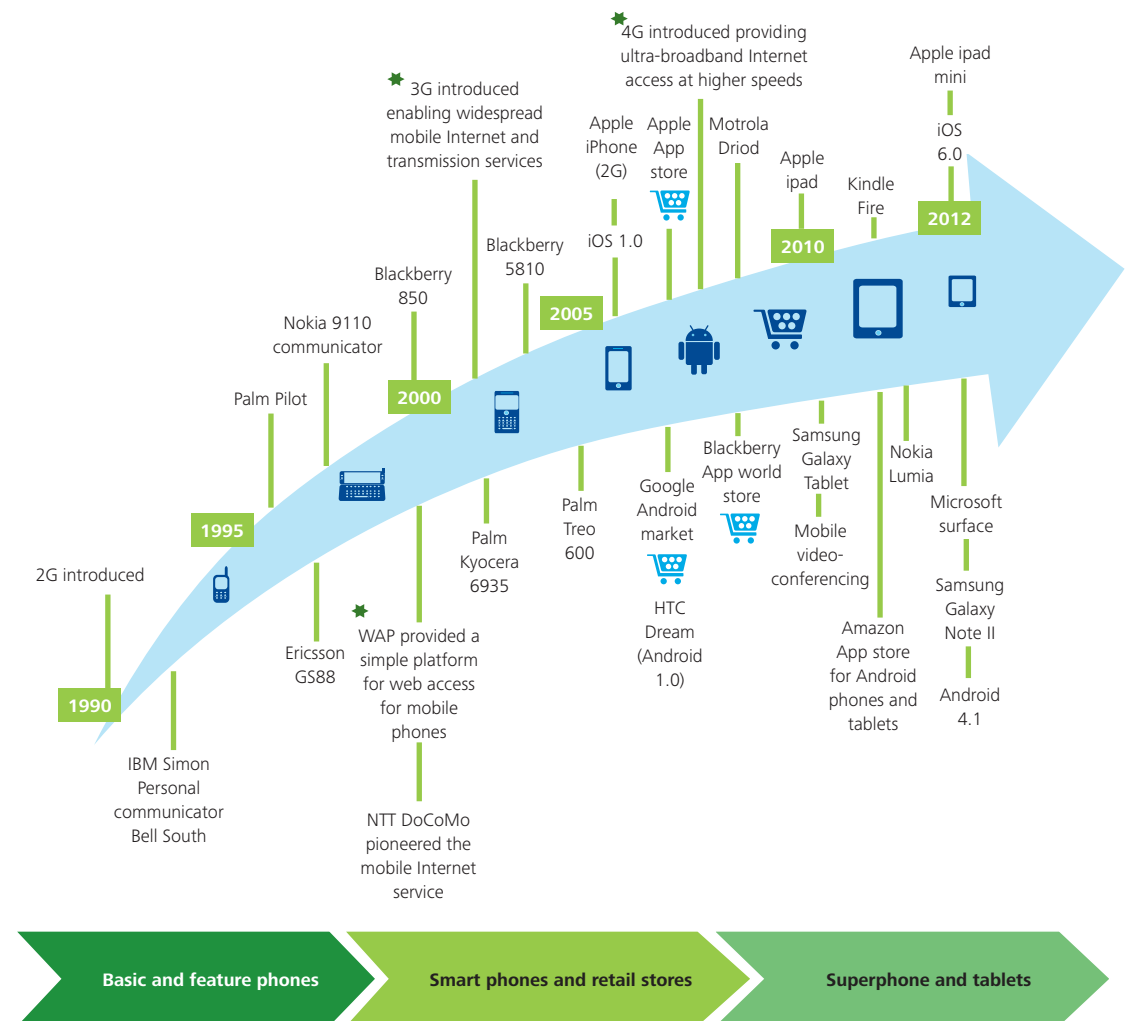
The future of mobile communication device utilization in the U.S. health care industry mirrors the bigger challenges facing this industry which consumes 18% of U.S. GDP: to accommodate intense demand for value from purchasers and consumers, new ways of doing business that leverage technologies effectively are requisite. Mobile health is a key element of the industry's response to the market's quest for value.



What is driving adoption of mHealth?

No longer simply a piece of hardware used to make a phone call, the ever-present mobile device has moved beyond facilitating voice transmissions to become a “smart” enabler of interactivity and the exchange of information, text, data, and images. Even basic phones and payment plans extend communication beyond voice calls to sharing slivers of content via texting and tweeting. More sophisticated devices and data plans facilitate relationships via social media, sharing photos, and one-on-one video interactions. The smartphone is many individuals’ best friend – it gives GPS directions, functions as a wallet, alarm clock, calendar, filing cabinet, and personal library, and offers an astounding array of health care apps that prod and poke the phone’s owner to exercise, lose weight and improve their overall health (Figure 1).

Figure 1. History of smart mobile devices

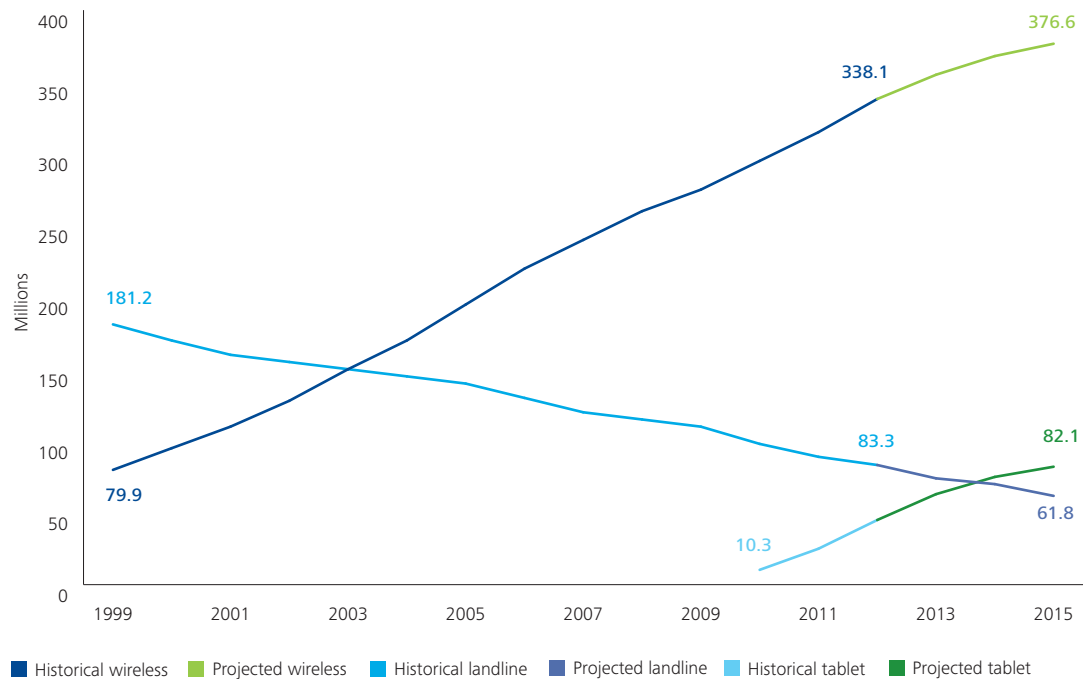


Source: Brief history of Smart Phones. PC World Jun 18, 2010 <http://www.guardian.co.uk/technology/2012/jan/24/smartphones-timeline>

There is a clear trend of consumers migrating from fixed phone lines to mobile (Figure 2). Many younger people skip the fixed line stage and go straight to mobile⁷ and it is expected that there will be 1.4 mobile devices per capita by 2016.³ With mobile cellular coverage in the U.S. at 100 percent,⁸ the pendulum has swung from ownership and market penetration towards boundless technological innovation for personal use – the driving forces are smarter hardware, sophisticated operating systems, promising software and services, and an ever-expanding array of user applications.

Many industries have been using mobile technologies to complement their brick-and-mortar sites for years. The retail, travel, and banking industries have been quick to adapt their business models to the transformative power of mobile technologies – lower transaction costs, time savings, and better market information are among the resultant benefits. Apps guide users to restaurants and retailers, where they can place orders, pay for services, and scan items to comparison-shop. Airline apps enable users to search for flights, purchase tickets, change seats, and display boarding passes. Financial institutions provide global access to accounts, alerts, and the ability to deposit checks using a phone’s camera. Companies connect employees, track people and products, manage workflow, and provide critical logistics data via mobile technologies.

Figure 2. Historical and projected wired and wireless connections



Source: Data from IBIS World Industry Reports

Consumers driving mHealth growth

Similar to other industries, consumers are driving much of the demand for mHealth technologies and applications. Mobile apps are enhancing overall consumer engagement in health care by increasing the flow of information; lowering costs through better decision-making, fewer in-person visits, and greater adherence to treatment plans; and improving satisfaction with the service experience.

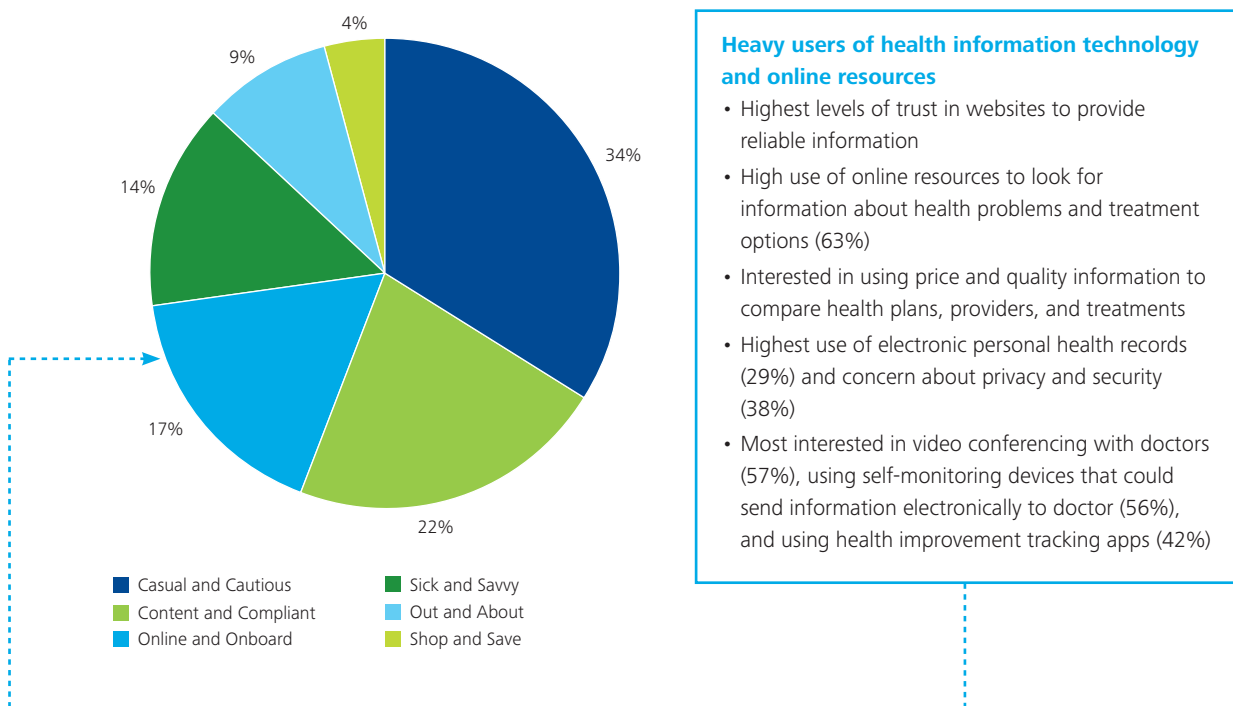
Insight into health care consumers' behaviors and attitudes is critical information in an environment where health care is moving rapidly towards patient-centered care, a model

premised upon individuals being active participants in managing in their health care. Deloitte has identified six unique consumer health care segments that navigate the health care system in very different ways.⁹ One segment, "online and onboard," represents a more "active" health care consumer that in comparison with other segments has a strong preference to use online tools and mobile applications to assess providers and compare treatment options and provider competence (Figure 3). This segment grew slightly from 15 percent of the total population in 2008 to 17 percent in 2012.⁹

⁹The initial segmentation analysis was conducted in 2008. The views, attitudes and health care behaviors of 4,000 U.S. adult health care consumers that were nationally representative of U.S. population were analyzed through factor and cluster analyses and six unique consumer segments were identified. Subsequent segmentation analyses were conducted in 2009 and 2012. The six segments are "content and compliant," "sick and savvy," "casual and cautious," "online and onboard," "shop and save," and "out and about."

Figure 3. Health care consumer segments

Health care consumer segments: Online and onboard consumers



Source: Deloitte Center for Health Solutions, 2012 Survey of U.S. Health Care Consumers. 2012 Health Care Consumer Segments.



What is the status of mobile health in the health care industry?

After a slow start, the capabilities offered by mobile technologies are fast becoming appreciated by industry stakeholders, with a raft of devices, sensors, apps, and other programs being developed that target chronic conditions, telemedicine and remote monitoring, patient data capture, electronic records, e-prescribing, and the parallel industries of fitness and wellness. Health insurance companies are promoting the use of mobile technologies in sharing information about hospitals and physician performance, and encouraging use in self-care for chronic conditions not requiring intense care from physicians. Pharmacists and retail health merchants are leveraging mHealth to bring information to consumers and offer therapeutic solutions that complement traditional treatments, often saving consumers time and money.

mHealth is becoming an extension of the intersection between technology and health care: Consumers' widespread use of mobile devices makes it easier and faster to access health care and creates opportunities to revolutionize the industry through high-quality and highly personalized care.

The mWorld is smaller, faster, and smarter

Accelerating technology and insatiable consumer demand

Rapid growth of innovative mobile web technology, the widespread use of mobile phones, and insatiable consumer demand for new mobile products and data services underpin the shift to a mobile-enabled era in health care. Consumer demand translates into a relentless churn of upgrading and acquiring devices that offer more functionality, faster connections, more memory, more processing capacity, and touch-screen technologies. Smarter devices translate into higher utilization of services based on the devices' extended capabilities. Access to a wireless connection increases the likelihood of an individual using the Internet to gather and share information.¹⁰ One study found that 31 percent of cell phone users use their phones to look up health information, almost double that of those who did this in 2010 (17%).¹⁰ The type of device impacts web utilization: a 2011 study showed that although smartphones totaled only 12 percent of the global handsets in use, the typical smartphone generated 35 times more mobile data traffic than a basic phone and that each tablet generated 3.4 times more mobile traffic than an average smartphone.³ In the U.S., the average mobile data traffic generated by a smartphone rose by 152 percent between 2010 and 2011 and that of tablets rose by 88 percent.³ Estimates for mobile data traffic to 2016 are expected to rise steeply (Figure 4). New entrants combining telephony and tablet-like features include *Superphones and Phablets*,¹¹ which provide optimal mobility and mobile content and screens (larger than a smart phone but smaller than a tablet) with better functionality for activities such as reading and viewing video streaming content.

Their high possession rates, connectivity, and capabilities range make mobile technologies ideal for use in the health care industry. Mobile devices can offer greater convenience and flexibility for both patients and providers, supply tools for better adherence and compliance, enable access to real-time data and monitoring, and facilitate routine monitoring of chronic care management (self-management, clinical care and care coordination). Aside from content development and privacy and security concerns about the integrity of personal health information, the big challenge for the health care industry will be how to monetize mobile-based services.

The following are among advances in mobile products and services that could benefit the health care industry:

Devices

- Greatly expanded memory and stronger processing capabilities
- Geospatial tracking
- Movement-enabled/accelerometers that track location and movement
- Touch-screen technologies
- Cheaper unit costs and cheaper connection/data plans
- Extended functionality through the addition of apps
- Immersive, full-screen apps
- Remote monitoring devices with embedded cellular or fixed-line modems to transmit data directly without using a smartphone or computer

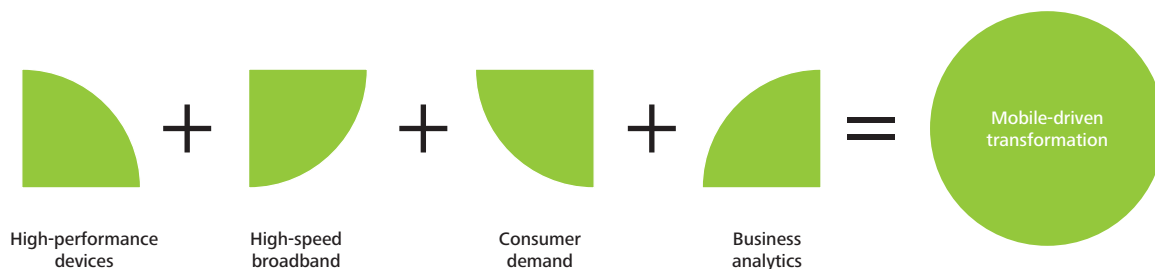
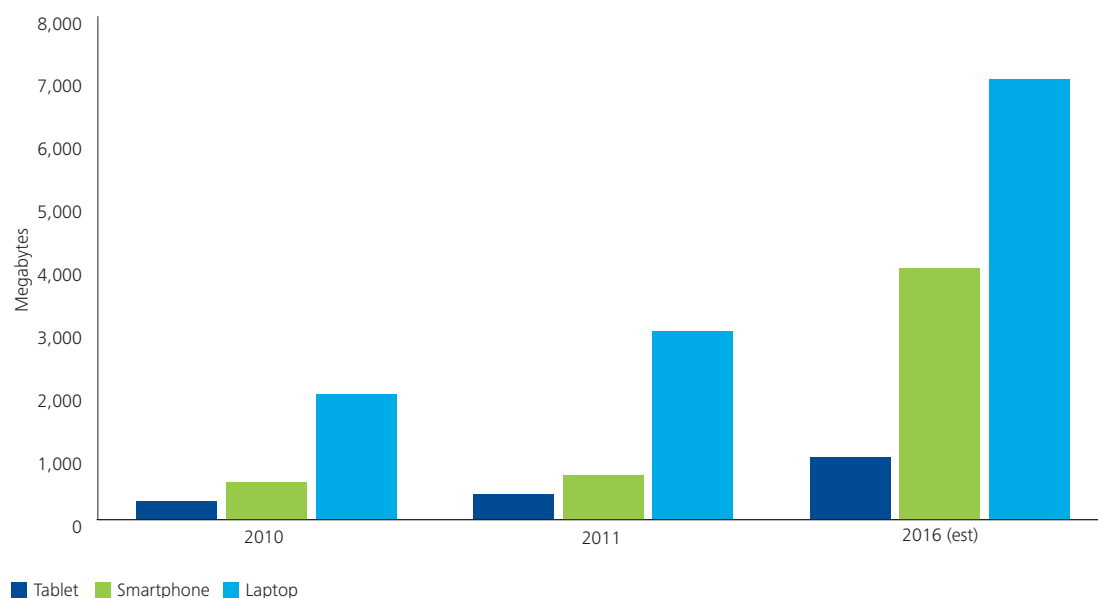


Figure 4. Average monthly mobile data traffic by device type



Source: Data from Cisco VNI Mobile Forecast Highlights, 2011 – 2016.
http://www.cisco.com/web/solutions/sp/vni/vni_mobile_forecast_highlights/index.html#~Country

Networks and operating systems

- Cloud-based services to overcome inherent limits in device memory capacity and processing power
- Faster download speeds and greater bandwidth capacity, particularly with comprehensive roll-out of 4G LTE capabilities.

Ownership and utilization

The U.S. mobile market has around 322 million subscribers,¹² of whom 48 percent are mobile media users who have browsed the mobile web, accessed applications, and downloaded content.¹³ Mobile media users who accessed apps rose 13 percent between 2010 and 2011 and those who used browsers rose by 11 percent in 2011 over usage in 2010.¹³ Demographic differences remain, as 25-34 year olds make up 26 percent of the smartphone market and those 55 and older represent only 15 percent.¹³ Analysts describe a subcategory of super-user, dubbed “Smartphonatics,” who change their shopping, financial, and payment behavior as a result of owning a

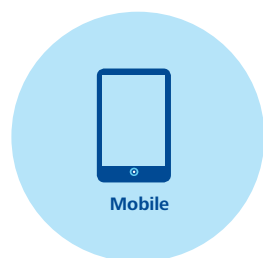
smartphone. These users are typically younger, with 36 percent between the ages of 20-31, and 33 percent aged 32-46.¹⁴

Health information (primarily oriented towards personal health, wellness, fitness and information on health services) is the fastest-growing content category for U.S. mobile users, increasing to 18.5 million mobile users in 2011, up 134 percent, from 2010.¹³ There are many similarities between consumer and clinician health information users, and some important differences, as well. Nine percent of adult U.S. cell phone users have downloaded an app to monitor their health.¹⁰ Overall, those younger than 35 years old are the most likely to access online health information, while those age 65+ are least likely; for example, one-fourth of those 35 years old or younger reported having visited a hospital’s website compared to only six percent of seniors who said they had done so over the same time period.¹⁵

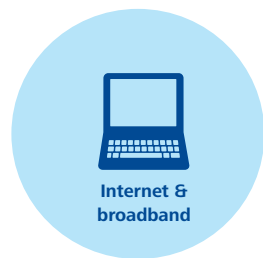
Adoption of mobile technologies among clinicians is high; their use in daily practice, less so. Eighty-one percent of physicians have a smartphone,¹⁶ although only 25 percent utilize smartphones and tablets in their practices.¹⁷ However, a 2012 study of 506 physicians (representative of the national physician population) revealed insights into how physicians are using mobile technologies: Nearly all (98 percent) reported using desktop computers to perform

online searches for general information, whereas 56 percent of smartphone owners used their smartphones if they needed information quickly. Most physicians searched for condition-related information (86 percent), information on pharmaceuticals (around 50 percent), and information about clinical symptoms (46 percent). Sixty-two percent said they abandon sites quickly if not optimized for mobile viewing.¹⁸

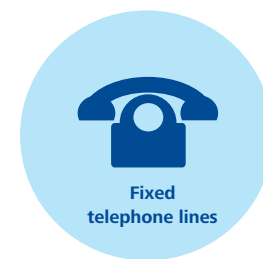
Communication device ownership and access: United States



	2005	2010	2011	2012
U.S. population covered by a mobile-cellular network (percent)	99%	100%		
Mobile-cellular telephone subscriptions (per 100 people)	70%		106%	
Mobile broadband subscriptions (per 100 people)	2.1%		72.8%	
Mobile broadband (% of total mobile subscriptions)	3.0%		67.0%	
Population using mobile Internet (%)	6.6%		35.6%	
U.S. mobile subscribers who own a smartphone			36%*	49.7%*



	2005	2010	2011	2012
Fixed (wired)-broadband subscriptions (per 100 people)	17.23%	27.62%		
Households with Internet access at home (%)	58.1%	71.6%		



	2005	2010	2011	2012
Fixed telephone subscriptions (per 100 people)	59.0%	48.7%		

Source: World Bank. 2012. Information and Communications for Development 2012: Maximizing Mobile. Washington, DC: World Bank.
 * Nielsen.com U.S. Smartphone penetration. February 2012

mHealth: Mobile-enabled health care in users' hands

mHealth has been defined as “medical and public health practice supported by mobile devices, such as mobile phones, patient monitoring devices, personal digital assistants (PDAs), and other wireless devices.”¹⁹

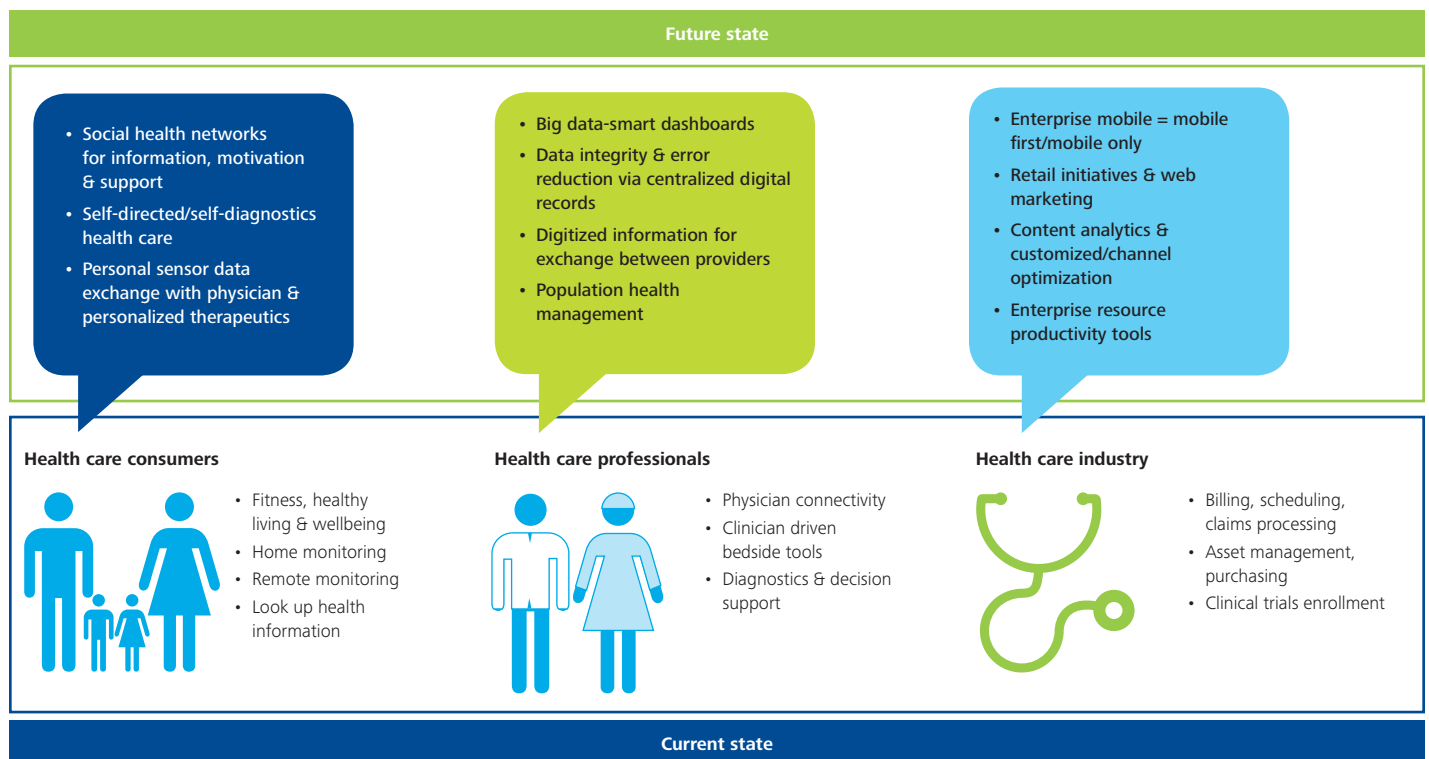
mHealth technologies are a valuable partner in health care’s shift towards a delivery model that is patient-centered and value-based. Mobile technologies can help to facilitate that shift among clinicians, payers, life sciences companies, and consumers by defining and directing the patient-centered model towards health care that is community-based, integrated, seamless, and assimilated into the daily lives of consumers accustomed to an ‘on-demand’ environment.

The power and reach of mobile communications offers great versatility and utility to enable provision of high-quality, low-cost health services. mHealth’s possibilities are virtually limitless: It may serve as a communication tool

that shares real-time information and messages; a remote monitor that reduces isolation and brings care into the home; a smart device that monitors and reports real-time on patients’ health status; a videoconference channel wherein both parties can interact; or a companion that reminds and motivates its user to exercise or take their meds (Figure 5).

In other health services advancements, personal sensor data is anticipated to grow from 10 percent of all stored information to around 90 percent within the next decade, and real-time data collection is expected to result in more precisely and individually targeted drug therapies based upon personal sensor data exchanges between patient and physician.²⁰ “Gamification” of health care is a prominent feature of many mHealth technologies; games such as those educating young children with diabetes on self-management use fun activities to stimulate and reinforce self-directed learning. Certain applications in the fitness

Figure 5. mHealth – Consumers, professionals, and the health care industry



and wellness industry segment leverage social networks, teaming, challenges, and group dynamics to facilitate and motivate individual behavior change. Mobile video is expected to be a dominant feature of network traffic by 2016³ and studies have been investigating the use of such tools as Skype etc. as videoconferencing and training devices. One large study of telemental health services found that videoconferencing-based sessions reduced hospital admissions by 24 percent and decreased the average time spent in the hospital by 26 percent.²¹

Industry productivity gains through the use of mobile devices are estimated at \$305 billion over the next 10 years (to 2021). Savings are expected to occur via reduced travel time, better logistics, faster decision-making, and improved communications.²² Remote monitoring technologies are predicted to save nearly \$200 billion, particularly by managing chronic diseases in the U.S. over the next 25 years.²² Other estimates suggest that remote monitoring can reduce costs for caring for the elderly in rural areas by 25 percent.²² Hospitals that have deployed mHealth applications have already felt an impact: A 2011 survey of 235 respondents primarily working in hospitals or multi-hospital systems found that 62.7 percent reported increased productivity for mobile clinicians and staff observed since deployment of wireless data applications. Thirty-eight percent reported productivity gains of between 5 percent and 20 percent, and 10 percent reported productivity gains of between 45 and 60 percent.²³ Such gains are made through enhanced communication, workflow for remote staff (particularly in home health settings), patient self-scheduling, and point-of-care information delivery and will go some way towards alleviating the rising demand for and utilization of medical personnel. Health systems and payers are using mobile apps to achieve administrative simplification through enhanced efficiencies in routine processes such as billing, scheduling, supply chain management, documentation, claims processing, and purchasing.

A range of tools has been implemented to improve the convenience of and access to health care, such as e-visits which – for a fee – provide virtual consultations (including prescribing of medications) and apps that enable potential patients to check wait times at various emergency facilities. Bar code scanners ensure that patients receive the correct

medications, other devices monitor falls among the elderly, record specimen samples, and facilitate patient care plans – the list is goes on and on.

The common thread among these tools is that many of them are designed to help practitioners know what to do and when to do it and to help consumers attain access to health care that is more convenient, affordable, and a better value.

The global mHealth market was estimated at \$1.2 billion in 2011. Analysts expect the market's value will increase to \$11.8 billion by 2018; a compound annual growth rate (CAGR) of 39 percent.²⁴ The commercial health care mobile market is also expected to show strong growth. Mobile point-of-care health solutions spending is predicted to grow from \$2.8 billion in 2010 to \$4.4 billion in 2015 (CAGR of 9.9 percent).²⁵ The U.S. wireless health monitoring device industry has doubled in the past four years to a current value of \$7.1 billion, and is estimated to triple to \$22 billion in 2015.²⁶ Similarly, the market for embedded medical monitoring gadgets is anticipated to grow to 170 million devices by 2017.²⁷ Medical apps are likely to show comparable growth. Currently estimated at \$150 million, the medical apps industry is expected to grow by 23 percent annually over the next five years.²⁸ By 2015, more than a third of the 1.4 billion smartphone users will have at least one mobile health care app.²⁹

The drivers for this growth are similar to those in other industries: rising consumerism, increasing information dependence, and the need for greater efficiency. In addition, health care faces specific challenges that mobile technologies are particularly suited to address.

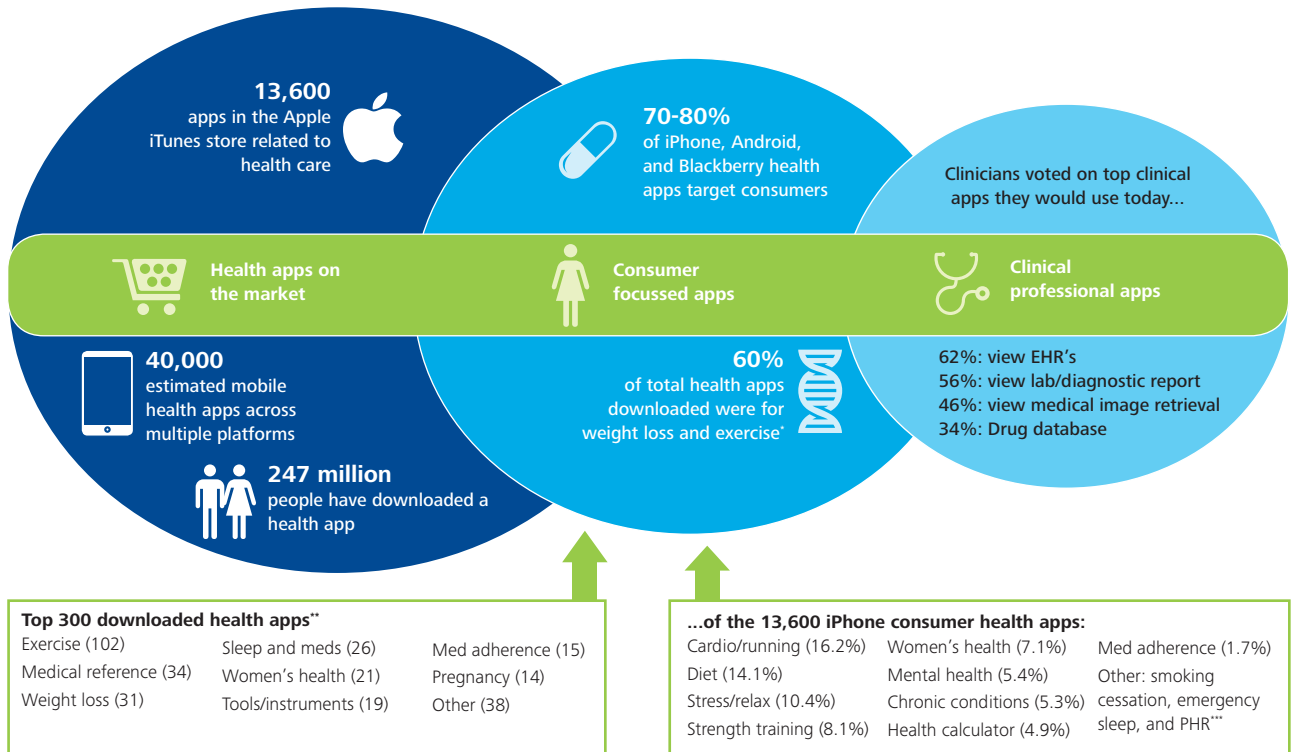
Health care apps today

Downloadable health care-related apps for smart devices are a rapidly growing component of mHealth. Substantial growth in this market is projected, with estimates for revenues from downloads, advertising, and direct sales suggesting that the market for health care apps is around \$1.3 billion revenues in 2012 compared with \$718 million in 2011.⁵ Other estimates expect the medical apps industry to grow by 23 percent annually over the next five years.²⁸ Mobile application users who downloaded at least one mHealth app onto their smartphone were estimated at

127 million in 2011 and are projected to double to 247 million in 2012.⁵ As of April 2012, there were over 13,600 consumer health apps in the Apple iTunes store with an average price of \$2.05 per app.³⁰ An estimated 40,000 mHealth apps are available across multiple operating system platforms.²² Approximately 70 percent of mHealth apps target the consumer wellness and fitness segments. Thirty percent of apps target health professionals,²⁴ facilitating such things as access to patient data, patient consultation and monitoring, diagnostic imaging, and pharmaceuticals information (Figure 6). App stores have become a vital part of the mobile industry value chain. While many apps are free, revenues from downloading paid apps have grown substantially; companies also experience a trickle-down effect into hardware sales.⁶

A robust and rapidly growing mobile health market clearly exists. However, there are critical gaps between consumers' adoption of mobile devices in health care versus their use in other industries. One sobering study of over 2,000 consumers who were online, have commercial insurance, and own a cell phone revealed that only 23 percent had used any sort of mobile health solution, while 64 percent had sent text messages and 38 percent used their phones to access the Internet. Sixty-seven percent said they would like to do "nothing at all" on their mobile phone in support of their health and 77 percent had never used their phone for health-related activities.³¹ Consumers are particularly concerned about their confidential health information falling into the hands of their employers or others, with 45 percent somewhat or very concerned about the security of using mobile devices for health-related activities.³²

Figure 6. "There's an app for that..."



Source:

* As of March 2012, iPhone and Android combined Source: "Mobile Health Applications: 2012 study", Verasoni Worldwide, August 2012

** Source: Dunbrack L. "The second wave of clinical mobility: Strategic solution investments for Mobile point of care", December 2011, IDC Health insights

*** PHR = personal health record. Source: "An analysis of consumer health apps for Apple's iPhone 2012," Mobilehealthnews, July 11, 2011

Our view

Health care stakeholders find themselves in an unusual position, eyeing the adoption of transformative technologies in an industry historically resistant to change and rooted in physical infrastructure, paperwork and forms, and outdated administrative procedures. Mobile technology has become increasingly and seamlessly integrated into virtually all aspects of everyday life; it is now time for its broad application in the delivery and management of health care services, especially as the model of health care is changing – precipitated to a considerable degree by the impact of mobile technologies – to a more diverse, integrated, and seamless system of care no longer dominated by episodic acute care treated at a brick-and-mortar hospital. While there will always be a place for hospitals, mobile technologies will go a long way towards moving health care systems beyond facility-based care.

Opportunities for developing new mHealth apps, content, products, and services are emerging daily. New fields of endeavor include highly personalized health care, population health, diagnostics, utilization management, consumer and provider incentivization, targeting specific populations for public health campaigns, and managing infectious diseases and global epidemics. Importantly, the future will see the development of more dynamic mHealth capabilities; for example, capturing and analyzing self-reported data with objective behavioral and contextual information to extract meaning from this data that positively impacts an individual's health status and well-being.

One challenge for the health care industry is to develop ways to successfully monetize mHealth; unfortunately, scant evidence is currently available on successful business models. mHealth holds promise for spurring improvement along the health care value chain — maximizing professionals' time and productivity, improving quality, increasing access and equity, driving greater involvement by consumers, potentially decreasing costs, and obtaining better value for the money invested.

What business models will emerge that provide solid returns to risk takers that deliver products and/or services via mobile health platforms? How will regulatory and industry environments encourage or dissuade investments in businesses that leverage mHealth as a central feature? These questions are to date not answered.

A second challenge health care stakeholders must address is consumers' information privacy and security concerns. Evolution of the data analytics field will require new ways of dealing with data ownership and privacy matters. Furthermore, legislative and regulatory guidance from the Food and Drug Administration (FDA) with respect to the classification and potential regulation of specific apps will need resolution. How will regulators define and implement technical policies and oversight processes for assuring privacy and security of personal health information that does not inhibit the flow and use of information across the connected health system? And what standards will be applied to mHealth as a result?

Third, the mHealth industry must recognize and respond to its maturing role as part of the medical device industry, thus necessitating likely regulatory scrutiny and approval processes involving the FDA, Federal Communications Commission, Federal Trade Commission and others. Is mHealth a technology play, a medical device play, an extension of online connectivity or something more? And as mHealth "devices" integrate greater capabilities in clinical decision support and enable consumers to self-diagnose and perhaps treat how does the diagnosis and treatment of disease— medical appropriateness, outcomes-based reimbursement for providers, care coordination — change as mHealth is incorporated?

Given the rate of change and creative innovation characterizing this nascent phase of mHealth, it is too early to speculate as to where mobile technology ultimately may take the health care industry; however, the history of technological advancements suggests that disruption and changes will be major and of great significance, advancing the practice of medicine beyond what is dreamt of today.

Implications for stakeholders



An integrated mobile strategy may well form a key component of growth plans for providers, health plans, retail health, and bio-pharma and medical device companies. A business case aiming to expand an organization's presence in mHealth should take into account the slow rate of behavior change in the health care industry; address privacy and security concerns; and recognize that widespread adoption across the entire industry (especially among physicians) will take time. Value and revenue generation from mHealth applications will depend on the deployment of new mobile business models, adoption rates, perceived value by consumers and providers, consumers' willingness to pay for devices and apps, and health plans' imperative of seeking value for money.

Physicians and medical professionals

- Reimbursement reforms such as bundled payments and service delivery models including accountable care organizations are predicated on achieving quality outcomes against evidence-based standards. Payments will ultimately be based upon evaluations of clinical processes, patient experiences, outcomes and efficiencies against industry benchmarks and base thresholds including incorporating data flowing both remotely and at the point of care.
- Mobile technology supports increasing consumer engagement in wellness, prevention, and treatment programs, as well as chronic disease management. Pilot studies in diabetes and hypertension management have shown improved outcomes through remote monitoring.³³ Other studies have demonstrated increased medication compliance among patients with access to their medical records and the ability to refill prescriptions automatically.³⁴ Lessons learned from other

industries on changing behavior through goal setting, gamification, and the use of social media can be applied to management of chronic disease. These factors become increasingly important in outcomes-based reimbursement models.

- Mobile technologies can support health care professionals to better serve their patients. Home-visits will return – as 'virtual' visits - with care and monitoring for chronic diseases and complex care management occurring remotely and judicious use of in-person office visits. Health care professionals' offices may resemble 'call-centers' as a broad range of services are bundled and delivered and practitioners monitor and respond to incoming flows of data and optimize care-coordination.

Hospitals and post-acute providers

- Hospitals and other facilities can utilize mobile technologies to improve communication and information exchange among staff, referring physicians, patients and visitors, yielding improvements in efficiency, utilization, outcomes and customer satisfaction.
- Post-acute care and early-discharge programs can incorporate enhanced capabilities for off-site monitoring through sensors, behavioral pattern monitoring, real-time data exchange and monitoring and decision-support tools. Further opportunities arise in early identification and intervention programs through home-care personnel training and support in such things as early recognition and decision-support to prevent or reduce the need for hospitalization.



- Development of the foundations necessary for mHealth through mobile oriented development architecture and framework. Enterprise-based analytics should draw upon mobile data and communication channels to optimize resource utilization in such key areas as patient-flow to reduce wait-times and crowding; facilitate mPayment systems to directly debit health service accounts or bill payers; improve process of care coordination and facilitate patient navigation.
- When deploying mobile solutions, appropriate policies and procedures to protect the privacy and security of personal health information must be established and regularly reviewed. Most breaches of personal health information reported to the Department of Health and Human Services (HHS) under the HITECH Act have been due to the theft or loss of a mobile device or laptop.³⁵ Enterprise-wide mobile application management

platforms will be required to increase security from malware attacks and to protect enterprise data as users migrate to BYOD (bring your own device) use in the workplace. Other concerns include issues related to reimbursement and liability.³⁶ Furthermore, liability for interacting with patients online or via mobile, or lack of adequate documentation of those interactions and adequate payment mechanisms for such interactions, raise major concerns among providers which have yet to be adequately resolved.

Commercial health insurance plans

- Several 'early-adopter' health plans have recognized the benefits that mobile can provide, particularly related to consumer engagement and disease management. Health and wellness apps are offered to members that provide education and self-monitoring³¹; guide members to facilities with appropriate levels of care³⁷; use gamification strategies to motivate members³⁴; and chronic disease management tools from remote monitoring to connecting select patients with providers via email, text, and video chat.³⁸ On-demand, transactional mPHR applications, such as co-pay and formulary reminders, help consumers make cost-effective choices at the point of care.
- Mobile optimized enterprise capabilities can help health plans to maximize value by applying mobile technologies to lower administrative costs, cultivate customer interactions, enhance customer service and boost business performance. Apps for finding physicians, explaining benefits, reviewing claims, customer self-service, and other functions have been successful. Newer apps address business processes for market analysis, support point-of-sale transactions, collect customer experience data and manage MLR requirements and rebates. Direct-to-consumer strategies will include new member capture,³¹ and real-time underwriting and quote generation.

- Through working with specialist developers (either through partnerships or acquisitions) commercial health plans are able to develop secure, password protected integrated apps for consumers that roll up end-to-end transactional and clinical features including capacity to check benefits and account status, direct consumers to in-network doctors and facilities, compare prices and services lodge claims & check on a claim status.
- mHealth may be an integral feature in the individual insurance market: plans must watch and incorporate mHealth solutions as they are verified for quality and reliability, and mainstreamed into core administrative operations—customer service, clinical decision support, claims adjudication, et al.

Bio-pharma

- The life sciences industry has slowly but surely embraced mobile across the spectrum of research and development, sales and marketing, and post-market surveillance. Mobile apps are transforming the drug development process, managing pipelines, and fostering innovation. Research has been streamlined through virtual mobile research labs and apps that enable data collection and analysis through improved connectivity and data transfer and support new research models such as collaboratives. Staff efficiency and flexibility has been enhanced by expanding access to data and sharing resources and tools.³⁹
- The clinical trials process can be enhanced through mobile technologies in terms of engaging researchers and subjects with improved communication, remote monitoring, and automated data capture.⁴⁰ Patient recruitment can be streamlined by using customer relationship management tools to more readily identify, reach, and engage subjects.

Medical devices

- This industry has made particular progress in engaging consumers. Currently, 11 million people in the U.S. use mobile-enabled glucose monitors.²² Apps for specific drugs for chronic disease, weight loss, and smoking cessation provide critical support for patients. More broadly, medication reminders have improved compliance. Such apps will become increasingly important as drugs and devices are evaluated on the outcomes they are able to achieve. Consequently, providers and health plans may judge products not only on their safety, efficacy, and cost, but also on the companion tools available to promote results.
- Regulatory concerns are a major factor for medical devices companies. Uncertainty as to what point an app becomes a “medical device,” as well as concerns about managing information obtained via social media can slow adoption.⁴¹ Under current reimbursement schemes, pharmaceutical and device companies face difficulty convincing private and public payers to help consumers cover the cost of mobile solutions.⁴²

State and federal policy makers

- The government, functioning as both a payer and provider of health care, stands to reap similar benefits and face similar challenges as other industry stakeholders. In addition, the government must grapple with a complex and fragmented regulatory environment for mobile health. The FDA is working on the issue of regulating mobile medical screening, monitoring devices, diagnostic tools, and therapeutic adjuncts. Initial guidance was issued in July 2012 when President Obama signed the Food and Drug Administration Safety and Innovation Act (S. 3187), enabling the FDA to regulate mobile medical apps. However, not all health care related apps would be regulated by the FDA; just those that act as medical devices or contribute to the clinical decision-making process. Health and wellness apps, or those that help users manage medical conditions, do not fall under the FDA’s purview. As such, ambiguity remains.

Retail health

- Retail outlets providing clinical care have moved into mobile health from their established footholds. Most already have a strong online presence and mobile functionality in terms of store locators, customer relationship management, and online/mobile shopping. As urgent care centers and retail clinics expand, they are using mobile for appointment scheduling, prescription management, and patient record access.⁴³ Other convenience-related applications include mobile wallets, text message reminders, and tie-ins with in-store promotions.⁴⁴
- Retail outlets may become associated with newly developing accountable care organizations and integrated networks, creating the need for networked health records, kiosk based consultations, transmission of biometric data and virtual consultations.

Technology developers

- The developer community has led the way in mHealth innovation, particularly targeting consumers with health and fitness management apps. However, lacking interoperability and an aligned incentive model, few of these apps provide connections to existing electronic medical records, thus creating new information silos.⁴⁵ Consequently, the ability for providers to utilize this information is limited, as is the ultimate value of the apps themselves.
- In addition, while an app may provide a service or remove a particular barrier, bigger challenges – such as data reliability or privacy concerns – often overshadow those benefits. The challenge for application and solution developers will be to create comprehensive solutions that can be incorporated into clinical workflows rather than standalone tools.

We believe mHealth will play a ubiquitous role in transforming the U.S. and global health systems, expanding access to decision support that permit consumers to engage effectively with their systems of care. Nonetheless, in the U.S. and elsewhere, the promise of mHealth faces three challenges that must be addressed in the near term: business models that allow investors to see a return, resolution of regulatory and technical issues around privacy and security of personal health information, and clarity around the regulatory environment in which mHealth solutions will be mainstreamed into health care product and service delivery.

The promise of mHealth is profound and urgently needed. Three challenges require resolution in order to achieve the full promise of mHealth. The industry's stakeholders are receptive, consumer demand is strong, and the potential that mHealth might contribute to lower health costs demonstrable if clarity around these challenges is achieved.

Endnotes

- ¹ Zimmerman. A, et al., Forecast: Mobile Devices, Worldwide, 2009-2016.1Q12 Update, 2012, Gartner Market Analysis and Statistics.
- ² Verma. S, et al., Forecast: Mobile Services, Worldwide, 2008-2016, 3Q12 Update, 2012, Gartner Market Analysis and Statistics.
- ³ Cisco, Cisco Visual Networking Index: Global Mobile Data Traffic Forecast Update, 2011-2016, 2012.
http://www.cisco.com/en/US/solutions/collateral/ns341/ns525/ns537/ns705/ns827/white_paper_c11-520862.html.
- ⁴ Spero. J and Werther. J, The Mobile Playbook: The Busy Executive's Guide to Winning with Mobile, 2012, Google, Inc.
<http://www.themobileplaybook.com/en-us/>.
- ⁵ research2guidance. US\$ 1.3 billion: The market for mHealth applications in 2012. 2012 [cited 2012 October]; Available from:
<http://www.research2guidance.com/us-1.3-billion-the-market-for-mhealth-applications-in-2012/>.
- ⁶ Wilson. S, Open Mobile: The Growth Era Accelerates. The Deloitte Open Mobile Survey 2012, 2012, Deloitte Research.
http://www.deloitte.com/view/en_US/us/Industries/Telecom-Telecommunications-Technology/69f289e50b484310VgnVCM2000001b56f00aRCRD.htm.
- ⁷ Blumberg. S, et al., Wireless substitution: State-level estimates from the National Health Interview Survey, 2010-2011 in National Health Statistics Reports2012, CDC.<http://www.cdc.gov/nchs/data/nhsr/nhsr061.pdf>.
- ⁸ The World Bank, Information and Communications for Development 2012: Maximizing Mobile, 2012, World Bank: Washington, DC.
<http://siteresources.worldbank.org/EXTINFORMATIONANDCOMMUNICATIONANDTECHNOLOGIES/Resources/IC4D-2012-Report.pdf>.
- ⁹ Keckley. P and Coughlin. S, 2012 Consumer Health Care Segments, in Deloitte Center for Health Solutions, 2012 Consumer Health Care Survey2012, Deloitte Center for Health Solutions: Washington D.C.
- ¹⁰ Fox. S and Duggan. M, Mobile Health 2012, 2012, Pew Research Center's Internet & American Life Project: Washington D.C.
http://www.pewinternet.org/~media/Files/Reports/2012/PIP_MobileHealth2012.pdf.
- ¹¹ Kay. R, Is the Market Ready for a Phablet?, in Forbes.com2012.
- ¹² CTIA. U.S. Wireless Quick Facts Year End 2011. 2011 [cited 2012 October]; Available from:
<http://www.ctia.org/advocacy/research/index.cfm/AID/10323>.
- ¹³ Comscore Inc. Mobile Year in Review 2011. 2012 [cited 2012 October]; Available from:
http://www.comscore.com/Insights/Presentations_and_Whitepapers/2012/2012_Mobile_Future_in_Focus.
- ¹⁴ Shevlin. R, Global Study Identifies Impact of Smartphone Use on Mobile Banking and Payments, 2012, ACI Worldwide, Inc.
http://www.aciworldwide.com/~media/Files/Collateral/ACI_Aite_Global_Rise_of_Smartphonatics_0512.ashx.
- ¹⁵ Healthleaders Media. Fact File: Healthcare Online Trends. 2011 [cited 2012 September]; Available from:
<http://www.healthleadersmedia.com/content/HOM-270229/Fact-File-Healthcare-Online-Trends>.
- ¹⁶ Berry. E. Apps let patients view insurance on smart phones. 2011 [cited 2012 September]; Available from:
<http://www.ama-assn.org/amednews/2011/06/13/bisa0613.htm>.
- ¹⁷ Gallagher. L, Mobile Computing in Healthcare: Privacy and Security Considerations and Available Resources 2012, HIMSS. NIST/ OCR 2012 HIPAA Security Conference.http://csrc.nist.gov/news_events/hiipaa_june2012/day1/day1-a1_lgallagher_mobile.pdf.
- ¹⁸ Google Inc and Manhattan Research, The Doctors Digital Path to Treatment: A Study by Google and Manhattan Research, 2012.
http://www.intouchsol.com/insights/articles/09-14-12/The_Doctor_s_Digital_Path_to_Treatment_A_Study_by_Google_and_Manhattan_Research.aspx
- ¹⁹ World Health Organization, mHealth. New horizons for health through mobile technologies, in Global Observatory for eHealth series2011, World Health Organization: Geneva, Switzerland.http://www.who.int/goe/publications/goe_mhealth_web.pdf
- ²⁰ Pentland. A, et al., Improving Public Health and Medicine by use of Reality Mining, 2009, Robert Wood Johnson Foundation.
<http://hd.media.mit.edu/rwjf-reality-mining-whitepaper-0309.pdf>
- ²¹ Telehealth.net. Telemental health study reports 25% decreased hospital utilization rates in sample of 98,609 patients. 2012 [cited 2012 October]; Available from: <http://telehealth.net/blog/telemental-health-efficacy-surpasses-face-to-face-encounters-with-98609-patients/>
- ²² West. D, How Mobile Devices are Transforming Healthcare Issues in Technology Innovation, 2012.
<http://www.brookings.edu/~media/research/files/papers/2012/5/22%20mobile%20health%20west/22%20mobile%20health%20west.pdf>.
- ²³ NetMotion Wireless Inc, Wireless Technologies in Healthcare: 2011 Trends Survey, 2012.
http://discover.netmotionwireless.com/rs/netmotionwireless/images/NetMotion-Wireless_2011-Healthcare-Trends-Survey_RPT.pdf.
- ²⁴ GlobalData. mHealth: Healthcare goes mobile. 2012 [cited 2012 October]; Available from:
<http://www.globaldata.com/PressReleaseDetails.aspx?PRID=294&Type=Industry&Title=Medical+Devices>.

- ²⁵ Dunbrack. L, The Second Wave of Clinical Mobility: Strategic Solution Investments for Mobile Point of Care, 2011, IDC Health Insights, HI2311829.<http://www.intel.com/content/dam/www/public/us/en/documents/white-papers/clinical-mobility-in-healthcare-paper.pdf>
- ²⁶ Kalorama Information. Remote and Wireless Patient Monitoring Markets. 2012 [cited 2012 November]; Available from: <http://www.twease.org/report/remote-and-wireless-patient-monitoring-markets.htm>
- ²⁷ Bird. J. Market for embedded health monitoring-gadgets to hit 170M by 2017. 2012 [cited 2012 September]; Available from: <http://www.fiercemobilehealthcare.com/story/market-embedded-health-monitoring-gadgets-hit-170m-devices-2017/2012-08-03>.
- ²⁸ Health Data Management. Kalorama Tracks Mobile Medical App Market. 2012 [cited 2012 September]; Available from: <http://www.healthdatamanagement.com/news/mobile-medical-apps-applications-market-kalorama-44597-1.html>.
- ²⁹ Raja. Y, Best Practices and Trends in Developing Mobile Healthcare Applications. LifeSciTrends, 2011. 10(3). <http://www.zslinc.com/Pdf/Best-Practices-and-Trends-in-Developing-Mobile-Health-Apps.pdf>.
- ³⁰ Mobihealthnews. 2012 Consumer Health Apps Report. 2012 [cited 2012 October]; Available from: <http://mobihealthnews.com/17925/just-launched-our-2012-consumer-health-apps-report/>
- ³¹ Boehm. E, Mobile Healthcare's Slow Adoption Curve, 2011, Forrester Research, Inc.
- ³² Blue Chip Patient Recruitment. Leveraging Mobile Health Technology for Patient Recruitment. 2012 [cited 2012 October]; Available from: <http://www.marketwire.com/press-release/blue-chip-patient-recruitment-survey-reveals-bright-future-mobile-healthcare-technology-1681246.htm>.
- ³³ Hampton. T, Recent Advances in Mobile Technology Benefit Global Health, Research, and Care. JAMA, 2012. 307(19): p. 2013-2014.
- ³⁴ Halvorson. G, et al., The Digital Dimension of Healthcare, 2012, Global Health Policy Summit. http://www.globalhealthpolicyforum.org/docs/GHPS_Digital_Innovation_Report.pdf.
- ³⁵ HIMSS Mobile Security Work Group, Security of Mobile Computing Devices in the Healthcare Environment, 2011. http://www.himss.org/content/files/PrivacySecurity/HIMSS_Mobility_Security_in_Healthcare_Final.pdf.
- ³⁶ Modhal. M, Tablets Set to Change Medical Practice, 2011, Quantia Communications, Inc. http://www.quantiamd.com/q-qcp/QuantiaMD_Research_TabletsSetToChangeMedicalPractice.pdf.
- ³⁷ Block. J, As Members Go Mobile, Health Plans Have Growing App-etite; Some are App-prehensive. Health Plan Week, 2012. 22(7). <http://aishealth.com/archive/nhpw073012-03>
- ³⁸ Berry. E. Big insurers investing in mobile health apps. 2012 [cited 2012 September]; Available from: <http://www.ama-assn.org/amednews/2012/01/23/bisd0123.htm>.
- ³⁹ Lefebure. S, et al., Case studies show mobility putting life sciences in motion, 2011, Gartner Industry Research. <http://www.gartner.com/id=1799621>.
- ⁴⁰ Fischer. E. Mobile revolution: How have drug developers embraced smart device technology? 2012 [cited 2012 September]; Available from: <http://www.pharmaceutical-technology.com/features/featuremobile-revolution-drug-developers-smart-device-technology/>.
- ⁴¹ Wicklund. E. Obama paves way for FDA's mobile app guidelines. 2012; Available from: <http://www.healthcareitnews.com/news/obama-paves-way-fdas-mobile-app-guidelines?topic=16,29,19>.
- ⁴² Sarasohn-Khan, J., The Connected Patient: Charting the Vital Signs of Remote Health Monitoring, 2011, California HealthCare Foundation. <http://www.chcf.org/~media/MEDIA%20LIBRARY%20Files/PDF/T/PDF%20TheConnectedPatient.pdf>.
- ⁴³ mHealthWatch. Walgreens Currently Testing Mobile Scheduling via iTriage Mobile App. 2012; Available from: <http://mhealthwatch.com/walgreens-currently-testing-mobile-scheduling-via-itriage-mobile-app-19183/>.
- ⁴⁴ Redman. R, CVS launches mobile text Rx notifications. Chain Drug Review, 2012. 34(3). <http://www.chaindrugreview.com/inside-this-issue/news/02-13-2012/cvs-launches-mobile-rx-text-notifications>.
- ⁴⁵ Payne. J, Mobilizing Standards: Aligning eHealth Standards to Accelerate the Integration of Mobile Health Systems into Global Health Practice, 2012, mHealth Alliance. Joint ITU-WHO Workshop on e-Health Standards & Interoperability http://www.itu.int/dms_pub/itu-t/oth/06/5B/T065B0000170041PDFE.pdf.

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