

From “Pull” to “Push”

A Transformation in Medicine

Consider the words we use to describe what a physician does when she or he sits across from a patient to perform a history. Take. Obtain. Elicit. These words all conjure images of physicians extracting information from patients. We pull information not just from our patients but also from our information systems, calling up vital signs and laboratory results when we want them, on our time and our terms. However, this is rapidly changing, as information will be coming to us from the patients themselves to create “push” medicine. Are we ready? Not yet, but with some pivoting and some preparation, we can be.

CONVERGING TRENDS LEADING TO “PUSH” MEDICINE

Several synergistic technological and cultural trends are leading us toward “push” medicine. Increasingly ubiquitous technologies such as broadband Internet, smartphones, and cloud computing have created fertile ground. There is increased focus on patient-centered decision making. Patients are increasingly well-informed; nearly 60% of adults have looked online for information about health topics.¹

Data are coming from many new sources. Mobile applications enable patients to actively create data, such as by answering symptom questionnaires, or allow wireless sensing devices to semipassively generate data like heart rate or physical activity. Other mobile applications use your calendar, text messages, and e-mails to passively generate meaningful health information, such as mood or quality of life.² The realm of data collected in the home is expanding beyond blood pressure and glucose log books to tracking daily pain and functioning scores for rheumatoid arthritis. Patients are also contributing data through social networks and personal health records and by direct entry into the electronic health record. Patients are increasingly requesting their personal genomes—and to do so they need only curiosity, an Internet connection, and a credit card. These activities are increasingly common, and 27% of Internet users, or 20% of all adults, have tracked their health online.¹

These data sources are revolutionary because they are patient generated. They do not require a physician to give permission or to place an order. This will result in more patients creating and pushing information to populate their medical records. Some may dismiss “push” data as being unreliable or overwhelming in volume. However, these new data, integrated with other sources of health

care data, are potentially valuable. It will complement rather than replace an artfully elicited patient history and physical examination, giving us additional pieces to an incomplete jigsaw puzzle. Moreover, our patients will expect us to accept and use it.

HOW DO WE BEST USE THE DATA?

Collecting data, however, is not the end goal. The crucial discussion must center on how to best use data to improve knowledge and health. All physicians can serve important roles by partnering with medical informaticists to devise better ways to collect, manage, analyze, and communicate these data.

Clinical Uses

Clinical delivery systems should be reimagined and reinvented to take advantage of “push” medicine. Real-time monitoring of outpatients could improve the matching of need to availability for office visits, improving efficiency by reducing the frequency of scheduled office visits for certain patients. It could also allow us to intervene sooner instead of waiting for an asthma attack or rheumatoid arthritis flare. When patients do come to our offices, we would have more detailed information to assist us in decision making. Our new paradigm should include “high-touch” connections with patients by reaching them at the precise moments they experience symptoms or make medical decisions. Kvedar et al³ note that these “just-in-time” connections can be “motivating, educational and caring.” Preventive care could be revolutionized, as increasingly intelligent analytics enhance our ability to act sooner and sooner during a person’s life.⁴ The shift toward a capitated payment model fits well with these new methods of care.

In this issue, exemplifying “push” medicine, Weitzman et al⁵ used the online diabetes community TuDiabetes to provide hypoglycemia surveillance. While there are frequent emergency department visits for hypoglycemia, these only represent the tip of the iceberg, and the actual incidence is far higher. Nearly 50% of study respondents reported more than 4 episodes of “going low” in the previous 2 weeks, and nearly 30% reported more than 1 severe low in the previous year. This shows an improved sensitivity toward finding hypoglycemia via the social network as opposed to waiting for a patient to visit an emergency department. The ability to intervene earlier is no small matter—46% of respondents had a daily

debilitating worry about hypoglycemia and 54% avoid exercise because of fear of hypoglycemia. This demonstrates precisely how “push” medicine affords us the wonderful opportunity to identify people who are suffering and to intervene.

Research Uses

“Push” medicine should facilitate the recruitment and enrollment of patients into research studies in addition to ongoing surveillance and monitoring for unintended benefits or harms from drugs, devices, or other treatments.⁶ As in the study by Weitzman et al, an increasing number of patients will engage in “citizen science” or public participation by “crowdsourcing,” volunteering to allow their data to be continuously collected online.⁷

Other Studies

Others also have identified the potential benefits of “push” medicine. Initiatives such as 23andMe and PatientsLikeMe have published peer-reviewed journal articles stemming from online, crowdsourced research.⁷ In the sphere of public health, Internet search data surveillance has been shown to predict the spread of influenza,⁸ and monitoring a social network may do so more rapidly.⁹

CONCERNS AND HURDLES

Critically important hurdles remain as we move toward “push” medicine. There are significant privacy and security concerns. Who owns the data? Who is responsible for keeping the data secure? Is the passive generation of data by your smartphone a privacy intrusion? An ethical concern is that we must be mindful to not deepen the divide between underserved, disconnected patients and those patients who are medically (and digitally) connected. Medicolegally, are physicians responsible for every piece of “push” data? Technological obstacles include ensuring the accuracy and integrity of the data and properly identifying patients. Research results from studies with self-reported data from self-selected participants must be interpreted cautiously, carrying the possibility of selection bias, information bias, and confounding.⁷ It will be critical to have thoughtful, high-quality studies to evaluate whether health outcomes and health care value are improved by “push” medicine.

CONCLUSIONS

“Push” medicine will be an integral part of reaching the goal of the Institute of Medicine of a “learning health care

system” that can provide “real-time guidance.”¹⁰ Jason Jacobs,¹¹ the CEO of RunKeeper, a popular application for exercise tracking, provocatively wrote

Over time, people will come to rely more on their phone to keep them healthy than they do their actual doctor. This does not mean that doctors will go away, but it does mean that the role of the doctor will be forever altered.

While consumers may currently be the driving force toward “push” medicine, we in the medical community should seize the opportunity to shape this transition by taking the following steps: First, acknowledge that we are in a time of transition and think about how it will benefit our patients. Second, discuss the changing role of the physician with our colleagues and patients. Third, experiment. Use social media in our practices. Ask patients to try new mobile health apps and bring the data back to our offices. We could all use a little push.

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1. Fox S. *The Social Life of Health Information*, 2011. Washington, DC: Pew Research Center; 2011.
2. Richtel M. Apps that can alert the doctor when trouble looms. *New York Times*. 2012;1-3. <http://well.blogs.nytimes.com/2012/10/08/apps-alert-the-doctor-when-trouble-looms>. Accessed October 9, 2012.
3. Kvedar JC, Nesbitt T, Kvedar JG, Darkins A. E-patient connectivity and the near term future. *J Gen Intern Med*. 2011;26(Suppl 2):636-638.
4. Topol E. *The Creative Destruction of Medicine*. New York, NY: Basic Books; 2012:233.
5. Weitzman ER, Kelemen S, Quinn M, Eggleston EM, Mandl KD. Participatory surveillance of hypoglycemia and harms in an online social network [published online February 11, 2013]. *JAMA Intern Med*. doi:10.1001/jamainternmed.2013.2512.
6. Fineberg HV. Shattuck Lecture: a successful and sustainable health system—how to get there from here. *N Engl J Med*. 2012;366(11):1020-1027.
7. Janssens ACJW, Kraft P. Research conducted using data obtained through online communities: ethical implications of methodological limitations. *PLoS Med*. 2012;9(10):e1001328.
8. Ginsberg J, Mohebbi MH, Patel RS, Brammer L, Smolinski MS, Brilliant L. Detecting influenza epidemics using search engine query data. *Nature*. 2009;457(7232):1012-1014.
9. Christakis NA, Fowler JH. Social network sensors for early detection of contagious outbreaks. *PLoS One*. 2010;5(9):e12948.
10. Smith M, Saunders R, Stuckhardt L, McGinnis JM, eds. *Best Care at Lower Cost: The Path to Continuously Learning Health Care in America*. Washington, DC: National Academies Press; 2012.
11. Jacobs J. Your phone will soon be your new doctor. Gigaom website. 2012. <http://gigaom.com/2012/09/30/your-phone-will-soon-be-your-new-doctor>. Accessed October 2, 2012.