INTRODUCTION

Moving Health Information Technology Forward

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Health information technology (IT) has been touted by the federal government,¹ the business community,² and the health care industry^{3,4} as a means of improving the quality of care while also controlling costs. These optimistic expectations are predicated on the substantial role health IT already plays in improving health care in the United States along with evidence from individual large- and small-scale experiments and demonstrations. This special issue of the Journal of General Internal Medicine effectively highlights the broad range of potential uses of health IT in its various forms, including electronic health records, datamarts and electronic disease registries, automated telephone outreach, patient portals, and research implementation. These efforts may target multiple components of a health care system or focus on individual patients, clinicians, or other providers. Taken together, the work presented in this issue provides insight into both the opportunities and challenges associated with the use of health IT to improve health care delivery.

One of the primary challenges to the effective use of health IT remains its adoption and successful implementation. Efforts to create a national health IT infrastructure in the United States are progressing very slowly. A recent report suggests that the model of regional health information organizations is not living up to the expectations with regard to facilitating data exchange.⁵ Current levels of adoption of health IT by clinicians, practices, and hospitals vary greatly depending on the type of technology. For example, in the United States, the penetration of electronic claim submission is approaching 100%,⁶ whereas only one quarter of ambulatory practices currently use advanced electronic health records.⁷

Health care is mainly an information business. The majority of clinicians' time is spent gathering, recording, processing, extracting, and transmitting information. One would expect that electronic tools to enhance the speed and flexibility of information management would be widely embraced. Yet, the comprehensive use of health IT has not become widespread,

and the benefits of electronic health records and other forms of health IT to improve the health of the population have not been realized. It appears that the health care community either may not recognize or may not appreciate the overall potential gains associated with implementing health IT. In this issue, Leu et al. conducted extensive qualitative interviews and have provided a roadmap to guide ambulatory health centers considering the adoption of health IT.⁸ Their work will allow health system leaders to clearly understand the potential impact of such innovation on clinical workflow processes and quality of care in the ambulatory environment.

Despite the expense and logistical challenges inherent to implementing health IT, the evidence base for its effects on health care quality continues to grow. In this issue, Weber et al. report on a multitargeted effort across the entire Geisinger Health System. The advanced electronic health record, which included an electronic diabetes registry, decision support, and nurse management tools, was combined with physician performance feedback and financial rewards, resulting in substantial improvements in diabetes care.⁹ This multifaceted integration of health IT into a larger performance improvement program represents an attractive strategy for health care systems able to effect such change.

Such large-scale change may seem daunting, yet more modest initiatives can also improve care. Patients in particular represent an untapped resource in the movement to improve health care quality.¹⁰ In this issue, promising results are described for multiple applications of health IT to facilitate the active involvement of patients in their health and health care. Sarkar et al. took advantage of an automated telephone outreach program to identify potential adverse events, such as hypoglycemia, in patients receiving treatment for diabetes.¹¹ Patients in office waiting areas had little difficulty using tablet computers to provide routine screening information in a study by Hess et al.¹² These programs highlight the potential for health IT to engage patients directly in the care process, which can lead to improved patient experiences and potentially improved outcomes.¹³

Health IT can also effectively target clinicians by improving access to patient data, medical evidence, and clinical decision support. Kern et al. demonstrated a strong association between physician access to an online portal for viewing diagnostic test results and improved quality of ambulatory care.¹⁴ Studies

indicate that computer reminders and patient-specific care suggestions can facilitate preventive care interventions such as immunizations and cancer screening.^{15,16} However, the effects of such interventions on patients' health outcomes has been more variable. In this issue, Hicks et al. demonstrated that physicians receiving electronic reminders adhered more closely to guidelines for medication use; however, there was no effect on patients' blood pressure control.¹⁷ Weber et al. similarly found that electronic messages targeting physicians of elderly patients who had been prescribed potentially harmful psychoactive medications decreased the use of such medications but did not reduce the primary outcome of falls.¹⁸ In their review of computerized physician order entry systems, Wolfstadt et al. found considerable variability in the effects of interactive decision support systems on the rate of adverse drug events.¹⁹ These variable and sometimes disappointing results may reflect differences in the effectiveness of both the design and implementation of decision support systems. Fung et al. addressed this problem in a study identifying principles for more effective design of clinical decision support tools embedded within an electronic record, including the importance of the clinician interface and effective integration with the clinical workflow.²⁰

One of the most promising uses of health IT involves electronic prescribing of medications. This has the potential to avoid problems related to illegible prescriptions, incorrect dosing, and potential adverse interactions between medications. However, in Massachusetts, Fischer et al. studied a large health plan's statewide initiative to support physicians' use of handheld prescribing devices and found that less than one third of providers used this technology.²¹ Even when such technology is used, there are still limitations to its effectiveness. Lapane et al. demonstrated that 40% of prescribers routinely override drug interaction alerts, most often citing problems with "oversensitive" alerts.²² These findings highlight the importance of careful attention to the details of implementing health IT, including active promotion of the benefits of these technologies, setting the appropriate sensitivity and specificity of the interventions and incorporating them into practice workflow and clinical activities.

Several studies in this issue highlight the emerging use of health IT to facilitate clinical research in ambulatory settings. Electronic health records and disease registries can provide a spectrum of data on large numbers of patients for rigorous sampling and treatment assignments that ensure good balance between intervention and control groups, as demonstrated by Love et al.²³ Both Leveille et al.²⁴ and Rollman et al.²⁵ obtained promising results when using an electronic health record to recruit patients to clinical trials. The former team successfully used a secure patient portal to deliver electronic invitations to patients, whereas the latter delivered reminders to physicians within an electronic health record to suggest enrollment of patients into a clinical trial. These innovative uses of health IT can facilitate the movement of research from academic centers to the community, epitomizing the "translational research" strongly encouraged by the National Institutes of Health.²⁶

The work described above and the other reports in this issue support cautious optimism that health IT can improve health care in diverse ways. Yet, in many instances, this potential remains untapped. What can be done to realize this potential? We will continue to learn lessons from studies evaluating the impact of individual health IT-based innovations on health care delivery and patient outcomes. However, equally important

insights are gained from studies specifically designed to explore principles that guide the effective development and implementation of health IT interventions. Seeking answers to the questions "Why do health IT interventions succeed or fail?" and "How can health IT be effectively used?" will clarify underlying principles and allow us to better understand the benefits of, unintended consequences of, and barriers to implementing health IT. With this understanding, we can use IT to help health systems, patients, and providers to work more efficiently and enhance the delivery of effective and safe health care.

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