

WHITE PAPER

Mobile Applications and the Future of Healthcare

INTRODUCTION

In the same way that mobile applications (apps) have changed the way that people live, work, play, and communicate, they are transforming healthcare. Mobile apps and related technologies promise to alter the way that healthcare is delivered and paid for, to empower patients to take patients to take responsibility for their health, to make the delivery of healthcare more efficient, and to potentially lower costs and improve outcomes.

This white paper examines how mobile applications and technologies are transforming healthcare, and looks at the effects mobile and related technologies will have on patients, IT, developers, providers, and payers.



ELSEVIER

Mobile Technologies Transforming Healthcare

There is no doubt that medical and health-related mobile applications and technologies — often referred to as mHealth — will transform the way the entire healthcare ecosystem operates, from the patient experience to the operations of entire healthcare organizations.

Mobile health apps will help to facilitate a future in which patients are put at the center of healthcare and are given the best tools for managing their health. The combination of sophisticated data analytics and mobile technologies are making it easier for healthcare professionals to deliver the best care possible, away from high-cost facilities such as hospitals and doctors' offices, and closer to where patients live, work, and travel.

Many types of technologies will cooperate to deliver this promise:

- **CLOUD-BASED TECHNOLOGIES** allow data to be stored on the Internet, giving access to powerful computing power remotely and eliminating the need to store data on local servers and other equipment. Cloud-based technologies work hand-in-hand with mobile applications, with applications frequently accessing or storing information in the cloud. Recent mobile applications for physicians combine patient data with geolocation information about bacteria types, patterns of resistance, and available drugs to combat infections, all of which is stored in a cloud. This technology puts the “m” in mobile by

giving clinicians access to powerful, patient-specific information literally in the palm of their hands.

- **HEALTHCARE VAULTS AND PORTALS** give patients online access to their own health records and information. Individual doctors, groups of doctors, medical practices, and hospitals have portals that allow patients to see their medical records from that institution. On a larger scale, vaults like Microsoft HealthVault are designed to give patients access to all their medical history, not just the records from one doctor, practice, or facility.¹ Mobile applications tap into vaults and portals, providing access to them everywhere.

The types of mobile health apps currently available, and in development, generally break down into two areas:

- **HEALTH AND WELLNESS CONSUMER APPLICATIONS** offer patients ways to better manage their own conditions and general health. They can be as simple as exercise trackers, heart rate monitors, diet, and calorie counting applications. Or they can be more sophisticated ones that help patients manage complex health conditions that tie patients directly to their healthcare providers via mobile phones. For example, UnitedHealth Group offers members multiple mobile applications, including one that helps people manage chronic disease and required medication via text messaging.

- **A WIDE RANGE OF MOBILE APPLICATIONS AND TECHNOLOGIES** are aimed at medical professionals, including those that give remote access to medical reference information, images and drug data, those that deliver patient information to professionals wherever they are, and those that improve workflow and productivity. Mobile applications are widely used by clinicians already. For example, a study in the Journal of the American Medical Directors Association found that 90 percent of nursing home physicians surveyed reported that they have avoided at least one harmful drug reaction by looking up prescription information on their mobile devices.²

Factors Driving Mobile Adoption — and Roadblocks Holding It Back

Manhattan Research's Cybercitizen Health U.S. 2013 study found that in 2013, 95 million people used mobile phones or tools to access medical information. That's an increase of 27% from 2012.

Driven by a variety of societal, medical, and technical trends, mobile health applications have become a part of many people's daily lives. Manhattan Research's Cybercitizen Health U.S. 2013 study found that in 2013, 95 million people used mobile phones or tools to access medical information. That's an increase of 27 percent from 2012.³

A major factor driving mobile use is the sheer ubiquity of mobile devices. Pew Research Center's Internet & American Life Project found that in June 2013, 91 percent of Americans owned cell phones, and 58 percent of Americans owned smartphones.⁴

The prevalence of smartphone ownership is largely dependent on age and income bracket. Ninety percent of those between the ages of 18 and 29 who make \$75,000 or more own cell phones. In all age brackets, the higher the income, the greater the percentage of people who use smartphones. Medical professionals are typically well-paid and, according to a recent survey, 86 percent of physicians use smartphones. Using mobile devices is a worldwide phenomenon. Ernst and Young reports that 90 percent of people across the globe were within reach of a mobile network in 2010.⁵

Smartphones, tablets, and mobile applications have become so ingrained in modern culture that people expect the same kind of instant access to information about their health as they expect in other parts of their lives.

So-called "big data" and data analytics are driving the mHealth trend as well, because insights gained from analytics can be used by clinicians at the point of care, or when preparing to meet with patients. Computer scientists and mathematicians have developed new ways to gain insights from mining massive amounts of data. Mobile technologies work with big data in several ways. Mobile devices can automatically gather tremendous amounts of information about people, their health, and the way that they live, and feed that data into large data warehouses. And when health insights are mined via data analytics, healthcare professionals want to access them everywhere, not just when they are at their offices or healthcare institutions.

Also fueling the mHealth trend is how much easier it has become to develop mobile applications. The cost of entry is low, and tools are available that allow even those without a great deal of computing expertise to develop simple mobile applications such as exercise trackers.

The movement towards patient-centric healthcare and patient empowerment plays a big role as well. People are being asked to play a greater role in their own healthcare via wellness programs and programs for managing diseases. This is being driven by payers looking for ways to hold down costs. The Affordable Care Act uses a variety of incentives to increase patient-centered care. Mobile technology is ideal for these kinds of programs because they provide patients personalized access to their information at home or while traveling.

Roadblocks to Adoption

Social networks are also a major factor driving the development of mobile apps. Hundreds of millions of people worldwide use social networks such as Facebook, and they use those networks to find information about health. Social media offers peer support from others with similar conditions. Increasingly, social networks are accessed via mobile devices, driving the development of new mobile apps.

Increasing healthcare costs are a big driver of mHealth. Kaiser Health News reports that healthcare costs will reach nearly 20 percent of the U.S. gross domestic product (GDP) by 2021, according to the Centers for Medicare & Medicaid Services.⁶ Mobile technologies can hold down costs by increasing physician productivity, and the overall productivity at healthcare facilities. In addition, costs will be reduced by helping improve overall patient health.

Although mobile health technology is advancing at a rapid rate, there are still a few roadblocks, particularly for applications involving patient-specific data. Privacy and security issues are a big concern due to fears that personal health information will land in the hands of hackers or inadvertently shared beyond the scope of the patient's preference. The desire to share patient information among health care institutions and professionals who care for that patient must be balanced with the need to keep private information private. Historically, patient information has been "siloeed" with patient records held by individual providers, so the general practitioner has one set of records while the cardiologist has another. From a medical perspective, the patient is best served when all healthcare providers have access to the complete picture. Accomplishing this, however, is difficult not only because of privacy concerns, but also because there is no commonly accepted digital format for storing patient information. Conglomerating patient records from disparate sources is a serious technical challenge. In fact, Google abandoned its plan for a health vault precisely because of these technical difficulties.

Another approach for healthcare providers and institutions is to build applications that connect to multiple systems and sources of information, but unlike simple mobile health applications that rely on general information, those that rely on patient information and medical records are very expensive to develop and maintain.

What the Mobile Health Future Means for IT

Typically, IT departments have tried to limit the types of computers and devices in use in order to simplify support and maintenance. But that is changing because employees and patients use many different brands and models of smartphones and tablets, prompting some organizations to adopt “bring your own device” (BYOD) policies, which are much in demand and will likely soon become the norm.

Healthcare’s mobile future has significant implications for IT departments and developers. For the IT departments within healthcare organizations, it means incorporating new types of technologies and ways of remotely accessing information. More IT departments will also need to hire people with mobile expertise, a skill set in high demand. Mobile requires IT departments to think differently than they have in the past. Typically, IT departments have tried to limit the types of computers and devices in use in order to simplify support and maintenance. But that is changing because employees and patients use many different brands and models of smartphones and tablets, prompting some organizations to adopt “bring your own device” (BYOD) policies, which are much in demand and will likely soon become the norm.

IT departments also need to find ways to break down the silos that house different types of data so that they are accessible to mobile devices and applications. In fact, IT must do more than that—they need to find ways to make some of that information available not just to those within their healthcare organization, but beyond that if they are to reap the benefits that mobile applications have to offer. Of course, patient privacy must still be protected, which increases the demand for IT security experts.

Taking a big step in support of mobile health applications, healthcare provider Kaiser Permanente has released an API (application programming interface) that allows independent mobile developers to tap into its general medical and healthcare information for use in developing mobile applications. Kaiser has already developed its own mobile applications that allow plan participants to see their electronic medical records and lab results, refill their prescriptions, and set up doctor’s appointments. Its appointment app has been downloaded more than 500,000 times and one of its general wellness apps, “Every Body Walk,” has been downloaded 85,000 times. By making its API available, Kaiser hopes that independent developers will create useful apps for Kaiser members, which would help Kaiser provide the highest level of care and possibly give them a competitive advantage.

Implications for Developers

mHealth offers developers a tremendous market opportunity and general consumer health applications can already be found in abundance. Consider this startling fact: According to Ernst and Young, 44 million healthcare-related apps were downloaded in 2011.⁷ Given the increasing market penetration of smartphones, and the increasing visibility of healthcare-related apps, that number should grow dramatically, which is saying something when you consider the success some companies have already achieved. Runtastic, for example, has created 15 fitness tracking apps, which, according to the analyst firm research2guidance, makes it the highest-grossing health and fitness mobile application in the world. Florian Gschwandtner, one of the founders, says that the company's apps were downloaded more than 14 million times in the first half of 2013, more than 100,000 downloads a day.⁸

Research2guidance says that the top ten mobile health apps account for up to four million free downloads and 300,000 paid downloads a day. By early 2013 there were 97,000 mHealth mobile applications, according to the firm. Its report "Mobile Health Market Report 2013–2017: The Commercialization of mHealth Applications," states that by 2017 there will be an estimated 3.4 billion smartphones and tablets in the world, and half of all smartphone and tablet users will have downloaded at least one mHealth app. Overall, research2guidance estimates a total mHealth market revenue of \$26 billion by 2017.⁹

For developers there are also opportunities beyond consumer app development, such as custom programming work and integration work for payers, hospitals and healthcare facilities, and medical professionals.

As Runtastic's experience shows, many of the most popular mHealth apps are related to general health and fitness. This makes sense because they can be used by the population at large, regardless of individual medical profiles. In addition, using sensors that monitor overall fitness indicators, such as heart rate and calories burned, is a comparatively simple task for a developer. Condition-specific applications, such as those to help manage diabetes, require a higher level of medical expertise and more complex, patient-specific information. A survey by IMS Institute for Healthcare Informatics found that of the more than 43,000 health and fitness apps in Apple's iTunes app store, only 16,000 "are patient-facing apps with 'genuine' health content."¹⁰

The quality, content, and function of those 16,000 apps vary widely, with many failing to offer top-quality content or make use of all of a mobile device's capabilities. The report found that only 159 of the 16,000 apps make use of mobile devices' sensors, and of those, fewer than 50 "relate to actual condition management or provide tools and calculators for users to measure their vitals." The report concludes that this area is a ripe market for developers, saying, "There is therefore considerable room for growth in this sector." Of course, in order

for a mobile application to assist in the diagnosis, treatment, or monitoring of a disease, it must be equipped with accurate and current clinical information from a reliable source. Desirable vital signs, blood sugar levels, potential drug interactions, etc. depend not only on sensors and patient-specific data but also on trusted and proven medical content to inform and interpret the data.

The tens of thousands of general health and fitness apps already on the market make it difficult for new ones to gain notice. But apps with clinically useful, high-quality, reliable medical content can cut through the clutter and quickly gain visibility — and downloads. Of course, developers typically have little medical expertise, which makes it important that they partner with recognized and respected content providers who can provide current, accurate, and trusted information in the desired format.

Mobile Health for Providers

A survey by HIMSS Analytics found that 93% of physicians are using mobile technologies in their day-to-day work, and 88% are using mobile technology to help deliver patient care.

A majority of healthcare professionals already use mobile devices and technologies in the course of their normal day. A survey by HIMSS Analytics found that 93 percent of physicians are using mobile technologies in their day-to-day work, and 88 percent are using mobile technology to help deliver patient care. This should come as no surprise. Physicians have long been early adopters of mobile technologies. Ernst and Young reported that within a year of the iPad launch, 27 percent of physicians owned tablets.¹¹

Providers use mobile technology for three reasons: it can improve outcomes, reduce costs, and improve efficiency. An article in the American Medical Association notes that mobile technologies have “caused physicians to view health IT adoption as something they want to do, as opposed to something they are being forced to do.”¹²

A study by the University of Chicago found that 80 percent of medical residents in the University’s hospital had increased productivity after being given an iPad for tasks such as accessing medical records, and ordering tests and procedures for patients. They reported saving, on average, an hour a day.¹³

Patient care can be improved by mobile as well, and not just in healthcare settings. In an article for the American Medical Association, Eric J. Topol, M.D. wrote about an experience he had on a cross-country flight when a fellow passenger was “in obvious trouble.”¹⁴ Doctor Topol used an app on his iPhone that can record

electrocardiograms and discovered that the passenger was having a heart attack. The plane made an emergency landing and waiting paramedics rushed the patient directly to the hospital.

Mobile technology, combined with data analytics, can improve patient outcomes by delivering better decision support to medical professionals by letting them tap into the latest and most accurate health data wherever they are. Mobile apps also facilitate better collaboration among physicians, which is particularly important as pay-per-performance business models become more popular, because coordination of a patient’s overall healthcare is believed to hold down costs. And because mobile technology improves overall workflow, it is expected to increase productivity in healthcare settings. With more healthcare providers forming Accountable Care Organizations and other partnerships across the healthcare delivery system, the demand for healthcare information via mobile devices will increase further.

Pilot programs using mHealth have already paid off. Partners Healthcare, a venture of Massachusetts General Hospital and Brigham and Women’s Hospital, has launched a variety of new mobile programs, including Connected Cardiac Care, TeleStroke Center, Diabetes Connect, and Blood Pressure Connect, among others. As a result, it has seen a 48 percent reduction in cardiac patients being rehospitalized.¹⁵

Mobile Health for Payers

A report from the Commonwealth Fund found that apps for managing health conditions can improve health outcomes and control costs. The report says that chronic conditions such as diabetes and asthma can be helped most by these types of apps.¹⁶

All evidence indicates that mHealth adoption rates by physicians and providers will grow dramatically. A HIMSS Analytics Mobile Technology Survey found that in 2012, mobile collection of data at the bedside jumped to 45 percent compared to 30 percent a year earlier, and mobile capture of the visual representation of patient data was at 27 percent compared to 13 percent the previous year.¹⁷

Payers bear the brunt of rising healthcare costs, and have long been adopters of technology to equip patients with the knowledge to assist them in finding quality care. Health plans and managed care organizations have long used Web portals to provide members with easy access to helpful information, and now they are actively pushing for greater use of mobile technologies. Chief among the ways to hold down costs is improving the health of their members — a healthier member population means fewer healthcare services needed and lower costs. In addition to the obvious benefit of cost control, health plans can gain competitive advantages with good mobile health apps. Due to the health insurance exchanges established by the Affordable Care Act, insurance companies face increased competition because consumers can easily compare insurance policies from multiple companies. In order to retain existing members and attract new members, engaging with and improving the health of their populations is important to improve satisfaction and build customer loyalty. Payers are not leaving it up to the marketplace to develop mobile apps that help members better manage their health. They are directly investing in the creation of useful apps, with some payers buying development companies to write them.

Some examples include several mobile apps from Humana that encourage healthy activities via game-like features, and the Health4Me mobile app from UnitedHealthcare that lets plan members access critical health information, talk to nurses, find physicians, and check the

status of their claims. Aetna has purchased iTriage LLC, an app development and technology company started by two emergency room physicians. It publishes the popular iTriage mobile app that helps people know what conditions they might have and shows where to go for treatment, including the nearest emergency room. It also provides access to the Microsoft HealthVault.

Payers are investing in the underlying mobile computing infrastructure, such as updating IT systems to enable mobile access, providing cloud-based services and investing in analytics software that can identify plan members who will most benefit from outreach via mobile methods such as text messages and email.

Aetna CEO Mark Bertolini explains, “We have invested heavily in a service-oriented architecture as part of our business model and that has allowed us to bring a lot of things to the Web, to mobile, and handheld technology. The healthcare system is difficult to navigate, so we have been building tools that make it easier for customers to interact with the system.”¹⁸

Mobile Health for Patients

Even though 44 million health-related smartphone apps were downloaded as far back as 2011, consumer use of mobile technology for healthcare lags behind mobile use overall.

Mobile applications and related technologies hold great promise for patients, helping them adhere to medication regimens, manage their conditions, control healthcare costs, access medical information, connect with physicians, pharmacists, and other healthcare professionals, and generally lead healthier lives. Even though 44 million health-related smartphone apps were downloaded as far back as 2011, consumer use of mobile technology for healthcare lags behind mobile use overall.¹⁹ As of 2011, only 23 percent of consumers had used mobile health solutions, according to Forrester Research.²⁰ And only four percent of people in the U.S. with chronic conditions used mobile apps to track their health, according to a survey by the Pew Research Center.²¹ This is not surprising given that, at this point in time, elderly people are much more likely to suffer chronic conditions and much less likely to rely on mobile devices. But change is on the way.

A Harris poll of people who frequently use the Internet found that more than a third want to use mobile devices to make appointments, ask questions of their doctors, and get medical test results. Similar numbers of people want apps that can diagnose and monitor conditions, such as high blood pressure.²²

Some disease-management apps are becoming popular, such as those that help manage diabetes. As patients are encouraged to take more responsibility for managing their own health, these and

other smart healthcare apps will become more popular as well, including those that allow patients access to their medical records, communicate remotely with healthcare providers, manage medications, and more. Many of these apps will likely be made available through health insurance plans, physician practices, and hospitals to help optimize the health and care of members and patients.

Patients are likely to be one of the most important drivers of mobile health solutions, because they expect the health system to be accessible via mobile just as other parts of the economy are. Kevin Price, Global Technology Advisory Leader for Ernst and Young notes, “Today’s healthcare consumers are better informed, technologically savvy and expect more from their healthcare system.”⁷

Conclusion

Healthcare mobile applications will make healthcare more efficient and effective, bringing dramatic benefits to providers and payers alike. In addition, mHealth offers tremendous opportunities for developers who can reap significant revenue by providing timely, useful apps powered by reliable and proven content.

Elsevier, the world's leading healthcare publisher, offers a wide variety of peer-reviewed and evidenced-based medical reference information for mobile app developers, including comprehensive drug data, clinical decision support aids, patient education information, and more—all current and from trusted experts. They all include images, illustrations, and videos. The information is perfectly suited for mobile apps, health care portals, and Web sites. Customized packages include whole reference materials or pieces of them, individual images and illustrations or entire collections, and selected drug information or complete databases. The information is available in a variety of formats, including XML, API calls, and flat files.

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