ditions, saving more than \$1,100 per patient. To meet social needs, collaboration with regional organizations outside the health care sector is often essential. Presbyterian Healthcare Services in New Mexico for instance, works with La Cosecha, a communitysupported agriculture program, to grow fruits and vegetables and distribute them to low-income families.

It might seem idealistic to

talk about principles and hopes at a time when elected officials are still focused on what reductions in access to health insurance are politically viable. But the health of millions of Americans remains at risk if leaders simply try to minimize the damage. We think health care is just one area in which Americans are rediscovering the values and principles that matter most to them. These five principles seem

likely to define the goals and nature of collaboration, and asserting them now can guide policy positions in the months ahead.

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From the Alliance of Community Health Plans, Washington, DC (C.C.); Press Ganey, Wakefield, MA (T.H.L.); and Harvard Medical School, Boston (T.H.L.).

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A 21st-Century Health IT System — Creating a Real-World Information Economy

Kenneth D. Mandl, M.D., M.P.H., and Isaac S. Kohane, M.D., M.P.H.

Data generated as a by-product of the day-to-day work of delivery systems are a fundamental currency of the 21st Century Cures Act. How efficiently and effectively we use this "realworld" evidence will shape the way medicine is practiced and the way drugs are approved.¹

In 2009, the Health Information Technology for Economic and Clinical Health (HITECH) Act established an incentive payment program geared toward "meaningful use" of information technology (IT), which ultimately disbursed more than \$34 billion for the promotion and purchase of electronic health records (EHRs). That federal investment was complemented by a substantially larger private investment by physicians and hospitals. Eight years later, however, the U.S. health care system still doesn't have a usable IT engine that can generate highquality data, a restriction that may impede progress toward the use of real-world evidence to advance treatment and research.

Fortunately, lawmakers included in the 21st Century Cures Act a provision that could transform hundreds of existing EHR products certified under the Meaningful Use program into a coherent platform for innovation and transformation, despite the systems' nonmodular design and disparate data formats. The new law requires that certified health IT products have an application programming interface (API) that allows health information to be accessed, exchanged, and used "without special effort." Such an interface could allow third-party developers to create functionality that interacts and integrates with other systems in predictable and standardized ways.

APIs are used universally in modern software and are fundamental to products made by Google, Microsoft, Facebook, and Amazon. The Apple App Store contains hundreds of thousands of apps because developers have a well-documented API that enables them to create software that seamlessly integrates with the operating system of the iPhone. EHR vendors have been slower to adopt APIs than companies in other industries — hence the need for a legislated mandate. The collective interpretation of the API provision and the response to it will shape the way that physicians and patients experience health care for years to come.

As we plan a path forward, it's worth observing the consequences of prior policies. Although the Meaningful Use program successfully promoted purchases of EHRs — 86% of ambulatory care practices and more than 95% of nonfederal acute care hospitals now own them — the program's structure led to important shortcomings. The Meaningful Use program dictated to EHR vendors the specific functionality needed

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for their products to become federally certified. It also mandated that physicians purchase and use these certified systems to meet specific milestones, first to receive incentive payments and later to avoid payment penalties from the Centers for Medicare and Medicaid Services (CMS). Even if the Meaningful Use criteria had been perfectly conceived, however, market offerings could still have been unresponsive to physician-users' demands. And although the Meaningful Use program was predicated on the emergence of interoperability, the necessary incentives and penalties weren't in place to produce it.

Going forward, the API provision in the 21st Century Cures Act could be leveraged to powerful effect. First of all, if the API is open and standardized across systems, a new form of interoperability will emerge: substitutability. Substitutability would mean that apps could be added to or deleted from an EHR just as they can be on a smartphone — a step that would reflect a shared commitment to the transferability of health care data and knowledge.

A uniform, open, standardized health care API would allow a given app to run on any EHR. This approach would produce game-changing economies of scale and starkly contrast with current conditions, in which nearly all innovative applications require expensive, time-consuming, custom integrations to connect to EHRs. Physicians and patients would have access to a wide selection of software that could connect to their existing systems. Innovators would have a marketplace where they could compete on quality, price, value, and user

experience without mastering the idiosyncrasies of each EHR brand. EHRs would become commodity components in a larger platform that would include other transactional systems and data warehouses running myriad apps, and apps could have access to diverse sources of shared data beyond a single health system's records.

Research, regulatory, and public health organizations could both access data obtained at the point of care and deliver services to physicians and patients through substitutable apps that connect to EHRs, as developers create resources for an "app store" for health and research. Substantial progress has been made toward these goals, but they haven't been achieved on a system-level scale. Researchers working on the Precision Medicine Initiative are collaborating with EHR vendors on a project called Sync for Science (S4S) to address the initiative's need for real-world phenotype and outcomes data for its millionsubject cohort. S4S will allow research participants to virtually knock on the door of a health system, connect an app to its EHR, acquire their personal health data, and donate them to the initiative. S4S is one of an increasing number of applications leveraging the SMART Health IT project, which was funded by the Office of the National Coordinator for Health Information Technology (ONC) after we proposed pursuing interoperability through substitutable apps.² To promote an apps ecosystem, the ONC has funded an online app gallery,³ streamlining the process for innovators to publish their health IT applications and providers to discover and assess them.

Today, it is possible in early-

adopter settings to connect thirdparty apps from an app gallery to proprietary commercial EHRs using a standard API. Although the 21st Century Cures Act didn't specify an open standard for the API or mandate that all certified health IT run substitutable "plugand-play" apps, such requirements could be established through regulation. The SMART specification — which incorporates the increasingly popular Fast Healthcare Interoperability Resources (FHIR) standards inspired by modern APIs - is already used by multiple health systems,4 and the Argonaut Project, an initiative focused on open interoperability standards, has spearheaded incorporation of SMART and FHIR APIs into major EHR products. Regulators thus have concrete, viable options for enforcing a uniform API specification. Without such a specification, each health system and IT vendor might need to develop a different integration pathway - a violation of the 21st Century Cures Act's requirement that information be obtainable and usable through an API "without special effort."

Until now, health systems and physicians have largely been passive participants in the Meaningful Use program and have rarely been in a position to demand from IT vendors the functionality they need. This arrangement has contributed to high rates of physician dissatisfaction with the Meaningful Use program and minimal innovation beyond what has been delivered by vendors. We believe that an open API with access to all core data resources and turnkey integration of apps should be required in all contracts with EHR suppliers. In a

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recent survey, a majority of physicians indicated that they were very or extremely likely to buy apps extending their EHR system's capabilities.5 Furthermore, whereas the Meaningful Use program applied only to CMS payments, we encourage private payers to also provide incentives for a standard open API as a mechanism for integrating decision-support apps to drive best practice and allow documentation of outcomes and value. App developers could ask their customers to allow integration with health system data through a standard API, rather than through expensive one-off projects.

If we make it our goal for a

given app to be able to run on any EHR in the U.S. health care system, we minimize the risk that the 21st Century Cures Act will produce only local successes and scores of balkanized, disparate apps. We also maximize the opportunity for the United States to become a leader in developing new health care applications for clinicians and patients with varying needs and ensuring the safe and timely flow of information for patients, care providers, and researchers.

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From the Computational Health Informatics Program, Boston Children's Hospital (K.D.M.), and the Department of Biomedical Informatics, Harvard Medical School (I.S.K.) — both in Boston.

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Letter to a Young Female Physician

Suzanne Koven, M.D.

This past June, I participated in an orientation session during which new interns were asked to write self-addressed letters expressing their hopes and anxieties. The sealed envelopes were collected and then returned 6 months later, when I'm sure the interns felt encouraged to see how far they'd come.

This exercise, in which the intern serves as both letter writer and recipient, both novice and veteran, offers a new twist on an old tradition. In 1855, James Jackson published Letters to a Young Physician Just Entering Upon Practice. More recent additions to this epistolary canon include Richard Selzer's Letters to a Young Doctor, which appeared in 1982, and Treatment Kind and Fair: Letters to a Young Doctor, which Perri Klass published in 2007 on the occasion of her son's entry into medical school.

When I started my internship 30 years ago, I wasn't invited to share my hopes and anxieties in a letter — or anywhere else, for that matter. In fact, I recall no orientation at all, other than lining up to receive a stack of illfitting white uniforms, a tuberculin skin test, and a hasty and not particularly reassuring review of CPR.

Perhaps the memory of my own abrupt initiation explains my response as I sat at the conference table watching the new interns hunched earnestly over their letters: I was filled with longing. I wanted so much to tell them, particularly the women — more than half the group, I was pleased to note — what I wished I'd known. Even more, I yearned to tell my younger self what I wished I'd known. As the interns wrote, I composed a letter of my own.

Dear Young Female Physician: I know you are excited and also apprehensive. These feelings are not unwarranted. The hours you will work, the body of knowledge you must master, and the responsibility you will bear for people's lives and well-being are daunting. I'd be worried if you weren't at least a little worried.

As a woman, you face an additional set of challenges, but you know that already. On your urology rotation in medical school, you were informed that your pres-

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