

Crossing the Chasm with Information Technology: Bridging the Quality Gap in Health Care

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I. Overview

The objective of this report is to describe and, where useful, illustrate with case examples, how currently available technology is being used by care providers in ways that support the goals of IOM II.

THE INSTITUTE OF MEDICINE'S SECOND REPORT in their three-part series on the quality of health care in America, *Crossing the Quality Chasm* (IOM II), describes fundamental flaws in the current care system that interfere with the consistent delivery of quality care. Memorably, the IOM authors conclude that between the quality of health care we currently have and that which we could and should have "lies not just a gap, but a chasm."¹ Deriving its conclusions from extensive research and case studies, the IOM report cites specific forces that have combined to create the present predicament:

- Growing complexity of science and technology, with lengthy delays between innovation development and implementation in clinical practice;
- Increase in chronic illness burden, with a health care system centered around acute care delivery;
- Inadequate use of information technology; and
- Payment schemes that produce conflicting incentives and do not encourage quality improvement.

The IOM authors acknowledge that information technology is one critical ingredient to any solution. While their report provides a convincing argument that the chassis is broken, it offers little practical information about how to go about the rebuilding. Rather, it provides a set of ten rules or goals for the future that will promote the transformation of the system and move American health care "across the quality chasm":

1. Care based on continuous healing relationships.
2. Customization based on patient needs and values.
3. The patient as the source of control.
4. Shared knowledge and the free flow of information.
5. Evidence-based decision-making.
6. Safety as a system property.
7. The need for transparency.
8. Anticipation of needs.
9. Continuous decrease in waste.
10. Cooperation among clinicians.²

The objective of this report is to describe and, where useful, illustrate with case examples, how currently available technology is being used by care providers in ways that support the goals of IOM II. Since technology cannot be implemented in isolation and process change is critical to quality improvement, this report discusses some of the organizational challenges that must be dealt with when implementing these technologies.

The principle emphasis of IOM II is on quality of care, and this report focuses on applications that specifically support clinical processes (as opposed to financial, administrative, etc.). In addition, the report emphasizes the outpatient setting. There are several reasons for this: First, the IOM principles concentrate heavily on systemic, rather than setting-specific, challenges, and many of the greatest challenges exist outside of the acute care facility. Second, there is much less known and written about quality improvement initiatives in the outpatient setting. Third, while there remains much progress to be made, the use of clinical information systems is well established in the inpatient setting, whereas adoption of technology affecting care quality in the outpatient setting is still in its relative infancy.

This report is not an attempt to “cover the waterfront” of available technologies; there are certainly other good examples beyond those considered here. Rather, this is a representative sampling of some important categories of technology and their application to the objectives of the IOM II report.

II. The IOM's Ten Rules

Patients should have access to information about their care, and should have the power to determine their degree of participation in decision-making about it.

THE TEN RULES CREATED BY THE IOM II committee state particular goals for improving the quality of health care. This section defines these rules and considers how current day processes work (or do not work) around each. In many cases, the rules serve to point up deficiencies that now exist in health care.

Rule 1: Care Based on Continuous Healing Relationships

This rule refers specifically to patients' access to care. The health care system should be accessible to patients at all times, by multiple means (telephone, online, in person, or other).

In the typical practice setting, access to care and information is a nightmare from the patient's perspective. A patient phoning to schedule an appointment typically faces an automated answering machine or service, and must navigate through a series of choices to speak with a practice administrator, sometimes spending significant periods of time on hold. Then, because a busy practice may be scheduled months in advance, the patient could have a significant waiting period before an appointment is available. Patients calling the practice with questions, refill requests, or urgent medical problems frequently face long waits as well. The result is that many become discouraged and feel compelled to schedule an office visit to get the attention they need, when often their needs could be met simply by better communication.

Rule 2: Customization Based on Patient Needs and Values

Provision of care should be able to accommodate patient-specific requirements and desires. Patients' preferences—for example, about alternate therapeutic avenues with differing side-effects and probabilities of co-morbidity—should be actively solicited and incorporated into clinical decision-making; and patients' decisions should be respected by physicians.

Rule 3: The Patient as the Source of Control

Overlaps with Rule 2; it states that patients should have access to information about their care and should have the power to determine their degree of participation in decision-making about it. The emphasis here is on access to information and choice about level of involvement in decision-making.

Traditionally, the degree to which patients have been fully informed of the options available to them and involved in decision-making has varied greatly. Providing patients with better access to information about wellness and disease can be done in many ways. Some information sources are available to patients independent of their interaction with their caregivers; others can be provided by physician practices and used to enhance the quality of care as well as the patient's experience in the health care system.

Rule 4: Shared Knowledge and the Free Flow of Information

This rule further emphasizes granting information access to patients, particularly access to their own medical records. Patients should also have the opportunity to correct—without deleting—provider-recorded information in their records, and be able to learn who has accessed their records. Seemingly a simple proposition, in several states patients are in fact barred from gaining access to their medical records.³

Rule 5: Evidence-based Decision-making

Medical decisions should be made not on the basis of personal anecdotal experience, but based on the best current evidence and understanding of the subject. Rule 5 addresses the need to reduce unnecessary variation in care.

An important component of promoting adherence to evidence-based practice is making the best evidence on current standard of practice available at the time and place where decisions are being made. This requires determining the best practice, assembling the specific description of how to adhere to the practice, and presenting it in a timely fashion. Best practice for many common conditions has been the subject of numerous studies and consensus statements; clinical practice guidelines exist for many conditions.

Rule 6: Safety as a System Property

Current understanding of safety in complex systems holds that safety is not principally a function of individual responsibility, but rather is determined by the system in which care providers and patients operate. Improving patient safety involves fundamental changes in the culture of the average care delivery setting: emphasizing discovery and learning from errors, rather than hiding them; encouraging error reporting, rather than assigning blame; and incorporating safety planning into all aspects of clinical operations.

Safety is a very broad topic. The most common area of attention for safety improvement has been the medication management process.⁴ In the outpatient setting, electronic prescribing has been promoted as a medication safety measure.⁵ A previously published research report discussed at length the safety benefits of electronic prescribing.⁶

Rule 7: The Need for Transparency

Transparency here means public accountability for quality. The care system's performance metrics should be available to patients to consider in their decision-making, and errors or adverse events should be communicated to patients. Some argue that medical errors (process errors) and/or adverse events (adverse outcomes) should be reported to public databases.

The transparency rule raises challenging issues for today's health care system. The principal obstacle to transparency in the area of error or adverse event reporting is fear of litigation. Indeed, some have argued that fundamental improvements in patient safety cannot occur until the American tort system undergoes significant reform.⁷ Nonetheless, several kinds of performance information are being made widely available. These are discussed later in this report, along with the debate surrounding them.

Rule 8: Anticipation of Needs

Patient care should be proactively managed—anticipating the monitoring and therapeutic needs of those with chronic illness, and reaching out to “non-participants” to draw them into the system for preventive care and screening.

The current health care system operates mostly in reactive mode, addressing illness when it presents rather than focusing on prevention and proactive management of chronic conditions. The latter has received much attention in the last decade, largely in the form of disease management programs sponsored by health plans, pharmaceutical companies, or provider organizations. This report looks at approaches to assisting providers and patients in working together to manage illness, rather than on disease management companies' efforts, which are numerous and exceed the scope of this research.

Rule 9: Continuous Decrease in Waste

This rule refers primarily to today's “penny wise, pound foolish” approach to medical care, which the IOM committee argues amounts to limiting access, reducing investment in resources, and constructing other barriers to care in the name of cost reduction. Ultimately, the IOM report's authors believe, improving the quality of care will lead to greater efficiencies.

Rule 10: Cooperation among Clinicians

An emphasis on cooperation should replace today's emphasis on clinician autonomy if patients are to receive the best possible care. The IOM authors believe too much attention is given to distinctions between professional roles and their respective tasks, which inhibits a more practical, patient-focused approach to care. Cooperation requires not only new attitudes, but also new ways of working. Rule 10 promotes greater use of team-based approaches to care delivery, better standardization of procedures where practical, and more attention to meeting the patient's needs effectively. These aspects of care delivery are facilitated by information sharing among providers.

III. Four Principles for a New Vision of High-quality Care

THIS REPORT ORGANIZES THE TEN RULES OF IOM II, which point to specific deficiencies in the current care system, into four general “principles of care” that describe the future ideal health care system.

1. Patient Empowerment

The degree of empowerment, or involvement in decision-making around care, is each patient’s choice; but in the future, all patients are able to be active decision-makers and collaborators in their own care. They have a better understanding of their care, and can access a variety of tools to assist them in administering self-care. Patients also contribute to improving the safety of their care, by being better informed and aware of the details of care.

Information management implications of patient empowerment. Empowerment requires knowledge, and the means to use it. Specifically, patients should have ready access to health care information, including disease-specific information, packaged for non-clinician consumption. They should also have access to their personal medical information and to decision-support tools for self-care.

2. Reliability and Safety

In the future ideal health care environment, patients know they can rely on receiving top quality care. The health care system and its components perform reliably in all aspects of care delivery. Physicians consistently practice according to the principles of evidence-based medicine, and are able to do so because they have access to necessary knowledge at the critical moment. Different clinicians involved in the care of a patient, or population of patients, communicate and cooperate as a matter of routine. A reliable system is necessarily safe and efficient; errors of omission and commission are minimized due to appropriate decision support. Safety is considered the cornerstone of quality and is treated as an integral consideration in all aspects of care delivery.

Information management implications of reliability and safety. Movement toward a highly reliable care system requires:

- Providing clinicians with clinical decision support at the critical moment, including evidence-based knowledge in the context of patient-specific data. Examples include drug interaction alerts at the time of medication prescribing (which improves safety), and reminders for specific guideline-based interventions during the care of a patient with chronic disease. These kinds of decision support must be provided in a manner that facilitates—and does not complicate—the process of care delivery. Information should be presented in a patient-centric view for individual patient care, and also in a population or aggregate view, to support population management and quality improvement.
- Information sharing among clinicians and information access for clinicians. Clinicians must be able to share observations and data, and multiple clinicians must have access to a given patient's data at their fingertips, regardless of their locations.

3. Care Relationships Beyond the Encounter

Relationships are defined by collaboration between patient and provider, not just face-to-face interaction. In the future health care system, the physician-patient relationship has evolved beyond encounter-oriented care to a fuller, continuous and ongoing relationship. Physicians receive more information about patients longitudinally, not just surrounding office visits. Care is delivered proactively; patients are confident that their chronic illnesses are monitored by caregivers

beyond the periodic office visit. They are able to communicate self-care data to providers, who are able in turn to track patient status between visits and intervene as appropriate. Patients have more options for obtaining information, advice, and care, and are able to make better decisions about how to use assistance. Care resources are used more appropriately, reducing waste and improving satisfaction for all participants.

Information management implications of continuous care relationships. Such continuity of care requires provider-patient communication as well as joint patient-provider information management and decision support.

4. Public Accountability for Quality

In the care system of the future, care quality is measured, and the resulting data are available to the public. Quality metrics are used by health care systems and practitioners for improvement, by employers and patients in selecting providers, and eventually, factored into compensation mechanisms. The result is a system that rewards high quality care.

Information management implications of accountability. Care quality measurement must be based on aggregate data analysis at the provider (physician, practice, hospital, or health system) level. As it is used more in the process of delivering care, data for measurement will accrue as a byproduct. Making such results available implies posting of quality measures on public Web sites or other similar venues.

IV. Twelve IT Applications

Providers find it easier to manage patient email messages than phone calls—for which they also do not get reimbursed.

PROPER MANAGEMENT OF INFORMATION IS critical to the pursuit of the four principles outlined in the previous chapter, and information technology is therefore an important contributor to improving the quality of care. A wide range of technologies in use today address the four principles. This section describes 12 different but occasionally overlapping categories of technology or technology use, which involve the management of health care information.

Patient Empowerment

Empowerment requires that the patient is informed and able to make decisions about care based on that information. Technologies that empower patients in their interactions with the health care system include: (1) those that give access to general and specific health care information as well as to the patient's personal medical data; and (2) those that grant patients the ability to perform data entry and tracking of their personal self-management data, both for their own use and to aid their caregivers.

Personal Health Records

Description. The term personal health record (PHR) has a number of interpretations. In this report, it is defined as: *A record that retains patient-specific health information in electronic form for subsequent direct access by the patient.* Most PHRs are commercial products. Some enable the patient to create the record, or enter or modify elements of the record. Other PHRs are really consumer portals into provider-maintained electronic medical records (EMRs). Some allow both provider and consumer to contribute data. In the case of a patient-controlled PHR, physicians can view the record if appropriate permissions are granted by the patient. The EMR-portal PHRs are accessible by providers without patient permission. Some products include a system of secure patient-provider email communication.

It should be emphasized that some products in the PHR category contain considerably broader functionality than indicated by this basic description. For example, some offer population management decision-support features, and health and wellness features. Thus some PHRs fit into both this category and others discussed below.

Contribution to patient empowerment. The PHR contributes to empowerment by granting patients access to their medical record information and permitting them to review and, sometimes, modify that information. The products most in demand are those in which the provider contributes most or all of the patient data. It appears that this is because neither patients nor providers fully trust patient-supplied data. Reasons for this include format of some PHRs, which resemble patient chart formats and are therefore not entirely patient-friendly, and the requirement by many products for patients to have a certain level of sophistication in order to accurately enter personal medical data.⁸

For these reasons, the systems that are tied to provider-maintained EMRs appear to enjoy more widespread adoption and praise. These make accessible to patients information about their care from an authoritative source (their physician or other provider), granting patients an element of control and providing a flow of information from provider to patient. Such applications also permit providers to designate what data will be available for the patient to view. This could be perceived as a negative feature by those who believe patients should be able to see all information at any time; on the other hand, such management features may help to avoid the scenario of the patient discovering troubling or ambiguous data online, rather than learning of it first-hand from a provider who can provide explanation and support as needed. That being said, early experience suggests that this concern may be groundless.³

PAMFOnline: A PHR Implementation

This case describes the use of PHR functionality in a high-end electronic medical record. The application gives patients easy access to their medical data, plus consumer-oriented health care information and electronic message exchange with their providers.

The Palo Alto Medical Foundation (PAMF) offers patients access to a highly functional ehealth system, PAMFOnline, based on Epic Corporation's MyChart application. MyChart is integrated with PAMF's EMR, EpicCare, also by Epic. The system showcases three of the types of applications discussed in this report: the personal health record, electronic clinician-patient messaging, and appointment scheduling (discussed in more detail later).

PAMFOnline (www.pamfonline.org) gives patients access to elements of their EMR data, including the problem list, medications, allergies, laboratory-test results, immunizations, and health maintenance record. Patients also get a link to content tailored to their medical data, through Healthwise. In addition, they can request prescription renewals, ask questions or seek advice, and request appointments online through a secure messaging service.

PAMFOnline was piloted in 2001 with 1,000 patients. During this period they explored changes to the physician workflow—which turned out to be quite modest, thanks largely to tight integration with the existing EMR. "That's the strength of the application," says Dr. Paul Tang, chief medical information officer at PAMF. "Electronic messages from patients are managed in the system like any other messages—so they look just like a telephone encounter. Online messaging with patients fits right in." PAMF patients and doctors alike are increasingly relying on the system to handle issues that do not require an office visit and to improve post-visit follow-up; physicians can contact patients to inquire how they are doing, and patients can reach physicians with questions.

How do patients like it? According to Tang, they particularly appreciate the convenience and unencumbered access to their providers. "Patients want to communicate their needs whenever they arise," he says. "They just expect a timely response, not necessarily an immediate one. The ability to communicate any time of day improves their sense of access to the health care team." Patients also find it reassuring to have access to their medical data. Online health record access is not only for the young—15 percent of PAMF's online patients are over age 75.

Lots of patients want to use the system. "When we announced the general release of the system in January," says Tang, "we received 1,000 applications in less than a month." Enrollment is limited to established PAMF patients. Because access to the system allows the user to see confidential health information, PAMF goes through several steps to confirm the patient's identity before access is granted.

The practice is experiencing several new efficiencies from using the system. As hoped, they are seeing a change in access patterns, from telephone to online communication. Use of online communication also allows the practice's advice nurse to work remotely.

Overall, the PAMFOnline experience has been overwhelmingly positive. The most important ingredient has been integration with the EMR, says Tang. "It's a huge success factor."

Source: Paul Tang, M.D.

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Patient Access to Hospital Information Systems

Description. A subcategory of the personal health record is technology that permits outpatients to obtain access to their clinical data (laboratory test results, imaging study reports, etc.) through online access to hospital information systems. A number of organizations have established applications that permit patients such access, and they have begun to report their experiences.^{9,10}

Researchers at the University of California, San Diego recently published the results of a trial of physician and patient use of a system by which patients access information from a hospital clinical data repository over the Internet.³ One of their concerns was how to manage patients' understanding and processing of the data, in particular, how to offer interpretation of results and manage patient anxiety. Their approach incorporates provider "filtering" of data—that is, grading information on a scale according to its sensitivity and appropriateness for viewing by parties other than providers. Elements include patient selection, according to factors such as level of activity with the health system and mutual physician and patient consent; and patient response management, such as offering a toll-free information hotline that patients can call with questions about their data. Such calls trigger a "triage" process, including contacting the patient's provider and offering counseling.

Contribution to patient empowerment. The pilot study found that patients appreciated access to their data, and none in this population suffered "information toxicity." Physicians who used the system to access patient data overall found the login requirements somewhat cumbersome; this was much less of an issue in the patients' eyes.

In general, these sites permit only selected patients access to the system; they limit access to some categories of data; and they construct information/referral resources to answer patients' questions and manage their concerns. In addition all such sites must have robust security approaches and well-defined policies and procedures safeguarding the privacy of patient data; and these measures must comply with regulatory requirements and legislation (e.g., HIPAA).

Patient Access to General Health Information

Description. Electronic access to generic information about health care topics is primarily accomplished through the Internet; sources include public institutions (e.g., National Institutes of Health; Medline) and private companies (e.g., WebMD, Healthwise, Medscape).

Contribution to patient empowerment. Public availability of medical information on the Internet can help patients develop a better understanding of their illness and treatment options—including alternate courses of therapy—and can provide access to support communities. Having such information can empower patients in discussing treatment with providers and in fact alter the balance of control in the provider-patient relationship.

Virtually every practicing physician has some experience with patients who have conducted extensive online research on their condition, and come to the encounter pre-educated and expecting sophisticated discussion and recommendations. Occasionally the patient's knowledge of the particulars exceeds the physician's. Such situations challenge physicians to work thoughtfully with patients around their understanding of their condition (which may be extensive, or misguided) and to treat them as partners in a therapeutic relationship.

Making the Care System Reliable and Safe

Educated, empowered patients will increasingly demand a health care system that performs in a consistent, safe, and dependable manner. Health system reliability is improved by the use of information systems that support the clinician's information and decision-making needs. Such systems provide access to patient data, and/or medical knowledge; the most powerful applications provide these in combination, and offer decision support based on patient-specific data in the context of best practice.

Electronic Medical Records

Description. The electronic medical record (EMR) is a software application for ambulatory practices whose functions include at a minimum: clinical documentation, problem list, prescribing, and result reporting.

Contribution to reliability and safety. The more sophisticated EMRs support reliability in several ways. They provide clinical decision support functions, particularly the capacity to promote adherence to guidelines in diagnosis, treatment, and prescribing.¹¹ The safety-enhancing features of electronic prescribing improve reliability, and patients' needs are better anticipated through the use of health maintenance reminders. EMRs contribute to practice efficiency by improving providers' access to clinical data, and improve cooperation among clinicians as multiple physicians (at least within a practice) can access the same patient's record for purposes of consultation or cross-coverage.

Some products include more sophisticated clinical decision-support features such as rules engines, which can remind physicians, for example, of the need for particular health maintenance or screening interventions for certain patients, and can support practice guidelines. Products generally permit the construction of standard order sets for certain conditions. In addition most include drug interaction databases to support safer prescribing.

In addition, some EMR applications include comprehensive modules representing other technologies, such as the PHR and physician-patient electronic messaging (a kind of secure email). A fully integrated EMR that offers patients access to their records and secure electronic messaging between patients and practitioners may be the single most powerful combination of existing applications for addressing the four principles. Its strength is derived from the collection of different kinds of data in a single database, combined with applications that serve physician decision-making and patient-clinician and clinician-to-clinician communications. However, this "complete" EMR model is beyond the reach of most physician practices at present, both financially and in terms of required clinical process change. It is for this reason that "partial" solutions, described in cases throughout this report, are attractive alternatives for many practices.

Pre-Visit Intake

Description. These applications allow patients to assemble a self-assessment and health profile in preparation for a doctor visit, for presentation to their physician. The tools guide patients through an “interview” to gather a comprehensive medical history.

Contribution to reliability and safety. This application contributes to the accuracy and completeness of the patient history. Some can also identify patients appropriate for entry into disease management programs. In addition, these tools help to streamline the physician-patient encounter and make it optimally productive.

Typically, patients complete the electronic assessment form online from their home before the encounter. This streamlines the intake process by reducing the time spent on history gathering in the office, eliminating or reducing the need for the patient to fill out questionnaires in the waiting room and answer extensive questions from nursing or triage personnel. The physician may still need to ask some history questions to complement the information already gathered, but this portion of the visit can be briefer and more focused.

Pre-Visit Assessment in a Family Medicine Practice

Patients enjoy the opportunity to give their physician a truly comprehensive medical history. It makes them feel “listened to” (even if it’s through a computer) and gives them a sense of assurance that their physician is being complete and thorough in their care.

Dr. John Bachman has been using a pre-visit intake assessment tool from PRIMETIME Medical Software in his family medicine practice for seven years now. The application, Instant Medical History, enables physicians to assemble a far more comprehensive patient history than is usually practical during an office visit.

Patients complete the self-assessment—consisting of multiple-choice questions—either in the waiting room or at home using a secure Internet site, much the way they fill out paper forms on a clipboard or through the mail. Instant Medical History uses a branching algorithm that allows it to get much more information than a traditional paper form. A summary report in clinical language is generated for the physician, with pertinent information organized by organ system. The report can be printed for review by the physician, imported into an electronic medical record, or incorporated into a messaging system to be shared with other clinicians. In this way, Instant Medical History fits into existing workflow and

provides time-pressured physicians with a means to easily access patients’ information and understand their concerns.

Bachman, who has recently completed an extensive review of interactive history-taking with computers (submitted for publication at the time of this writing), finds that patients are more than willing to take the time to complete the assessment; almost all of his patients do so, some with help from family members. As for the physician, he feels that the most difficult adjustment is learning to trust the computer to do its job! The system excels at getting comprehensive information from patients, since it does not forget questions, and because patients tend to be more comfortable sharing sensitive information with a computer than with a person. Once the physician learns to trust the system, he doesn’t need to review every piece of data, but can focus on the most important areas and on assessing the patient’s emotional status. Bachman finds that he has more time to listen to patients during the encounter. In addition, the application handles the lion’s share of the history documentation task, saving time there as well.

*Source: John Bachman, M.D.
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Inter-Hospital Data Sharing

Description. Central to these schemes is the capacity for remote access to hospital clinical data, from departmental systems (laboratory, radiology, etc.) or from a central clinical data repository. The technologies are either Internet-based or rely upon secure dial-up connections.

Contribution to reliability and safety. Efficiency is increased in several ways. Patient data are available more quickly than is possible when reliant on access to copies of paper records; data on a patient may even be available to a referral center before the patient arrives. Quick access to recent data may reduce the number and kinds of tests that need to be ordered or repeated. In addition, cooperation between clinicians at the different hospitals is enabled by these technologies. Where previously the clinicians often operated as independent practitioners, data-sharing mechanisms enable organized consultation and referral among hospitals, as well as better management of step-down care as patients are transferred from referral centers back to the community.

Several academic medical centers have developed electronic data exchange systems between referral and community hospitals. Data sharing within a hospital network has been accomplished in several places, including Boston's CareGroup. CareWeb is a Web-based application that uses the Health Level 7 (HL7) standard for clinical data exchange to give combined access to medical records across several of the network's hospitals.¹²

Sharing data across hospitals that are not part of the same delivery organization raises additional challenges. Research showed the feasibility of such an approach years ago, demonstrating the use of HL7 streams to model the exchange of a minimum clinical data set among hospital emergency departments, in spite of radically different information infrastructures at the participating institutions.^{13,14}

In another example of data sharing, a randomized controlled trial examined potential benefits of data exchange between an academic center and two urban emergency departments. Physicians received both printed summaries and electronic access to patient data. The study found that at one hospital, but not the other, electronic access was associated with a decrease in charges per encounter; the disparity between hospitals was attributed to workflow differences. There was no difference in the rate of hospital admission or return ED visits associated with electronic access to patient data. A factor that likely limited the success of the trial was significant physician discontent with the time-consuming logon and search procedures; this underscores the importance of considering impact on workflow when implementing such systems.¹⁵

Care Relationships Beyond the Encounter

Technologies that support continuous care relationships include those that enable patient-provider communication; patient access to the care system for information, advice, and care; and provider access to interval (between visits) data and decision support.

Information for Physicians to Manage Patient Populations

Description. These technologies assist providers in tracking and managing populations of patients, especially those with chronic illnesses, according to clinical practice guidelines. Such assistance can address several aspects of management. One is reminding providers of appropriate interventions when the patient is being seen in the office (often for something else); an example is triggering a reminder to give an elderly patient

a flu shot, even though he or she is at the office for another illness. Another is seeking out patients in the care population who will benefit from closer management, but who do not come to the office, and drawing them into the care process. This can be done by screening population data for indicators of chronic disease. A third is measuring the impact of a disease management program: Are we doing a good job of improving blood sugar control in our diabetic population? Data collection and analysis tools are critical to measurement.

Contribution to care relationships beyond the encounter. Technologies to assist with patient population management track predictable needs of patients—either disease-specific interventions from clinical guidelines, or routine wellness measures for patients on an ongoing basis; and they systematize the approach to the tracking and care of large numbers of patients.

Population Management at Group Health Cooperative

This staff-model HMO developed an integrated data system to identify and track patients with chronic disease. The system helps with outreach to patients in need of interventions, ensures that chronically ill patients receive the care they need during appointments, and improves care quality tracking and measurement of physician performance.

The staff physicians at the Group Health Cooperative of Puget Sound have been using a patient registry to improve the care of patients with diabetes, cardiac disease, depression, and other chronic illnesses for several years. The organization decided in 1992 to take on the challenge of proactive population management. They started by designing “roadmaps” for the care of patients with chronic illness, incorporating published guidelines, changes to visit structures, physician education, and other interventions. The development of an electronic registry was a critical success factor in the adoption of these roadmaps, according to Mike Hindmarsh, manager of clinical improvement at the MacColl Institute for Healthcare Innovation at Group Health.

The first step in creating such a registry was identifying patients with chronic disease. While discussions around the purchase of an EMR for the entire system began in 1995, they felt they needed to provide information support for population care without delay. Group Health employed a programmer approximately half-time for six months to write software to extract data from 12 separate information systems within the organization and export them to a separate patient registry database. The program uses an algorithm to screen diagnostic code data to identify patients with chronic disease, and then extracts demographic and clinical data necessary for disease management. In addition to assembling the data in a convenient format, the application signals clinicians when one of their patients is out of compliance with a disease roadmap guideline. The application is available online to all of Group Health’s staff model physicians.

*Source: Mike Hindmarsh
Group Health Cooperative of Puget Sound
Seattle, Washington*

IPA Uses a Patient Registry to Manage Asthmatics

A simple registry along with mostly manual procedures was used to collect data on patients with asthma and to encourage physician interventions. They observed that just the act of measurement produced changes in physician behavior. The initiative is improving the physician-patient relationship, too, as patients feel their doctors are genuinely interested in how they are doing over time.

One New Jersey independent practice association (IPA) employed a patient registry as part of a strategy to use population management as a market differentiator in negotiations with health plans. Their approach holds several important lessons for managing workflow changes that accompany new kinds of care delivery.

The practice chose asthma management for their first target. They started by collecting a single data point on their asthmatic patients: frequency of use of fast-acting bronchodilators, an indicator of how well the disease is controlled. The population of likely asthmatics was identified by screening diagnostic coding data; stickers indicating “registry patient” were affixed to the charts of patients with asthma. A simple survey form was developed to record bronchodilator use at the time of a visit. Patients were also asked to list their current medications and whether they had been to an emergency room or admitted to a hospital for asthma since they were last seen at the practice. The forms were collected from all practices by a data entry person, and the information entered into a computer registry (CarePlanner, by DocSite, LLC).

Data capture was spotty at first; only one asthmatic in four was asked the screening questions. (Patient capture was up to about 50 percent as of April 2002.) From these initial inquiries, the organization discovered that 42 percent of their asthma patients were poorly controlled (about the national average!). But they also observed that just the process of asking about control prompted a change in physician behavior: In 76 percent of cases where control was inadequate, the doctor initiated a change in the patient’s medical regimen to improve control.

As provider-specific reports on patient disease control and physician prescribing behavior are generated from the registry, Dr. Jim Barr, the IPA medical director, meets with each physician and his or her clinical coordinator nurse, and they work together to devise interventions to improve control within the physician’s asthmatic population. The specific approach to intervention, such as outreach to patients, is left to individual practitioners and their clinic staff.

Work with community employers has proven instrumental to the group’s success. When health plans balked at giving the group more favorable contracts based on their disease management efforts, Dr. Barr discussed his predicament with local employers—who subsequently persuaded the plans to rethink their position and grant the desired contracts. Pressure from employers was also critical in convincing local laboratories and health plans to share patient data electronically with the practice in order to facilitate disease management of diabetes, the group’s next target diagnosis. The registry in turn assists the practice with the production of HEDIS performance data for plans and employers.

Perhaps most important, Barr believes the organization’s population management program has been important in strengthening physician-patient relationships. “Patients like the fact that physicians are utilizing the registry system to more closely monitor their disease state,” he says. Future plans include broader automation of the registry and provision of a Web interface through which individual practices will be able to enter their own survey data as they collect it.

Source: Jim Barr, M.D.

*Central Jersey Physician Network, LLC
Flemington, New Jersey*

Several kinds of technologies support population management, all providing population type views (overview of all patients in a given population group—for example, hypertension) as well as patient-centric views of data. At the most basic level, populations can be tracked using simple spreadsheets on a PC; at a more advanced level, data can be imported electronically into the system through interfaces. The most sophisticated approach incorporates the population management application into an EMR; such integration automates much of the data entry involved in tracking patients. Applications must be programmed to provide information on past interventions and schedules for future interventions.

All applications for population management require significant up-front labor to configure them and to populate them with baseline data. Simpler (e.g., PC-based) applications need to be introduced into practice workflow in a systematic way: Elements include pre-printing of population- or patient-specific sheets to remind practitioners of interventions due during visits; processes for insuring that patient data are updated in the application as they are received; and periodic analysis and quality assurance tracking of the full population base. More advanced applications make some of these tasks easier, but practical allowances must still be made to insure that the application's functions (e.g., electronic reminders) fit into and do not disrupt workflow, otherwise they will not be used by clinicians.

Patient-Physician Electronic Messaging

Description. Electronic message exchange between patient and physician can occur in many circumstances and through a variety of technology applications—from “standard” email with no particular security or encryption safeguards, to specialized secure messaging systems provided by commercial products or developed by hospitals, to messaging systems associated with EMR and PHR applications. A great deal has been written on the topic of physician-patient email, including a recent research report for the California HealthCare Foundation.¹⁶ This section will briefly summarize some of the critical issues.

Contribution to care relationships beyond the encounter. The asynchronous nature of electronic messaging allows patients and physicians to contact each other whenever the need is felt, and at their own convenience. Patients appreciate the improved access to the physician. Physicians appreciate the improved efficiency; many find it easier to answer patient queries between tasks throughout the day, reducing the number of hours they spend on the phone. The self-limited nature of electronic messaging helps control the scope of the exchange, which is much more difficult to do with telephone calls. Electronic messaging is also self-documenting, an improvement over phone contact.

E-messaging at UC Davis

This case describes the start-up of a physician-patient electronic messaging initiative in a primary care network. The leaders had to manage physician reluctance, and providers are starting to enjoy some of the efficiencies of asynchronous communication with patients.

Physicians in a primary care network affiliated with the University of California, Davis have been piloting electronic messaging with patients since November 2001, using a secure messaging system from Healinx Corporation. Located in one of the country's high-technology centers, the practice was experiencing demand from tech-savvy patients for electronic access to providers. In addition, the practice's phone system was heavily leveraged: Patients were experiencing long telephone waiting times, and practice administrators wanted to reduce waits and relieve the burden on the phone banks.

Eric Liederman, MD, medical director of clinical information systems, was a central player in the decision-making process. A product integrated into an EMR would have been their first choice, but the organization was several years out from being ready to implement an EMR, and they didn't want to wait that long. In considering the alternatives for providing electronic access, the group determined that security, message capture, and archiving were top priorities. The Healinx product addressed these requirements, as well as providing message templates and the ability for patients and physicians to view and modify lists of problems, medications, and messages.

Initially seven physicians and one nurse practitioner used the system to communicate with about 300 patients. As of April 2002, four more physicians, and another 250 patients were added; and the network is preparing for broader roll-out to its other groups. All patients in participating practices are allowed to request an electronic access account, but physicians can turn down such requests by patients for whom they feel the medium would be ill-suited to managing their relationship. Access can be revoked in cases where a patient's behavior proves inappropriate or difficult to manage.

At the outset some providers raised concerns of being overwhelmed by unmanageable quantities of patient messages, and of losing revenues by providing "free care" online. The first of these turned out not to be an issue; in fact, one provider found herself able to leave work earlier, due to fewer telephone calls, and to answer patient messages from home in the evening. Likewise, the concern about loss of revenues has not been borne out. Rather, providers find it easier to manage patient email messages than phone calls—for which they also do not get reimbursed. "With electronic messaging, physicians are in complete control of their time. That's not true on the telephone," says Liederman.

While Healinx enables providers to charge patients on a per-message basis, the organization has chosen to hold that option in reserve, only to be used for volume management—if for example, a patient were to start sending numerous unnecessary messages. So far there has been no need to charge any patients.

Given the small scale of the initial pilot, it has not been practical to this point to attempt to measure changes in telephone use or other impact on the practice, although a patient satisfaction survey is being readied for use now. As the application is rolled out more widely Liederman plans to gather more such performance data.

Ultimately Liederman sees messaging as one step along the road to implementation of a full EMR with patient access. But for most practices that cannot afford to, or are not ready to, implement highly integrated EMRs, he sees electronic messaging as a huge opportunity to improve patient access and practice efficiency.

*Source: Eric Liederman, M.D., M.P.H.
Clinical Information Systems
University of California,
Davis Health System*

Patient Access to Tailored Medical Information, Online Data Entry, and Tracking

Description. These applications give patients information that addresses their medical condition in the context of their personal clinical data (e.g., blood glucose level, weight, or blood pressure). They include online “disease management” applications, which permit patients to obtain specific medical reference information on their disease, and to track their management of their condition (e.g., blood sugar control in diabetes) online using data-entry and trending tools. The results can be made available to physicians to assist them in patient monitoring.

A number of disease management companies carve out a full range of services, providing their own clinicians and managing patients directly; since these companies’ primary contribution depends at least as much on their clinical management model as on technology, they are beyond the scope of this report. The general topic of disease management is considered in depth in another report in this series.¹⁷

Contribution to care relationships beyond the encounter. These technologies support patient self-care as well as provider monitoring and support of care between office visits. Patient needs are better anticipated as a result of ongoing trend data available to patients and providers. Providers are able to monitor patients’ progress at their convenience, and having trending data regularly recorded and easily available also facilitates an efficient office visit.

The greatest impact of this technology is on the patient’s self-care experience. Patients are primarily responsible for entering their personal data into the application on a regular basis. This may help to draw them more actively into the management of their own disease.

Online Scheduling

Description. Through these applications, patients are able to connect with a practice over the Internet and schedule appointments. In most instances, practices manage online scheduling by accepting patient requests for appointment times; the practice administrator then examines the schedule and responds to the request with a confirmation or alternative appointment. Online scheduling may also occur within a health system, with physician practices using the system to schedule patients for outpatient procedures.

Contribution to care relationships beyond the encounter. Online scheduling improves the care relationship by facilitating access to care, reducing the time and inconvenience—particularly from the patient’s point of view—of the traditional appointment scheduling process.

Electronic Capture of Patient Self-care Data

A software system that downloads blood glucose measurements from patients' glucometers, and permits tracking and trend display and analysis is revolutionizing the management of diabetes at this endocrinologist's practice.

Monitoring patients with chronic disease is literally a full time job for Tim Bailey, M.D., an endocrinologist at the University of California, San Diego. "Over half of my patients have diabetes," says Bailey, "and diabetes is a disease with lots of data, and lots of targets for management. Insulin management requires analysis of patterns of data, not just a few data points." Monitoring patients' blood sugar control generates from one to four data points per day, every day, for each patient; and this doesn't include other labs (HbA1c, liver functions, creatinine) or physiologic parameters like patient weight and blood pressure.

Eight months ago, Dr. Bailey and his partner began using iMetrikus' Medicompass system. It is a patient registry for diabetes management, allowing the physicians to capture and track the relevant data, display it graphically, and screen their patient population for individuals who would benefit from an intervention. A unique feature of the system is automated capture of patient monitoring data. Patient-measured glucose levels are downloaded from the patient's glucometer (which has a memory) to the iMetrikus system; depending on the device and frequency of blood sugar checks, patients can store and download from one to six months' data at a time.

Downloading can be done when the patient arrives at the clinic; but increasingly, patients are submitting the data from home, using a portable device that sends the data to the Medicompass system by secure dial-up connection. The remainder of the data must be hand entered by administrative staff, with the exception of lab values from one particular reference lab, which provides an electronic feed. Patients can also view their data online using iMetrikus' patient portal, myhealthchannel.com.

After eight months, Bailey estimates that about 95 percent of his diabetic patients are in the system. Consistency of data capture has been steadily improving. Bailey also encourages patients to enter their medications into the system, preferably in advance of their visits; this saves valuable time during the encounter and helps to keep the registry up-to-date.

The principle value of the system so far has been the capture and graphic display of patient data for use during the clinic visit. As more data are captured over time, the outreach value of the system will come to the forefront, enabling better identification of patients who need care interventions. The physicians are also able to evaluate patients' adherence to their monitoring regimens. Finally, the system facilitates report generation for payers and others who request population data on patients.

How do patients feel about the system? At first it was relatively transparent to them; but as they have begun to see how it aides physicians in tracking their progress between visits, and have started to send in data themselves from home, it seems to give them a sense of security that someone is paying attention to them even when they are not in the doctor's office.

While it's too early to formally evaluate the system's performance, Bailey is confident that Medicompass is helping him improve care for diabetic patients. His enthusiasm has led him to work with iMetrikus to assist other users with the system and to offer consulting advice as the product is further developed.

Source: Tim Bailey, M.D.

University of California, San Diego

Centralized Scheduling of Medical Center Procedures

Implementing centralized scheduling of procedures using an automated system can serve as a first step to opening access to care.

McLeod Regional Medical Center implemented an application by Scheduling.com, to address mounting dissatisfaction with this aspect of access to care. McLeod had been receiving a number of complaints from both physicians and patients—earliest slots for procedures were often a month out and wait times once at the health system could reach three hours.

With this application, physician offices call in through an automated phone system to the schedulers, providing the patient's name, date of birth, and social security number. A number of algorithms built into the scheduling process ensure efficiency and safety. For example, the system takes into account the time required for a procedure in addition to travel time between locations, so the patient cannot be scheduled for back-to-back procedures in departments located 20 minutes apart. If the patient is being scheduled for a radiology exam, the scheduler is prompted to ask if the patient is pregnant, to ensure that the appropriate procedure is ordered and that the technician is prepared for any special needs.

The move to centralized scheduling across the health system, serving more than 300 physicians, required a number of changes in office workflow. The need to provide schedulers with patient data necessitated obtaining the patient's chart before calling the central scheduling facility; this in turn required changes in the routing of records in the office. The organization soon plans to implement a physician portal that will allow practices to schedule procedures online themselves. McLeod also plans to implement a consumer portal that will enable patients to request appointments from the McLeod Web site.

Since moving to online scheduling, patients are seen sooner, they can choose the most convenient facility, and wait times are down. McLeod has been able to increase capacity by more efficiently filling existing slots as well as by opening up new time slots as efficiency has grown.

*Source: Lesli Kennedy
Director of Reservations and Scheduling
McLeod Regional Medical Center
Florence, South Carolina*

Computer-Assisted Telephone Triage and Assistance

Description. Various models of call center technology have been used to improve communications between patients and their caregivers. The most advanced centers are staffed by both trained customer service representatives (CSRs) and advice nurses, the latter backed by physicians, and are capable of a range of service, including appointment booking, prescription refills, dispensing medical advice (guided by protocols), and provider messaging. CSRs and advice nurses

are assisted by computer-telephony integration—technology that presents patient information including demographics and medical records as soon as the patient calls. Online advice protocols, appointment guidelines, and scheduling and registration systems are also available to assist the patient with a wide range of options and information. Messages can be sent automatically to a patient's physician, triggered by specific events (such as new prescription requests, patient requests, or according to special provider instructions).

Contribution to care relationships beyond the encounter. Advice and appointment call centers provide access to specific medical advice and self-care information and appointment scheduling, and are a more convenient avenue of communication with the provider compared with calling and leaving messages at the office.

Public Accountability for Quality

Online Access to Provider Performance Data

Description. Some regulatory bodies, state governments, and private companies provide public online access to various kinds of physician and hospital performance or quality data. Examples include hospital rankings according to Medicare data on outcomes or practices, and state Boards of Medicine providing physician licensure and disciplinary action online.

Many types of information are being made accessible through the Web, and the quality and utility of these data vary dramatically. At least one state Board of Medicine¹⁸ makes available historical data on registered physicians, including licensure status, medical school and training, whether any disciplinary actions have been taken against the physician, and whether the individual has made a payment on a malpractice action in the last five years.

Several factors must be taken into account in weighing the value of providing quality data to the public. One factor is the nature and reliability of the data, which is (not surprisingly) hotly debated. Another, perhaps more important, factor is the curious lack of impact of such data on consumers' selection of providers. The latter equation may change as employer groups have recently taken a keen interest in care quality measures, and are planning to influence their employees' choices of providers accordingly.

The Leapfrog Group is the primary employer-based coalition targeting care quality improvement at present. As of mid-2002, this health care purchasing coalition has more than 100 corporate members who collectively purchase benefits for approximately 31 million Americans. The organization is committed to improving patient safety through the use of market incentives. In November 2000 they announced their intention to target three specific quality improvement standards: use of computerized medication ordering in the hospital to intercept dangerous medication orders; coverage of intensive care units by intensive care-trained specialists; and referral to high-volume hospitals for certain surgical procedures. The group issued a voluntary survey to hospitals to evaluate their current level of adherence to these standards and is posting the results on their Web site. In the near future hospitals with computerized physician order entry will be asked to test their systems for adherence to the Leapfrog standard using a specific methodology, with the results posted for public view (see sidebar). The Leapfrog Group will encourage employees to consult these results in selecting their care providers; and it is likely that provider contracting patterns will begin to be affected as well.

The Leapfrog Group's Standard for Computerized Physician Order Entry (CPOE)

This standard for physician order entry is unusual in several regards. Not only does Leapfrog call for hospitals to adopt a specific technology to reduce adverse drug events; they also request that each hospital report publicly the results of a Web-based evaluation of their system's effectiveness at blocking ADE-causing errors.

The automated, self-administered test requires each hospital to download from the Leapfrog Web site a series of "test patients" to be programmed into their CPOE testing environment. They then download a series of test orders to be entered into the system, against the test patients; they are generated at random from a large master order set, and represent 12 categories of dangerous orders (e.g., drug-allergy, drug-drug interactions, etc.). The hospital records the system's response to each order, and

reports these results back via the Web site. The Web-based evaluation system contains a scoring algorithm that calculates a weighted score for each order, depending on the severity of any error intercepted (or not). In addition to public posting of an aggregate score on the Leapfrog Web site, the hospital taking the test receives detailed feedback on how their system performed in each category of error interception/quality improvement. This information serves to guide the hospital in designing improvements to their CPOE system, which should improve its safety performance.¹⁹

*Source: Peter Kilbridge, M.D.
First Consulting Group
Long Beach, California*

V. Organizational Challenges

The principle requirement to achieve such change is committed leadership.

THIS REPORT HAS REVIEWED SOME TECHNOLOGY applications in use today that can contribute meaningfully to bridging the health care quality chasm. But technology cannot be successfully implemented without consideration of organizational context. This section discusses some categories of organizational issues—including workflow, cost, and culture change—that must be managed if a new technology is to contribute optimally to improved quality of care.

For some applications, enormous organizational and workflow change must occur before a technology can be implemented effectively. This is particularly true for access to care applications, especially online scheduling. Traditional access to care is practice- and physician-centric, as opposed to patient-centric; physicians are loathe to give up control of their schedules. A typical office schedule has almost all of its appointment slots booked before the office opens for the day, making it difficult for patients to be seen quickly. Opening access requires that a number of changes in the management of patient visits be undertaken, and physicians must be willing to relinquish control of some aspects of their schedule. Approaches include an emphasis on team-based care, which improves the use of physicians' time; better ongoing management of patients with chronic disease; and changes in the types of appointment blocks scheduled to free up a larger number of visit slots each day. These changes can make it possible to see more patients on shorter notice, and permits greater flexibility to meet specific patient requests.

While redesigning access to care is hard work, it has been successfully accomplished at several organizations.^{20, 21, 22, 23}

In cases where a full redesign and direct online scheduling is not possible, managing appointment requests via electronic messaging is a viable option. The lower level of organizational change required to accomplish this is within the reach of many practices. The principle requirement to achieve such change is committed leadership.

Implementing a highly functional EMR presents another obstacle: cost. High-end EMRs are designed for medium to large practices, and their costs are prohibitive for many smaller ones. Implementation of these systems also requires a moderate to large amount of change in work process; clinician practice patterns are greatly affected, especially those related to clinical documentation and intra-office communication. Other approaches that achieve elements of the functionality of the EMR (such as electronic messaging within a secure application) can be achieved at lower cost, and with more modest changes to workflow.

Large call center systems, while ultimately very efficient, are also expensive to implement. They are therefore most attractive to large organizations that can finance such projects, and where economies of scale, once realized, can generate significant savings.

The third type of obstacle to change—cultural—is well illustrated by the case of remote electronic access to hospital data for patients or physicians. Hospitals are reluctant to grant remote access to patient data, particularly to patients themselves; several of the concerns have been discussed above. Other hurdles—technology and management—are less significant than the cultural and cost barriers. This will likely change, as the pioneers continue to publicize their successes, more affordable products are developed, and consumers begin to expect access to their medical information as a matter of course.

Electronic messaging between physician and patient also raises cultural issues. Many physicians are fearful that patients will fail to respect the limitations of the medium and use it inappropriately. If electronic messaging is to be adopted by providers, patient use of the technology must be proactively managed. Much has been written about this; the following are some of the factors requiring attention:

- Email is not appropriate for urgent problems, and patients must be educated to this effect.
- There is the possibility that the physician may not be able to respond quickly. Patients must be advised to move to other modes of communication in a timely manner if the issue warrants.
- Email outside of specialized applications is not secure—employers can read employees' email sent on company networks, and the legal precedent supports their right to do so.
- Some providers worry about legal ramifications of advising patients online. For this reason, many physician users restrict email exchange to follow up of known problems for which the patient has already seen the physician.
- Some physicians fear a deluge of patient messages that would be unmanageable. Experience has generally shown that this fear is unfounded, if care is taken in educating and obtaining consent from patients.²⁴

Another concern sometimes voiced by clinicians is potential loss of revenues if such communications are not reimbursable. It can be argued that physicians already spend large amounts of unbillable time on the telephone answering questions from patients. Further, electronic messaging has been found by some providers to be considerably more efficient and less time-consuming than phone communication. Nonetheless, these concerns have prompted at least one electronic messaging mail company to offer the option of charging patients for each contact with their physician;²⁵ and several health plans are now offering reimbursement to physicians for electronic messaging “encounters” with patients.^{26, 27, 28} Such willingness indicates that some health plans are coming to see electronic messaging as a cost-effective adjunct, or alternative, to traditional encounters.

Practices that offer disease and wellness management applications will need to change their practice culture from the reactive “siege” mindset in which so many physicians are trapped today, to a more holistic, proactive management philosophy and style. This is a challenging transition in many practice environments where clinicians are working long hours and struggling to keep up. Here again, educated and enlightened leadership is required, and the transition will be easier in some practice environments than others.

The movement to provide better access to provider performance data faces yet another set of challenges—largely political, but also scientific and educational. Provider associations generally oppose public release of performance data, on the grounds that such data are in some way inaccurate or misleading, or will lead to an onslaught of litigation, which will suppress reporting and hobble quality improvement efforts.⁷ Beyond the defensive aspects of such objections, they hold some truth; indeed, much of the information currently available to consumers is problematic and may be misinterpreted. Thus, daunting challenges remain—not only in determining which measures of quality are most viable, and how to obtain, interpret, and present them, but in educating consumers about why some data are valuable and others not.

VI. Conclusions

THIS REPORT HAS ILLUSTRATED THAT A VARIETY of technologies, many of which have come into use fairly recently, can meaningfully contribute to improved care quality, as defined by the principles of patient empowerment, reliability and safety, continuity of care relationships, and public accountability. These tools can be used by many organizations *today* to improve all aspects of care for their patients. Organizational issues must be dealt with; indeed, with the exception of the EMR and call centers, change management represents a greater barrier to adoption than does cost. But as our case studies and examples from the literature illustrate, such barriers can be overcome with adequate leadership commitment.

Many aspects of the current, evolving health care environment will support and encourage the adoption of such improvement technologies and facilitate the organizational changes required. Consumers are becoming more actively involved in their care; this trend is certain to continue, and will go a long way toward overcoming the cultural and political barriers that have been discussed. Employers—particularly the Leapfrog Group—are demanding adoption of technology to support quality, and will likely further expand their standards to encompass additional aspects of quality and patient safety. Increasing regulatory attention to safety and quality will increase the pressure to adopt technology to support these objectives.^{29, 30, 31} Indeed the third report in the IOM series on care quality suggests the likely measures of quality whose reporting will be required of provider organizations in the near future.³² And as the cases presented here illustrate, there are plenty of examples of early successes among those pioneers who have chosen to use technology as well as process innovations to begin to cross the quality chasm.

Endnotes

1. Institute of Medicine. *Crossing the Quality Chasm: A New Health System for the 21st Century*. National Academy Press, Washington DC, 2001;3.
2. Ibid Pp. 8-9.
3. Masys, Daniel, et al. 2002. "Giving patients access to their medical records via the Internet: the PCASSO experience." *JAMIA* 2002;9:181-191.
4. Kilbridge, Peter, M.D., and D. Classen, M.D. *A Process Model of Inpatient Medication Management and Information Technology Interventions to Improve Patient Safety*. 2001 Research Series, Volume 1, VHA.
5. Institute for Safe Medication Practices. "A Call to Action: Eliminate Handwritten Prescriptions Within 3 Years!" (<http://www.ismp.org/MSAarticles/Whitepaper1.html>).
6. Kilbridge, Peter M.D. *E-Prescribing*. California HealthCare Foundation, November 2001.
7. Brennan, Troyen M.D., J.D., M.P.H. "The Institute of Medicine report on medical errors—could it do harm?" *NEJM* 2000;342:1123-1125.
8. Kim, M.I. and K.B. Johnson. "Personal health records: evaluation of functionality and utility." *JAMIA* 2002;9:171-180.
9. PatientSite application at CareGroup, Boston (www.caregroup.org/patientsite.asp).
10. Cimino, James M.D., et al. "Architecture for a web-based clinical information system that keeps the design open and the access closed." *Proceedings of the 1998 AMIA Symposium*, p. 121-125.
11. Metzger, Jane. *Clinical Decision Support Tools for the Small Physician Practice*. California HealthCare Foundation, 2002 (in press).
12. Halamka, J.D. and C. Safran. "CareWeb, a web-based medical record for an integrated health care delivery system." *Medinfo* 1998;9:36-39.
13. Kohane, I.S., F.J. van Wingerde, J.C. Fackler, et al. "Sharing electronic medical records across multiple heterogeneous and competing institutions." *Proceedings AMIA Annual Fall Symposium* 1996:608-612.
14. van Wingerde, F.J., J. Schindler, P. Kilbridge, et al. "Using HL7 and the World Wide Web for unifying patient data from remote databases." *Proceedings AMIA Annual Fall Symposium* 1996:643-47.
15. Overhage, J.M., P.R. Dexter, W.H. Cordell, et al. "A randomized, controlled trial of clinical information shared from another institution." *Annals of Emergency Medicine* 2002:14-23.
16. MacDonald, Keith, J. Case, and J. Metzger. *E-Encounters*. California HealthCare Foundation, Oakland, CA: November 2001.
17. LeGrow, Greg and J. Metzger. *E-Disease Management*. California HealthCare Foundation, Oakland, CA: November 2001.
18. Massachusetts Board of Registration in Medicine (www.massmedboard.org).
19. Kilbridge, Peter, E. Welebob, and D. Classen. "Overview of the Leapfrog Group Test Standard for Computerized Physician Order Entry." The Leapfrog Group and First Consulting Group, November 2001.
20. Murray, Mark, M.D., M.P.A. and Catherine Tantau, B.S.N., M.P.A. "Same-day appointments create capacity, increase access." *Executive Solutions for Healthcare Management*, February 1999.
21. Lippman, Helen. "Same-day scheduling." *Hippocrates*, February 2000, 49-53.
22. Simmons, Janice. "Striving to provide more efficient care in the outpatient setting." *The Quality Letter for Healthcare Leaders*, Vol. 12, No. 10, October 2000, 1-12.
23. Grandinetti, D.A. "You mean I can see the doctor today?" *Medical Economics*, March 20, 2000, 102-114.
24. Kane, B. and D.Z. Sands. "Guidelines for the clinical use of electronic mail with patients." The AMIA Internet Working Group, Task Force on Guidelines for the Use of Clinic-Patient Electronic Mail." *JAMIA* 1998 Jan-Feb;5(1):104-11.
25. Healinx Corporation (www.healinx.com).
26. Baldwin, Fred. "Will pay for email," *eMD*, Fall 2000, 21-23.
27. Appleby, Julie. "Insurers, doctors ponder implications of e-consultations," *USA Today*, March 26, 2001.
28. Carrns, Ann. "In effort to boost health care quality, employers urge doctor visits by email," *Wall Street Journal*, March 23, 2001.
29. California Senate Bill 1875; www.leginfo.ca.gov, 1999-2000 legislative session.
30. United States Senate Bill S. 2590, the Patient Safety and Quality Improvement Act, introduced June 2002.
31. United States House of Representatives Bill H.R. HR 4889, the Patient Safety and Quality Improvement Act (House version), introduced June 2002.
32. Institute of Medicine, "Envisioning the National Health Care Quality Report." National Academy Press, Washington DC. 2001.



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