



Doctor's Orders: Healthcare Apps and Self-Monitoring

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Eric Topol is a practicing cardiologist with Scripps Clinic in La Jolla, California, and a pioneer in the field of cardiovascular medicine. His research interests include the use of preventive medicine, wireless digital technologies, and genomics to reshape the future of medicine. A practicing physician as well as a researcher, Topol believes that patients should be fully empowered. He ensures this by sharing information completely and building a partnership with his patients.

In his book, *The Creative Destruction of Medicine: How the Digital Revolution will Create Better Healthcare* (Basic Books, 2013), Topol attacks the wastefulness and lack of precision in medicine as it's practiced today and proposes using digital technologies to improve the efficiency and quality of healthcare delivery. In 2013, in a televised interview with Nancy Snyderman of NBC News, Topol demonstrated the use of a smartphone app to perform a clinical-quality electrocardiogram. Using the app and a wireless sensor attached to his body, Topol was able to monitor his blood glucose in



real time. (You can watch the interview at www.youtube.com/watch?v=r13uYs7jglg.)

Although patient self-monitoring has been shown to be effective in both wellness programs and early diagnosis,¹ some physicians are reluctant to include patient-reported parameters in the patient medical record. I asked Topol what IT professionals and software designers might do to make healthcare-related apps more effective, less intrusive, and more user-friendly, thereby increasing their acceptance by both healthcare providers and patients.

How can app designers increase the acceptance of patient self-monitoring, and how can we efficiently integrate such measurements into the electronic health record?

In general, we don't have enough respect for patient-generated data. Although the data is generated by a patient, it is the sensor that is capturing the data and not some subjective, suboptimal source. The key is the processing of the data to [create] useful information. For example, if there is a sensor that captures blood pressure every heart beat for a week, there needs to be a single graph that nicely summarizes this and that can be archived in the electronic health record. Integration will be critical.

Many healthcare professionals are concerned that using electronic health records will interfere with the doctor-patient relationship. Using laptops and smartphones to record patient information during a patient encounter shouldn't be intrusive. What usability factors should be considered when designing interfaces for electronic health records?

I would like to see the whole visit captured by voice processing so that there is no distraction or distraction from the patient-physician encounter. There is currently a trend of hiring scribes to enter the data and reduce the distraction, but that certainly is not a cost-effective solution. Eventually, via voice processing and sophisticated software, this could be the ideal solution to a vexing problem.

Letting patients remotely report parameters, such as vital signs or glucose readings, instead of requiring an office visit can save time and money, but many insurance plans won't reimburse patients for these telehealth functions. How can we improve our insurance model to address the increasing use of patient self-monitoring?

Once it is proven that this lowers cost and yields better outcomes, I believe the health insurers will be entirely supportive.

What can software/hardware designers do to improve the accuracy and ease of use of self-monitoring measurements? Are there emerging sensor technologies that could play a role in increasing user acceptance of self-monitoring?

The best self-monitoring is passive, seamless, and invisible to the individual. It doesn't necessarily have to be continuous, depending on the metric that is being assessed. There is no lack of hyper-innovative sensor development that is presently occurring to achieve these objectives. The main bottleneck is with the processing and displaying of data, rather than the alluring aspect of emerging sensor technologies.

How can digital technologies help us transition from a paradigm of chronic care to one of

wellness and prevention? How can smartphone apps and similar technologies help people improve their fitness levels and reduce risky behaviors?

Actually, the wellness and fitness apps and hardware have been the first entries to the field. The problem with their promoting improved lifestyle and fitness is that achieving durable behavioral change is exceedingly difficult. Things like ramification, incentives, and other tactics may be necessary beyond the apps.

Looking forward, how can we address potential privacy concerns? Will patients feel the technology is too invasive or have concerns about who else can access the data?

The privacy issues are especially important and have been underscored with all of the hacking and dissemination of non-medical personal data without the individual's knowledge. There needs to be assurance to each individual that his or her data will be made as secure as possible—it cannot be guaranteed—and that the data will not be sold or used for any purpose without the individual's explicit permission. Furthermore, the entity holding the data needs to take data security precautions to unprecedented levels. While this will always be an issue, I am optimistic that it will eventually not be a barrier for wide-scale acceptance and progress in this field.

Genomic testing could affect healthcare delivery by helping patients understand their genetically based risk factors. How soon will genomic testing be affordable for the average patient, and how might we integrate this information into the patient medical record? How should we address related privacy concerns?

It will be at least a few years before whole genome sequencing is used for healthy individuals—there is no such thing as an “average” patient. But well before that, thanks to the sub US\$1,000 cost now announced for sequencing a human genome, it will be increasingly used for determining the root cause of cancer and rare, unknown diseases. Further, both fetal and neonatal sequencing will likely gain marked popularity in the years ahead for early diagnosis or prevention of very serious medical conditions. The sequence data can be easily folded into the electronic health record. The privacy issues are similar to those above, but here, an additional concern is the possibility of re-identification (from an encrypted, de-identified database) of the individual by knowledge of the sequence. So data security issues are especially important here, too. ■

Reference

1. J. Jepsen, “Personal Health Records, Patient Engagement and EHR Meaningful Use,” *Search Health IT*, April 2013; <http://searchhealthit.techtarget.com/opinion/Personal-health-records-patient-engagement-and-EHR-meaningful-use>.

Thomas C. Jepsen is an independent IT consultant. His interests include health information technology, interoperability, and the history of technology. He is the author of Distributed Storage Networks: Architecture, Protocols and Management (Wiley, 2003) and a contributor to Systems Engineering Approach to Medical Automation (Artech House, 2008) and Encyclopedia of Software Engineering (Taylor & Francis, 2010). He received the IEEE-USA Citation of Honor in 2009. Contact him at tjepsen@ieee.org.

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