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Going mobile

Wireless devices and technology bring surge in advanced applications for health monitoring and treatment, but legal and privacy issues remain

By Shawn Rhea
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The idea that medical providers would someday have mobile devices that allow them to monitor, diagnose and communicate with their patients isn't exactly a new one.

It's been more than four decades since the cast of Star Trek appeared on TV with fictitious "tricorders"—handheld devices that allowed crew members to scan for life signs and diagnose patients. Fast forward all these years and advances in cellular and wireless Internet technology have made such devices a reality for doctors and patients.

A growing number of providers are adopting technology that facilitates more cost-efficient, timely and effective patient care through devices as commonplace as BlackBerrys, Treos and iPhones. And the recent introduction of the iPad—a portable wireless device that is certain to spawn knockoffs—provides doctors and patients with a more reader-friendly platform for sending and receiving more visually demanding information than can be facilitated by smart phones.



Applications by Airstrip Technologies turn iPhones into a variety of health status monitoring devices.

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For many providers, mobile health adoption is part of a natural movement toward next-generation technology.

Four years ago, New York City Health and Hospitals Corp.—the city agency responsible for running 11 acute-care public hospitals and 90 clinics among other facilities—launched a telemedicine program that allowed medical providers to remotely monitor and instantly respond to diabetes patients' fluctuating insulin levels. The program, dubbed House Calls, provided 500 diabetics with flip-phone-sized modems equipped with detachable glucometers. Participants use the glucometers to test their blood several times daily, and each reading is immediately sent via the modem to the House Calls nurse assigned to monitor the patient.

"If it's outside of their high or low range, a message is triggered to the nurse's BlackBerry, and the nurse makes a call to the patient and goes through their activity with them

to determine the cause and effect relationships" of the incident, says Ann Frisch, executive director of the New York system's home-care division. "There's immediate feedback, so the patient knows what activity led to that type of reading."

According to Frisch, the system has seen significant improvement in disease management in more than 85% of diabetics who have participated in the program. So much so that in late 2009 the provider began distributing a wireless version of the device for use by patients who don't have land lines. The wireless version also has the benefit of being portable—allowing patients to take the device with them and continue having their glucose levels monitored by nurses while on the go.

"People are mobile," says Mitch Morris, a physician who's national leader of Health IT for Deloitte Consulting's Life Sciences and Health Care division, discussing healthcare's broadening adoption of mobile technology. "I may have Internet access if I'm at home, but not if I'm at a restaurant."

While smart phones are helping to bridge the mobility gap, the devices do have limitations. Hand-helds "are small instruments, so it's really impossible to read certain information" on them, says Morris, who noted doctors are increasingly interested in using mobile technology to access patient test results, including viewing imaging studies. "So, there's a lot of work being done to make sure the info is being transmitted in an appropriate format. Instruments like the iPad are

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in-between solutions, but the battery life is a concern there, and for a busy physician that can't be a problem."

As a result, Morris and others say wireless technology will have to overcome some significant hurdles before it becomes a ubiquitous facilitator of healthcare services. But all also agree that it's a question of when, not if, mobile-health technology will proliferate.

Two recent surveys show that the number of physicians relying on their smart phones and other mobile devices to conduct day-to-day business is rapidly growing. A March report issued by Manhattan Research, a healthcare market research company, projects that by 2012 81% of physicians will have smart phones—up from 64% in 2009—and more than half of that group will use their devices for administrative work, continuing-medical education and patient care.

Meanwhile, a survey conducted by healthcare marketing research firm SDI, and also released this past March, found that 30% of doctors already are using hand-held mobile devices to access medical information. Fifty-four percent of those doctors say they use their devices to access information primarily during patient appointments.

User-friendly?

For all its promise, it's still unclear how mobile technology can best facilitate the delivery and management of healthcare. Finding answers to that question is a goal of a just-launched, six-month pilot program of the Greater New York Hospital Association. The association, which also includes the group purchasing organization GNYHA Ventures, plans to loan about 150 iPads to hospital CEOs, chief financial officers, materials management executives and pharmacy managers in an effort to determine how mobile technology can be used to facilitate better healthcare operations and communications.

The pilot program will look at developing proprietary applications that can be used by the association's membership, says Lee Perlman, president of GNYHA Ventures and the hospital association's CFO.

"From a trade-association standpoint, we want to determine how we can best get information to our members about what's going on in Albany (N.Y.) and D.C.," Perlman says. "On the group purchasing piece, I'm absolutely looking at how to support our customers with information flow. It might be a purchasing manager on the floor talking to a doctor and he would be able to punch up the contract information he needs to make a purchasing decision."

Even as providers figure out the possibilities, mobile health applications already have taken firm root among some providers who are using the technology to access and send vital information that isn't subject to scrutiny and approval by regulatory agencies.

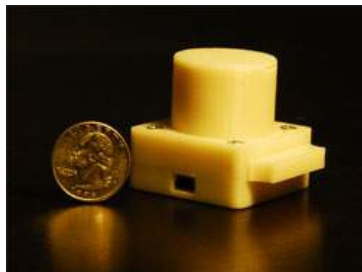
Physicians and nurses, for example, have been using their smart phones for some time now to access clinical-decision support tools, drug-reference materials and CME mobile courses from content companies such as Epocrates. More recently, individual providers have begun developing and issuing smart phone applications that help direct patients to their services. Both the Cleveland Clinic and Jewish Hospital & St. Mary's HealthCare, Louisville, Ky., have launched mobile applications that allow potential patients to search for doctors, access hospital location information and in some cases make appointment requests.

The 319-bed Hospital of Central Connecticut, with campuses in Southington and New Britain, has developed an iPhone application that allows patients to look up emergency room wait times, and a company called ER Texting has created a multicarrier texting service that allows patients to text their ZIP codes and request emergency room wait times for hospitals in their area. The company also offers additional outbound texting services that allow providers to notify patients about available healthcare services.

The company has yet to sign up any provider clients, but CEO Anthony Baradat says the service will cost healthcare organizations between \$600 and \$1,000 a month depending on their size.

Drugmakers have also jumped into the mobile health game offering prescription-drug discount coupons that can be texted to patients at point of purchase and developing texting anti-piracy programs that allow patients and retailers to authenticate a medication's origins prior to purchase.

Learning to interface



A small microscope, designed for use by physicians, connects to a cell phone to transmit images for remote review by pathologists.

Such uses of mobile-health technology represent just a small fraction of what healthcare professionals and inventors believe is possible. The technology's real transformative power could lie in the ability of cellular and wireless devices to interface with existing medical devices and electronic health records and securely and efficiently transmit sensitive information.

"The platforms are there and most of the core elements are there," says Alessio Ascari, McKinsey Consulting senior partner and mobile health expert. One such example is a Food and Drug Administration-approved fetal heart-monitoring device called Airstrip OB, which hit the market five years ago. The product, says Airstrip Technologies Chief Information Officer Neil McQueen, is a combination of an interface that works with existing fetal monitoring systems to gather and transmit information to doctors' smart phones and a software application that replicates the fetal monitors' readings onto the phones.

"A doctor can't be there the entire labor, and previously a nurse would have had to get on the phone and describe what they were seeing," McQueen says. Now, however, the remote visual monitoring system allows doctors to attend to other business and still respond to patients in real time as the labor progresses, he says.



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Other smart phone-enabled technologies are on the horizon as well. Several providers are investing in the development of security-enabled applications that will allow doctors to access patients' EHRs via their smart phones. UPMC, a 12-hospital system based in Pittsburgh, for example, has partnered with mobile technology developer dbMotion to create an application that translates and delivers EHRs to physicians' BlackBerrys. Doctors can use the application to look up patients' laboratory results, medications and allergies when they are at a UPMC facility or off-campus.

"We are looking for more effective ways to make patient information available at the point of care—and increasingly the point of care isn't just in a hospital or a doctor's office," says William Fera, a physician who's UPMC's vice president of medical technologies and interoperability medical director, in a news release.

Working out of the University of California at Los Angeles technology incubator California NanoSystems Institute, MediSens Wireless, a startup company, is developing wireless body-sensor technology that will allow providers to remotely monitor and collect long-range information on patients at risk for falls and diabetic neuropathy.

Meanwhile, Savannah, Ga.-based Health Discovery Corp. is developing a skin-cancer screening application that will allow customers to use their mobile phones to photograph suspicious moles or skin lesions and e-mail the images to a computer that uses an algorithm to evaluate the marks.

Aydogan Ozcan, an electrical engineer with the California NanoSystems, has developed a similar, more sophisticated diagnostic technology aimed at physicians. Leading a team of researchers, he has created a lens-free technology that will allow a doctor without immediate access to a laboratory to use a cell-phone camera as a remote microscope.

The technology, called LUCAS—which is short for Lensless Ultrawide field Cell Monitoring Array platform based on Shadow imaging—connects a device slightly bigger than the size of quarter to a cell phone. A fluid-sample slide can then be placed over the cell phone camera's viewer and the image transmitted to a remote computer or pathologist for analysis.

"If you have a very strong pathologist on the other end, he can look at the image and make a diagnosis," Ozcan says. "Or you can send it to a computer with an algorithm program that looks for certain abnormal cells and makes a statistical decision for the field user and spits out an answer, saying here's our recommendation."

The LUCAS smart-phone technology, which is focused on diagnosing infectious diseases, can currently recognize and diagnose malaria, HIV and tuberculosis, but the developers expect to expand the number of offerings. Ozcan recently received funding from the U.K.-based company Vodafone for a three-year pilot project that will test the technology's reliability and usefulness. In addition to bringing badly needed diagnostic services to underserved areas, Ozcan predicts that the mobile technology will also be highly affordable.

"The components we use are fairly cost effective," he says, noting that the light-source component costs roughly 25 to 30 cents for 10 pieces, while the sensor chip costs about \$15. "But they could be less expensive if you purchase them in large quantities."

Cutting costs

Technology experts say mobile-health technology has the potential to lower costs and improve care quality, and that could be a key motivator for adoption since the recently passed healthcare law aims to accomplish both goals. "If you look at some of the elements of reform, like increasing use of midlevel practitioners and in-home care, those types of efforts can accelerate use of these devices," says Deloitte's Morris.

Programs like House Calls in New York appear to verify the savings and quality-improvement potential of mobile health. The program runs about \$3,600 per patient annually—less than the cost of a one-day hospital stay or emergency room visit for patients that lapse into diabetic episodes. What's more, patients who participated in House Calls decreased their unplanned doctors' visits, hospitalizations and emergency room visits by half, according to data gathered on the program.

But while newly developed mobile-health applications and technologies could help transform the delivery of healthcare, technology experts say questions about which federal agencies will regulate and handle pre-market approval of such devices still need to be answered.

Because many of the developing technologies combine medical and communication-transmission devices, both the FDA and Federal Communications Commission have some level of responsibility and jurisdiction over mobile-health product approvals. Both patient safety and communication privacy laws are at issue, says Zachary Bujnoch, a telemedicine analyst for consultancy Frost & Sullivan.

"It gets so complicated so fast," says Bujnoch, who noted that remote monitoring allows doctors and other providers to be in different states than the patients they care for. "You're talking about crossing state lines, and that brings up issues of medical licensing that are still unanswered."

Ascari of McKinsey agrees, saying development of mobile technology will likely outpace broad adoption until such regulatory issues can be settled.

"I don't think there will an easy answer on cross jurisdiction and international use," Ascari says. "But I think the important thing is that people realize there is a place for this technology in healthcare, because the costs are becoming unsustainable."



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