



The Forever Health Monitor

Your smartphone can monitor your vital signs in real time, alerting you to the first sign of trouble

MOST PEOPLE HEAD TO THEIR DOCTORS IF THEY HAVE CHEST PAIN or a suspicious lump, but signs like these often appear too late. Catching symptoms earlier requires ongoing monitoring—the kind of thing a cell phone might do. Health-scanning systems that exploit the continuous flow of data from cell phones could help eliminate the perilous lag time between the onset of symptoms and diagnosis. Mobile devices could also help care providers identify and treat problems before they become too serious—and too expensive—to address effectively. In theory, such always-on warning systems could slash the 75 percent of health care spending used for chronic disease management and extend life spans by staving off millions of potential health crises.

The mobile marketplace is glutted with health apps that are little more than gimmicks, but a few standout systems promise to help users manage chronic conditions or identify red-flag symptoms. AliveCor's iPhone ECG, a plastic phone case that is slated for U.S. Food and Drug Administration approval in early 2012, has two metal electrodes on the back of the case that record heart rhythms whenever users hold the device in both hands or press it against their chest. This real-time electrocardiography (ECG) data can be beamed wirelessly to patients, family members and doctors, alerting them to any heart rhythm irregularities. "It doesn't just give people an early warning but also gives it without the cost associated with conventional ECG tools," says the device's developer, biomedical engineer David Albert. Similarly, French company Withings has developed a blood pressure-monitoring device that works with the iPhone. After users don the sleek white cuff, a reading pops up on the phone's screen within 30 seconds; if the reading is abnormal, a warning also appears. And WellDoc's FDA-approved diabetes application, DiabetesManager, allows patients to enter a variety of real-time data into their phones, such as blood glucose levels, carbohydrates consumed and diabetes medicines taken. The software analyzes all these factors and supplies patients with a recommended action to keep sugar levels in a healthy range (take insulin, eat something). A trial published in September showed that DiabetesManager users have significantly better long-term glucose control than nonusers.



Beats to go: AliveCor's iPhone ECG system monitors heart rhythms.

So far the new systems are largely disjointed from one another, and many remain in development. Yet wireless health experts say they represent the beginning of an era when mobile health-monitoring systems will work seamlessly and in concert, giving consumers and their doctors a comprehensive, data-fueled picture of their overall health. "It's technically possible to press a button [on your

phone] and say, 'I want to look at my vital signs in real time,'" says Eric Topol, director of the Scripps Translational Science Institute.

The big roadblock is sensor technology. Traditional blood glucose monitors must pierce the skin to work, and few people want to wear a blood pressure cuff or a taped-on electrode everywhere they go. But more convenient alternatives are imminent. Scientists in Japan recently created injectable fluorescent fibers

that monitor blood glucose. Topol says a future array of nanoparticle-based sensors that interface with smartphones could achieve more reliable monitoring for vital signs and, most enticingly, earlier detection of disease markers such as antibodies. Sensors that can detect so-called tumor markers, for instance, could send immediate alerts to mobile devices, giving patients the option to start preventive chemotherapy before cancerous cells can get entrenched. Moreover, the simpler mobile health monitoring becomes, the more likely consumers will be to sign up. A 2010 survey found that 40 percent of Americans would pay a monthly subscription fee for a mobile device that would send blood pressure, blood glucose or heart rate data to their doctors.

Paul Sonnier, a vice president at the Wireless-Life Sciences Alliance, points out that resolving health issues early on will be even easier when mobile health monitoring is integrated with genetic analysis. If a patient has a gene that predisposes her to diabetes or cancer early in life, for example, she could potentially wear an unobtrusive sensor that sends word of any unusual developments to her phone. "You'd have an embedded nanosensor to be ahead of the first attack on the islet cells of the pancreas, the first cancerous cell that shows up," Topol says. Should mobile health-monitoring systems reach their potential, they will serve as ever present sentinels that protect people before they know they're in danger.

—Elizabeth Svoboda

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