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Enhancing Primary Care Through Online Communication

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ABSTRACT The effective delivery of primary care requires more frequent information exchange and communication than the typical office visit allows. Although industry leaders endorse health information technology (IT) to improve health outcomes and reduce costs, there has been less attention devoted to the use of this technology to deliver care. Using Internet-based technologies such as secure messaging, videoconferencing, and remote physiological monitoring can provide information to improve the patient-provider relationship and the quality of health care. Evidence has shown that patients and providers are willing to use these care delivery technologies. However, their success will require integration with electronic health records and payment models that support their implementation and growth.

The relationship between the clinician and the patient lies at the heart of primary care. Ideally, patients are empowered through this relationship to change certain behaviors in order to achieve better health outcomes.

The electronic health record is an important step in making patients' medical information more accessible and capable of being shared. It directly benefits health care delivery networks and insurers but has little impact on patients.¹ Online technology can take further advantage of data in the health record and allow providers and patients to exchange information continuously, not just in office visits.

This "technology-enabled" model of care is simple, evidence-based, and built on an existing technological infrastructure. It includes three components. The first component is the use of secure messaging known as asynchronous communication, to enable follow-up and more continuous management of patients' chronic conditions. The second component is the use of synchronous communication technologies, such as Skype Internet telephony, videoconferencing, and mobile phones, to manage patients'

health in real time. The third component is the use of remote-monitoring technology to enable continuous care of people with chronic diseases.

Health Care Compared With Other Industries

Industries such as banking, travel, and retail have used technology to transform their businesses during the past decade. Bank customers can go online to access and act on current information about their accounts at any time. Travelers can book airline reservations and print boarding passes in an instant. Customers can purchase and track items across the globe from thousands of online retailers. Health care is the only major industry resisting the adoption of the ubiquitous technologies we use today in other sectors of the economy.

Despite all of the rallying cries for the modernization of medical practice, only 4 percent of practicing U.S. physicians use a fully functional electronic health record.² Leaders of health care delivery networks would uniformly agree that "enhancing productivity and efficiency in the provision of care"³ is a desirable strategy

to use in addressing rising costs and access. However, delivering on that strategy has real challenges.

Barriers To Adoption Of Online Care

PAYMENT SYSTEM The main reason for the reluctance to use online methods of health care delivery is the current visit-based payment system. Providers are already challenged with time constraints resulting from fee-for-service practice, and many find interacting with an electronic health record enough of a challenge to their work flow.¹

LACK OF INTEGRATED TOOLS Additionally, many of these online tools are not integrated with electronic records, and providers are skeptical about the efficacy of online health care delivery because the evidence supporting it is still nascent.⁴ Providers have also articulated concerns about privacy⁵ and how the technology would intrude on their interactions with patients.⁶

FINANCIAL INCENTIVES The step that would do the most to enable the growth of online care is the restructuring of financial incentives. Such incentives may include paying for individual online visits, paying physicians a management fee to compensate for time spent in online patient care, or paying providers in a capitated manner. Transformation of the payment system is a requirement for the acceptance and growth of online health care delivery for providers.

CHRONIC DISEASE MANAGEMENT Today, treatment and management of chronic diseases such as obesity, diabetes, high blood pressure, and high cholesterol account for more than 75 percent of all U.S. health care spending.⁷ For the most part, management of these diseases in traditional office visits is intermittent. To make care more continuous, large health care organizations are now investing in technologies to support their patients with chronic diseases. Additionally, the federal government has proposed the development of alternative approaches to improving the care of such patients.⁸

What Is A Technology-Enabled Practice?

A technology-enabled medical practice uses a combination of tools that improve communication with and care of patients wherever they are. At the core of this practice is a strong relationship between the patient and the provider team.

PATIENT PORTAL The administrative underpinning of this practice is the “patient portal,” a secure Web site that allows patients and their providers to communicate securely online. Pa-

tients using any device connected to the Internet can access the portal with a secure login. The portal provides a way for patients to initiate routine and nonurgent requests beyond office hours. Using the portal, patients may also complete requests for prescriptions, appointments, and referral authorizations, and can view limited information from their outpatient medical records.

The portal is also complemented by a health information library and specific information about the medical practice. For administrative staff, requests processed through the patient portal reduce phone-call volume and allow efficient triage of patients’ needs. The portal also provides a way to transmit lab test results and interpretation letters to patients electronically.

For providers, the portal provides detailed statistics about patients’ use of services and can provide a way to review business processes and manage resources at the practice. All data are exchanged in a manner that is both secure and compliant with privacy regulations produced under the Health Insurance Portability and Accountability Act (HIPAA).

ADDITIONAL COMPONENTS Along with the patient portal, a technology-enabled health care practice includes three other components, as follows.

► **ASYNCHRONOUS CONSULTATION:** Asynchronous consultation with the provider team is an essential component of the future of primary care delivery. Many patients would like to e-mail their physicians, but providers are concerned that e-mail may provide patients with unlimited space for essays of complaints. Managing communication to physicians can become unwieldy. One approach already proven effective involves a customized platform that provides scripted templates that guide patients through online visits, presenting physicians with the information they need in a short and interpretable form.^{9,10}

For example, a patient complaining of back pain would be guided through a form that would ask about specific symptoms and medications taken. The provider would receive the patient’s information when the patient submitted it. The provider would then contact the patient regarding follow-up treatment based on the information provided.

Several studies describe the use of asynchronous communication in primary health care. In one study of diabetic patients, the Department of Veterans Affairs (VA) Care Coordination Home Telehealth program used a stand-alone two-way messaging device connected to a telephone line that sent messages to patients daily.¹¹ Patients enrolled in the study answered questions about

their symptoms and their overall health status. Providers who monitored the responses took actions such as calling the patient or placing new orders for medications. Findings supported the benefit of this device in reducing diabetes-related hospitalizations and clinic visits.

In another study, heart failure patients participated in a randomized controlled trial that tested the use of an online health record called System Providing Access to Records Online.¹² The tool provided a secure portal for patients to use in getting access to their medical records, sending messages, and finding relevant health education content. This study found that patients' adherence to medical advice improved. In addition, the study found that patients' satisfaction with doctor-patient communication was improving.

Scripted templates that guide patients through online visits for chronic diseases have also been evaluated.^{13,14} For example, a patient with asthma may be asked if he or she is taking a steroid inhaler as directed. The template would enable the patient to enter the number of times he or she has used a rescue inhaler in the past week.

Studies show that such templates are effective in the management of hypertension.¹⁵ To use these platforms to their full potential, they must be accessible with available technologies such as mobile phones and home computers.

An example of this is a study in which patients with diabetes used mobile phones and the Internet to monitor their blood glucose levels.¹⁶ They accessed a Web site to enter food logs, medications, dosing, and glucose levels. Data were automatically made available for a nurse to review; the nurse then gave feedback to the patient via text message. Results showed that over the course of six months, standard measures of blood sugar control improved using this technology.

Other investigators have tested an Internet-based glucose monitoring system with patients with type 2 diabetes to monitor their glucose levels.¹⁷ Over the course of twelve weeks, patients entered glucose levels, medications, insulin doses, blood pressure, and weight into a secure Web site. Clinicians reviewed data remotely through the site and used e-mail to follow up. At the conclusion of the study, patients who used the online system had lower glucose levels than patients who received traditional diabetes care and education in the doctor's office.

Forward-thinking health systems are already using asynchronous messaging as a major component of their care plans. Kaiser Permanente in Hawaii introduced messaging as a component of its integrated electronic record in 2004. An analysis of all outpatient contact between 2004 and 2007 showed a reduction in outpatient vis-

Forward-thinking health systems are already using asynchronous messaging in their care plans.

its, an increase in virtual patient visits (either scheduled telephone visits or online visits through a patient portal), and maintenance of patient satisfaction.¹⁸

Group Health Cooperative in Seattle uses a secure messaging system as part of its patient-centered medical home demonstration.¹⁹ Patients enrolled in the demonstration site used the messaging system 94 percent more than patients at other clinics, even though the messaging tool was available at those clinics. Patients at the demonstration site also had 6 percent fewer in-person clinic visits.

► **VIRTUAL VISITS:** The second component is synchronous, or real-time, communication between provider and patient. Videoconferencing and real-time messaging allow for the timely evaluation of both urgent and nonurgent issues that might not require an office visit. They can be carried out in a shorter amount of time than an office visit would entail. Most people who work in business settings are familiar with interactive videoconferencing that allows people in two or more locations to interact through two-way video and audio transmissions. Although videoconferencing has been used widely in medical teaching, where techniques or conferences are broadcast to a group watching remotely, there has been resistance to using this technology in medical care delivery.

Evidence is mounting that the use of videoconferencing in the medical environment is useful for a variety of acute and chronic issues. The author and collaborators recently compared face-to-face visits with videoconference visits using Web cameras.^{4,20} In these studies, a physician conducted visits with existing patients using computers equipped with Web cameras and videoconferencing software. Such visits were found to be as effective as face-to-face visits for the evaluation and management of acute, nonurgent issues, such as upper respiratory infections or back pain. Qualitative patient satis-

faction was rated very highly for the videoconference visit experience. This study indicates that videoconference visits can be an effective means of care delivery for a subset of chronic and acute conditions.

Another study that highlighted the potential of videoconferencing in primary care was the Informatics for Diabetes Education and Telemedicine project.²¹ Medicare beneficiaries with diabetes in New York were provided with a home telemedicine unit platform. The platform included a video camera and Web connection, as well as home glucose and blood pressure monitoring devices. The group using home-based telemedicine exhibited improved blood sugar control, improved blood pressure, and better total and low-density lipoprotein (LDL) cholesterol levels as compared to the group receiving office-based primary care.²²

The potential for nonphysician care providers to use videoconferencing in primary care was also evaluated in the Informatics for Diabetes Education and Telemedicine project.²³ Registered nurse case managers videoconference with this same population of New York Medicare beneficiaries for urgent issues. Some 338 patients used their telemonitoring platform over a thirty-six-month period. Sixty-seven medically urgent cases, twenty-four major drug contraindications, and nineteen medically urgent conditions were detected and problems averted using this system.

Obviously, there are limitations in conducting physical exams through Web cameras or other online media. However, within certain limits, real-time patient-provider encounters using this type of technology can be an effective means of delivering care to patients. Virtual synchronous visits may also reduce overhead costs for a physician's practice by reducing space and resource requirements. For patients, a virtual visit can minimize time taken away from work and transportation costs.

► **REMOTE MONITORING:** The third component is remote monitoring of patients' conditions. Clinical information is one of the key resources that physicians need to care for patients. Devices that remotely monitor patients' clinical and physiological measures, such as blood sugar, blood pressure, and weight, provide a good opportunity for seamless collaboration between physician and patient. Remote monitoring can also reduce the burden on patients of unnecessary office visits.

There has been an explosion of commercially available devices to monitor physiologic measures. These are measures that, over time, can provide data that physicians can act upon with patients. Unfortunately, little of this informa-

tion ever makes it to the physician's office. The information is usually stored on the remote device or the patient's home computer, and it is only occasionally brought to a physician's attention during an office visit.

In the provider community, most of the data in support of remote monitoring come from studies conducted among frail patients with heart failure and chronic pulmonary disease. Although limited data are available that support the technology's use in healthier patients with chronic disease, consumers' interest and the development of online personal health records have the potential to stimulate demand for major changes in health IT on the provider side.²⁴

One recent study employed a home blood pressure monitoring protocol that allowed patients with high blood pressure to enter their home blood pressure readings through a Web portal.¹⁵ A pharmacist then reviewed these readings and relayed a customized asynchronous message to the patient in response. The study found that remote monitoring, patient education, and asynchronous remote care provided by the pharmacist were all required to significantly lower blood pressure in this patient group.

Another study reviewed a glucose monitoring system that was used to follow up with patients with type 1 diabetes who had poor metabolic control.²⁵ Patients received medication adjustment information from their doctors based on the remotely monitored data. Patients who were monitored showed an improvement in long-term blood sugar, a decrease in hypoglycemic events, and an improvement in quality of life. Additionally, costs for monitored patients were lower than for those who were followed up with normally in the clinic.

As demonstrated by the studies cited above, remote monitoring can have positive effects on health outcomes. The technical infrastructure of primary care must be designed in a fashion that integrates with third parties who develop monitoring solutions and that enables outcomes to be measured.²⁶

Conclusion

The information age and communication technologies have transformed nearly every aspect of our personal and professional lives during the past decade. Most efforts in health IT on the delivery side have been focused on the development of interoperable electronic health records; less effort has focused on IT to provide channels for the delivery of health care.

The introduction of videoconferencing, electronic messaging, and remote monitoring to augment communication between a primary

care provider and a patient provides an opportunity to improve information flows in both directions. As a result, there is potential to improve health outcomes and increase the efficiency of primary care delivery systems.

Today, the payer system in the United States does not support the integration and use of technologies that enable online communication between physicians and patients. Privacy concerns

and cultural resistance have stalled such technologies' adoption. However, as patients are poised to adopt technology to collaborate with providers online, providing financial and institutional support for the use of these technologies may cause providers to adopt them more rapidly and should make delivery more efficient for practices and patients. ■

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NOTES

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Ronald F. Dixon directs the Virtual Practice Project at Massachusetts General Hospital.

Ronald F. Dixon is director of the Virtual Practice Project at Massachusetts General Hospital, a program that explores ways to deliver what he calls “continuous care” to patients through Web-based technology.

Far from replacing face-to-face office visits, Dixon believes that tools such as e-mail communication, teleconferencing, and remote monitoring can bring doctors and patients together in the spaces between office visits. Such tools can allow doctors to monitor someone’s progress in controlling diabetes, hypertension, and other chronic conditions, and can enable both parties to exchange ideas and information as problems arise.

“Even though face-to-face encounters are the only way to get paid, it’s woefully behind the times

and ineffective at really monitoring what people do when they’re not in the office,” says Dixon, 40, an internist who is a native of Montreal, Quebec. “After all, people spend the majority of their lives outside the physician’s office.”

Dixon founded the Virtual Practice Project in 2006 and began putting online tools to the test at MGH Beacon Hill, a primary care practice where he sees patients. His ideas had taken root a few years earlier while he was treating seriously ill patients in a hospital clinic. There, he realized that the office-based model of care was inadequate. Patients who had been hospitalized in the throes of heart attacks or heart failure were competing for office visits with patients who had been asked to return to the clinic to have their blood pressure checked. These simple visits seemed wasteful and inefficient for all concerned, and they constituted an access barrier for patients who really needed follow-up.

“I’d say, ‘Just go home with a blood pressure cuff and take your pressure and e-mail me with the numbers,’” recalls Dixon.

Patients liked it because it saved

time; Dixon liked its efficiency and the ability it gave him to adjust medications if readings suddenly spiked. Administrators, however, soon recommended that he stop, because in a fee-for-service payment system, nobody gets paid if the patients don’t physically show up.

Lacking a more flexible payment system, he later depended on grants and institutional awards to support the online care delivered at Beacon Hill—a model that he agrees is unsustainable. But his next step is to launch an entirely new medical practice that fully integrates traditional office visits with Web-based care—an approach that will require cooperation from insurance companies willing to pay annual flat fees or amounts pegged to episodes of illness.

“The aim is to develop a self-sustaining model of primary care delivery that can be replicated,” says Dixon, who earned his medical degree at Dartmouth Medical School and trained at Mass General. “The technology is essential. The practice doesn’t work without it.”