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CTO INSTITUTE

HEALTH CARE TRANSFORMATION

Innovative Business Models and Next-Gen Technologies

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If ever an industry were in need of innovation, healthcare is it.

The U.S. alone spends $2.2 trillion annually on healthcare, or $8,000 per person, representing 16% of the U.S. gross domestic product. Healthcare consumes some of the world's most advanced technology for diagnosis and treatment, and yet uses the lowest level of information technology (IT) of any information-based business in the U.S. One effect is that unlike banks, for instance, healthcare providers currently cannot transfer information reliably from one stakeholder to another—even though healthcare information is arguably the most critical information we own.

In April 2010, leaders from healthcare provider organizations, payers, IT vendors, and academia came together through the CTO Forum to explore healthcare transformation through innovative business and financing models and advanced technology.

Regarding business models, speakers and panelists brainstormed ways to better align incentives for providers, payers, employers, and consumers. Moving from a fee-for-service to a pay-for-performance model could encourage providers to implement

technologies and processes that shift healthcare model from treating acutely sick patients (as many as possible) to preventing sickness and promoting wellness. The need has become more urgent in the 21st century because today's global pandemics are diabetes, dementia, and depression. All are influenced by behavior, and none are suited for cost-effective treatment in capital-intensive "sick-care" systems staffed by expensive and scarce professionals.

Regarding the role of IT in healthcare reform, a theme that repeatedly surfaced during the forum is that the electronic medical record (EMR) is an essential building block for healthcare reform—but not the end goal. The real benefits arise from intelligent applications of the EMR, including:

- Aggregation, leading to better clinical pathways of care
- Enabling electronic payment, eliminating $500 billion in annual healthcare costs for manual payment processing
- Event-based EMRs, or recognizing telemetry data collected over the Internet (such as an out-of-range heart rate) and then automatically taking an associated action, such as notifying a designated person
- Maximizing the value of the EMR will require standards for semantics, and web-based tools for patients to give consent for their records to be shared.

Participants in the forum also discussed the cultural issues impeding healthcare reform. In particular, today's consumers are unable to vote with their wallet because the industry has not provided an easy way to identify the best providers and compare the cost of care. And even if consumers can compare the cost of care, they are insulated from the decision because the employer or payer bears the cost. IT cannot solve the cultural issues. However, IT can help to create expert systems to determine how to use resources effectively, matching the cost of the resource to the need.

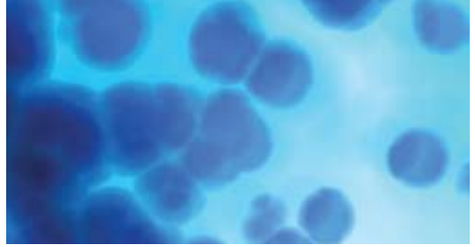
The barriers to true healthcare reform—a shortage of people and increased demand—are the same barriers that technology has solved repeatedly in other industries

Therefore, IT can play a valuable role by helping to increase productivity, improve the quality of records and transactions, and provide systems to rapidly and accurately transfer critical information between stakeholders. Examples of IT innovations include telemedicine and cloud services for sharing medical images.

This white paper summarizes the discussion and recommendations of the speakers, panelists, and forum participants. It is hoped that this report can serve as the springboard for innovation to improve healthcare access, quality, and costs.

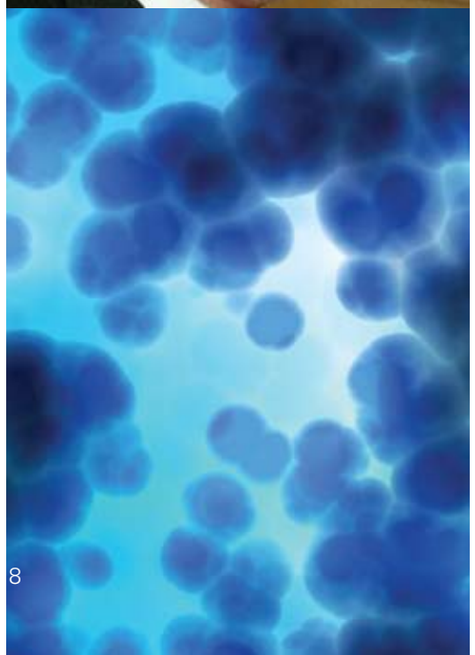
Sincerely,

Basheer Janjua
Founding Chair and President,
CTO Forum



Healthcare Transformation: Challenges and Opportunities

Summary of comments by Randy Spratt, EVP, CTO and CIO of the Global Infrastructure and Business Systems, McKesson Corporation



The U.S. healthcare system is in need of repair:
25% of healthcare claims are paper-based.
65% of medical records are paper-based.
100,000 deaths per year are attributed to medical errors.
$400-$500 billion per year is wasted on rework because of ineffective information exchange between providers, and between providers and payers. Financial institutions and grocery store chains have made much more progress in taking out administrative costs.

The America Affordable Healthcare Choices Act of 2009 provides funding to extend access to 30 to 35 million people who previously lacked insurance. When these new patients enter the system, can providers manage the additional data while protecting privacy?

Three Challenges for the Technology Community

Solving the challenge requires three capabilities.

Extended Access

The Affordable Healthcare Choices Act addresses financial access. It does not, however, address how physicians can provide care for more than 30 million additional patients. IT solutions such as telemedicine may well provide the answers.

Patient safety and quality

Extended access must not come at the expense of quality. Research shows that the highest quality of care generally is associated with the lowest cost, because of fewer complications. Therefore, providers need incentives to change the delivery system to reduce unnecessary variability in patient care. The law must support the widespread use of health information technology with rigorous privacy protections. And the industry must collect data on the effectiveness of medical interventions to improve the quality of care delivered.

Cost containment

The Affordable Healthcare Choices Act includes valuable provisions to improve access and quality, and yet it will have little impact on the overall cost of the healthcare system—the most urgent problem. Consumers simply cannot continue to consume at the current rate if the overall economy is to remain viable. We need to:

- Change financial incentives to link dollars spent with improved value and patient wellness
- Increase transparency of costs and authorizations
- Shift from a fee-for-service model to a pay-for-performance model
- Decrease the administrative burdens on providers and patients
- Implement prevention and wellness programs

Essential Starting Place: Electronic Medical Record

A good place to start is with the $500 billion spent annually on rework, for lack of a meaningful electronic medical record (EMR) system. The current, paper-based medical records system relies on patients to accurately remember and report their medical history. The system is error-prone, time-consuming, costly, and wasteful.

The current process is rife with redundancy, the simplest example being the requirement to fill out an intake form every time you visit the healthcare provider. A hospital that admits an unconscious patient has no knowledge of the patient's medical history, including medications. The person assigned to save a person's life might know only about the patient's injuries—not current medications, previous illnesses, or other aspects of the medical history.

With rigorous privacy standards in place to protect sensitive medical records, the U.S. is embarking on an effort to computerize all Americans' health records by 2015. Intended to help prevent medical errors and improve healthcare quality, the EMR is the foundation for the modernization of the U.S. healthcare system and for cost reduction.

An Imminent Consumer Revolution: From Sick Care to Health Care

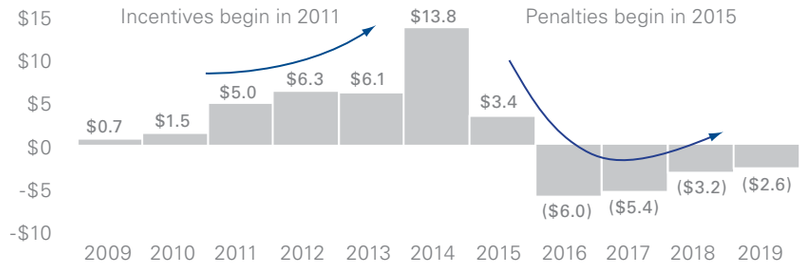
Free market forces are not at work in today's healthcare system. The financial incentive is to treat as many sick people as possible, and there is little financial incentive to keep people healthy and out of treatment. In general, consumers are unable to vote with their wallet. They have a hard time identifying the best providers and comparing the cost of care. And even if they could compare the cost of care, they are insulated from the cost difference because the employer or payer bears it.

How many iPhone owners have downloaded an App to schedule a physician appointment, read reviews of physicians and hospitals, view test results, or manage children's inoculation records? Few, and this is a problem.

Until we have informed consumers who can select their caregiver and experience the financial effects of their decision, the healthcare industry will have limited motivation to innovate.

Healthcare Information Technology Act

Estimated Net Deficit Impact ($ billions)



HITECH funding utilizes both a "carrot" and "stick"

- Incentive payments for use of healthcare IT begin in 2011
- Penalties for non-compliance begin in 2015

Figure 1. Timeline for HITECH Act Funding

Currently, an estimated 100 million medical records are in electronic form. Of the almost trillion dollars allocated for the American Recovery and Reinvestment Act (ARRA), about $157 billion is earmarked for healthcare. Of that, $23 billion is set aside for the Healthcare Information Technology Act of 2009, or HITECH Act, to stimulate hospitals and physicians to acquire the technologies they need to create EMRs, interconnect them, and protect privacy. The goal of the HITECH Act is to achieve EMR interoperability through Health Information Exchanges (HIEs). Any physician you visited would have access to your entire medical history, from pharmacies, long-term care facilities, hospitals, emergency rooms, and physicians' offices.

The HITECH Act establishes multiple organizations to define standards for EMRs, and provides direct incentives for implementing EMRs of up to $65,000 per physician and $2 to $8 million per hospital. To receive funding, applicants need to demonstrate "meaningful use" of EMRs, which includes:

- Physician order entry (POE), eliminating redundant activities when physicians instruct a nurse to enter the order
- Treatment outcomes recording
- Interoperability of EMRs between providers, and potentially with consumers

These incentives are available through 2014 or 2015 (Figure 1). If physicians and hospitals have not demonstrated meaningful use of EMRs by then, they will no longer receive reimbursement for federally provided insurance such as Medicare and Medicaid. This provides a powerful financial incentive to put EMRs into meaningful use.

Hurdles to Adopting Meaningful Use

One hurdle is that the Office of Standards has not yet finalized many technologies required to achieve meaningful use. Another hurdle is that most U.S. physicians have small practices, and tend to regard EMRs as an impediment. The main objection is the perception of increased workload, decreasing the number of patients they can see. They also resist taking on what they regard as a clerical role: entering exam results and diagnoses into the patient record. It remains to be seen whether stimulus monies are sufficient to overcome these barrier to physician adoption.

The economic benefits of the EMR are clearer in larger organizations. Most U.S. physicians have smaller practices, however, and it is likely that the majority of primary patient care records will be excluded unless the industry can overcome these barriers.

Conclusion

An unprecedented amount of funding is available to transform access and, to a limited degree, reduce costs and improve quality of healthcare delivery. The barriers—a shortage of people and increased demand—are the same barriers that technology has solved repeatedly in other industries. Therefore, IT can play a valuable role by helping to increase productivity, improve the quality of records and transactions, and provide systems to rapidly and accurately transfer critical information from stakeholder to stakeholder.

Innovation Spotlight

John Muir Medical System Improved Quality

Located in Walnut Creek, California, John Muir Medical System in 2003 launched a multipronged program to improve the quality of care delivery. The effort included tracking medications from the point of prescription to the point of administration, guideline-based POE, and other technologies to enhance patient safety. By applying these technologies, John Muir decreased its mortality rate by 30%, and has been recognized for the last two consecutive years in US News and World Report as one of the best hospitals in the country.

Spartanburg Regional Healthcare System Reduced Costs

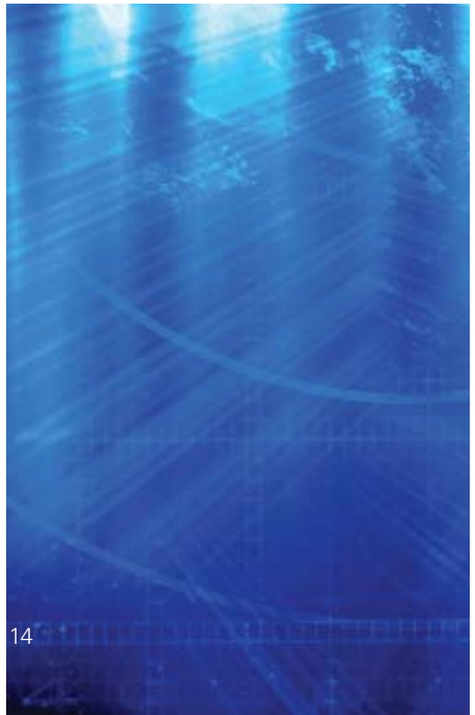
Spartanburg Regional Healthcare System of South Carolina implemented information technology to improve collections, improve coding processes, and be informed about patient coverage. As a result, the system reduced accounts receivables by $25 million and increased cash flow by $3 million monthly, in just two years.

Health Information Exchanges Enabled Interoperable EMRs

Northern California has a coalition of six healthcare organizations with interoperable EMRs. The exchange includes labs, physician groups, and hospitals with 3,000 physicians and more than one million patients, 15% of which are already using their own personal health records obtained through the exchange. New Jersey has a similar system, with 14 participating healthcare systems with 1000 physicians and more than 250,000 patients. Both organizations have met the requirements to receive stimulus funds.

Infrastructure for 21st Century Healthcare

Panel Members: Alan Cohen, VP of Enterprise Solutions, Cisco Systems • Eric Billingsley, Director of Technology and Operations, Google • Greg McGovern, CTO, Adventist Health • Kevin Kolander, Architect and Technical fellow Emeritus, McKesson Corporation • Lori Wright, VP and GM, Electronic Health Group, Symantec



Increasing Physician Access

Technology can help address access in two ways. One is changing the communications model to include video and other rich media. The other is changing the computing model from the current web-based system. New trends such as epidemiology heuristics will transform the ways people access and use medicine.

Transition to Cloud Computing

As data centers reach power and cooling capacity, cloud computing will become inevitable. It is far more economical for healthcare providers to pay a cloud services provider for precisely the capacity they need than to scale their own data centers for peak volume.

Summary of Comments

Role of the Cloud in the EMR

As applications and infrastructure continue to move to the cloud, healthcare information will no longer be tied to the place of origin. An example is a new cloud service that enables doctors to share health images over the Internet. Doctors who have no prior affiliation can agree to share information, similar to the way people befriend each other on social networking sites like Face book. Participating hospitals connect a plug-and-play appliance directly to their Picture Archiving System (PACS), which uploads images to a cloud environment, saving hospitals from storage costs.

Accelerating the Speed of Information Exchange

The goal is to aggregate all healthcare information—about the individual and epidemiology studies—and present it to doctors at the moment they're interacting with their patients. Currently, the rate of information exchange in the healthcare environment is very slow—hours, days, weeks, and even months.

Empowering Patients to Say Who Gets to See Their Data

Oddly, patient medical records are more private from the individual than they are from doctors. According to Health Information Portability and Accountability Act (HIPAA) regulations, patients must give consent for one doctor to share that patient's information with another doctor, a process known as consent interoperability. Healthcare providers must find an efficient method for consent interoperability to avoid liability. One vision is a patient portal, where a patient can add or block doctors from their records, and have the note propagate to hundreds of thousands of electronic repositories.

Distributing and Storing Growing Volumes of Health Information

It is not feasible to move a 300 GB CAT scan image to multiple servers. We need a way to store files where they originated while enabling authorized people to view the file from anywhere in the world, without downloading the full file over the network.

Standardizing on Semantics and Consent for Health Information Exchanges

The technical aspects of setting up HIEs are easy. The more difficult aspects are semantics and consent. All parties have to agree on terminology, or else errors might occur because an IT system misinterprets data.

Need for Human Collaboration to Reduce Medical Errors

Medical-grade networks must be more than fast and secure. They also must support collaboration, because ultimately people must interpret the information in the EMR. It is not economically feasible to bring 30 MB Internet connections to people's homes, so technology providers that develop application and displays need to design around today's connections. People eventually might want the data delivered to their mobile phones. Scaling down the delivery requirements will keep data centers from imploding.

Security

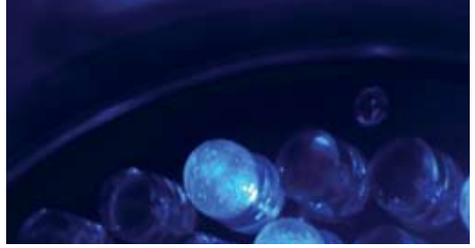
Privacy violations can result in steep financial penalties, even criminal penalties, for healthcare providers. The necessary security technologies are available today. However, they have been more widely deployed in the financial services industry than in healthcare, even though people ostensibly care at least as much about their health as their money. The security hurdles that remain are cultural, including agreement to create and use unique patient identifiers (other than social security numbers) and use of standards. The Health Information Technology Standards Panel (HITSP) and Integrating the Healthcare Enterprise (IHE) are hard at work on standards. Health Level Seven International (HL7) is the global authority on standards for interoperability of health information technology, with members in over 55 countries.

Overcoming Cultural Issues Around "Cookbook Medicine"

A thorny cultural issue is that certain physicians resist best practices because they don't want to follow so-called cookbook medicine. The shift in medicine from art to science is not without hiccups. Some parts of the world would welcome so-called cookbook medicine and would tolerate the risk of innovation. Perhaps the industry could pilot healthcare innovations in these areas, and later introduce the breakthroughs to more litigious parts of the world.

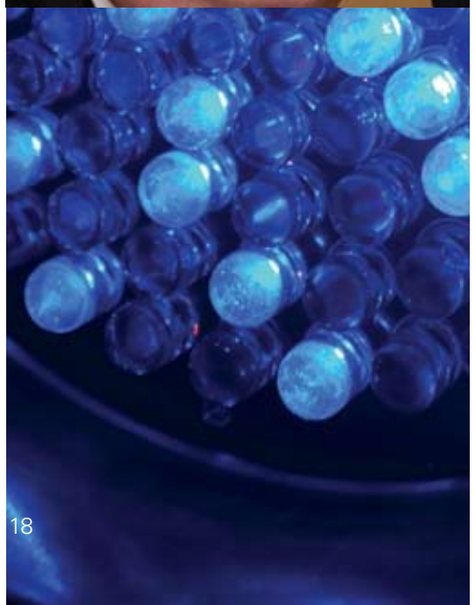
Overcoming cultural issues, continued

Improving the healthcare cost model requires two actions. One is increasing the efficiency of care delivery, for example, through telemedicine. The other is removing waste, such as the hundreds of billions of dollars of care that yields low marginal returns. Much of the time, giving a baby aspirin to someone who comes to the emergency room with chest pain is a good solution. But the economic model encourages a more expensive procedure. IT cannot solve the cultural issues. However, IT can help to create expert systems to determine how to use resources effectively, matching the cost of the resource to the need.

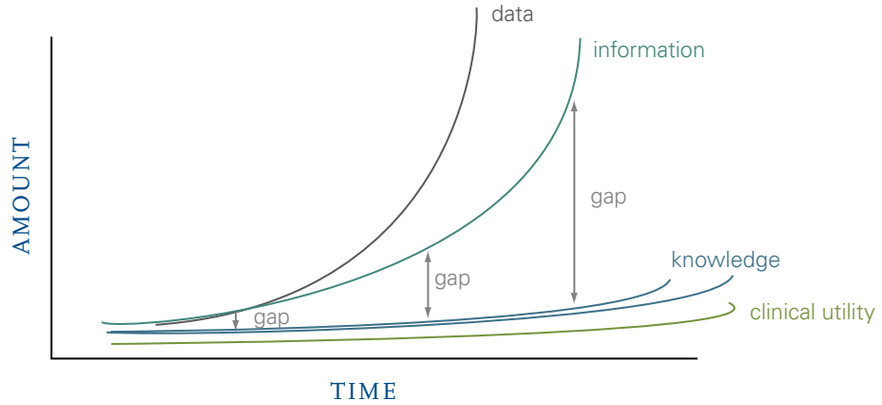


The Journey to Integrated Electronic Medical Records: The Promise and the Risks

Summary of comments by Hal Wolf, Senior VP and COO of The Permanente Federation, Kaiser Permamente



Current incentives built into the U.S. healthcare system can reward short-term actions that might not correspond with long-term cost efficiency and quality. Some healthcare providers are succeeding at aligning financing and medical care by stepping up emphasis on prevention. At Kaiser Permanente, for example, intelligent use of data is at the core of the effort (see Figure). Data is often locked inside an application, EMR or other. Pooling application data and other data sources creates information useful for meaningful reports and analysis, leading to knowledge, expressed as measurements and targets. Finally, subsets of data acquire clinical utility by helping caregivers improve outcomes for individual patients.



Source: Michael N. Liebman, PhD: Executive Director Windber Research Institute

The end goal for Kaiser is to aggregate all data available so that it is available to members and physicians from anywhere in the world. Already, members need only a web browser to see their lab results, request referrals, view immunization records, view a history of medical visits, and send a secure email to their physicians.

The availability of data helps meet multiple healthcare goals:

- Panel support tools
- Metrics in support of care pathway designs
- Critical quality metrics
- Provider-to-provider data exchange
- Provider-to-regulatory data exchange
- Patient-to-provider communication

Innovation Spotlight

High Value for Humble Email

Rather than taking more time for physicians, email communications with patients actually saves time for both parties. As an example, someone with foot pain might email a primary-care physician to ask which department to visit. The physician responds the same day and sets up an appointment, which the member can confirm with another email. The member spends about three minutes writing two emails and saves a couple of hours to visit the primary-care physician to ask for a referral. The physician, in turn, spends about five minutes to save a 20-minute office visit.

Barriers to Accelerated Introduction of IT into Healthcare

Fully exploiting IT to transform healthcare will require overcoming cultural and process barriers. Cultural issues include fear of misused data that could compromise privacy, and a scarcity of IT skills. Process barriers include the complexity of workflows, lack of an end-to-end patient-centered view, and limited use of tools for design, analysis, and monitoring.

Simply publishing member test results online is not the answer. Healthcare providers must also adjust their business processes. For example, a patient who is confused about a test result viewed online is likely to send emails and make phone calls. The provider must be prepared with an appropriately staffed contact center.

New Healthcare Relationships

In the Internet age, the relationship between the physician, caregiver team, and community has changed radically. One reason is the public has an unprecedented level of information about medicine on the web. They are more likely to research treatment options and demand more information of their physicians.

Another reason is that physicians in this century for the first time have access to information about treatments administered by other providers. That is, physicians can monitor care and outcomes for all patients with a particular chronic-care diagnosis, such as cardiovascular disease or diabetes, to discover best practices and co-morbidities. About 15% of a typical primary-care physician's panel of care costs. The implication for healthcare providers is that it makes economic sense to keep the remaining 85% healthy—and out of the chronic care environment.

The implication is counterintuitive: In today's healthcare environment, specialists need to focus on individuals, while primary care physicians must look at the entire panel. This requires access to data. And access to data outside of a physician's own hospital system requires standardization.

HIEs are spurring standardization. The question of trust remains, however. That is, physicians need assurances that patients have not altered or removed information, for example.

The integration effort is massive. Internal IT organizations must develop or hire expertise to integrate applications and data. National standards are incredibly important for interoperability. Each organization must ensure that its own data complies with standards.

Innovation Spotlight

Increasing the Return on Investment from the EMR

Collaborative Cardiac Care Services

At Kaiser Permanente, patients who are admitted with an acute coronary event are enrolled within 24 hours in a three- to six-month educational program with four goals: smoking cessation, diet and exercise, psychological support, and drugs such as stations and aspirin. The EMR must store new types of information, such as when the nurse called and whether pharmacy allocations are consumed at the expected rate. If a patient is consuming prescription refills too quickly or slowly, the system notifies physicians or nurse practitioners to follow up.

Clinical pharmacists, often left out of the mix, are an integral part of the team. The physician acts as the advocate, monitoring patient milestones using panel support tools with color-coded alerts indicating if any patients are deviating from the prescribed sequence of activities.

In the first 3.5 years of the Kaiser educational program for CAD patients, mortality from all causes decreased by 89%, and mortality in conjunction with a cardiac event decreased by 76%. The system kept 100,000 people alive.

Monitoring Kidney Patients

In the Kaiser Permanente Hawaii region, physicians use electronic lab results to monitor more than 10,000 kidney patients not yet referred to specialists. Physicians reviewed the patients' scores to identify those most at risk and proactively contacted them. As a result of the program, 35-56% more high-risk patients adhered to new standards of care.

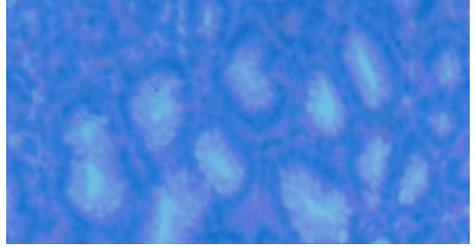
Using the EMR to monitor kidney patients prevented high-risk patients from experiencing negative events that would place them into hospitals. The health system helped the individual live longer and avoid aggravation, while also saving bed space and resources.

Conclusion: Massive Cultural Change on the Horizon

The combination of staffing, new teams, aggregated data, and use of clinical capabilities signal a massive cultural change in healthcare delivery. The caregiver community must come together to rethink how they use information from EMRs and clinical subsystems, and redesign the care pathways within a program. The formula is: "Old Organizations + New Technology = Costly Old Organizations. That is, technology transformation must be accompanied by organizational transformation to succeed. This will require leadership.

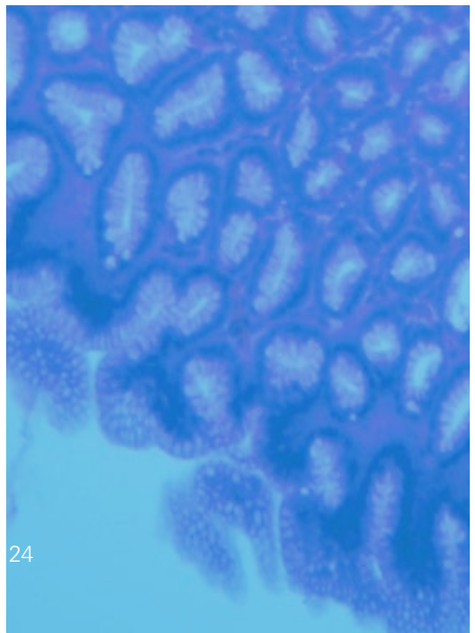
OO + NT = COO

Old Organization New Technology Costly Old Organization



The Data for 21st Century Healthcare: Using EMRs to Support Evidence-Driven Patient Care

Panel Members: Alan Smit, VP Shield Advanced, Blue Shield • Hal Wolf, SVP and COO, The Permanente Federation, Kaiser Permanente • Randy Spratt, EVP, CIO and CTO, McKesson Corporation • David Cheng, CTO Healthcare, IBM Software Group, IBM • Bill Ruh, VP Technology Solutions, Cisco Systems



Value of Open EMR
The power of the EMR is that it is open, and can be useful for diverse programs such as smoking cessation or diabetes control.

Barriers to EMR Adoption
The barriers to widespread EMR adoption are less about information-sharing policy than security. The challenge is to allow flexible security policies, make them easy to apply, and provide an audit trail to confirm that policies have been followed. Another barrier is automating the entry of information into the EMR to take the burden off providers.

Event-Based EMRs
There is high value in an EMR that can recognize telemetry data collected over the Internet, such as an out-of-range heart rate, and then automatically take an associated action, such as notifying a designated person.

Summary of Comments

Applications for Public Health
Interoperable EMRs have the potential to improve public health reporting in addition to medicine and research. If a patient presents with Ebola at a clinic in San Francisco, the entry in the EMR could trigger an automated alert to all appropriate agencies and healthcare providers.

Empowering EMR Application Developers
Just as the Internet has flourished because of open standards for data presentation (HTML) and communications (HTTP), the EMR will increase in value when standards exist for application development. Technology developers can be more productive when they don't have to read through thousands of pages of standards documents.

ROI for EMRs
The EMR is not the benefit, but rather the foundation for benefit. Simply implementing an EMR in a physician's office costs money and adds time to the process. Using the EMR for exchange alone does not provide a compelling return on investment, but only a more efficient alternative to the fax machine. The real benefits come from aggregation, leading to better clinical pathways of care.

Who Will Adopt EMRs First?
The likelihood of adoption is directly proportional to the size of the organization. According to Randy Spratt of McKesson, adoption rates are less than five percent for 1-2 physician practices, around 60% for 20-50 physician clinics, and more than 90% for hospitals. In theory, a well-deployed EMR, integrated with the billing and admissions systems, can improve the profitability of even a small provider group. A small practice might prefer to avoid the disruption, however. Smaller practices are more likely to adopt as they consolidate, or when service providers begin offering a web-based service that lowers the barrier to entry. As business owners, physicians need assurance that their investment in EMRs will pay itself back in terms of productivity savings.

Who Will Pay for the EMR?

Community Health Information Networks (CHINs) pilots proved that the technology to collect and exchange records is real. However, CHINs weren't economically sustainable because the people who paid were not necessarily the ones who experienced value. Now, funded by stimulus money, dozens of HIEs are operating already, and dozens more are in various stages of implementation. But once the capital investment has been made, how will ongoing operations be funded? Who will pay for the privilege of access to a patient record? Patients and physicians will not; hospitals might.

And Who Owns the EMR?

Ownership of the EMR is a fundamental question. In the European Union, the patient owns the EMR and must formally release it to an individual physician or to a HIE. In the U.S. currently, the EMR is owned by the institution that stores it, although patients have full access.

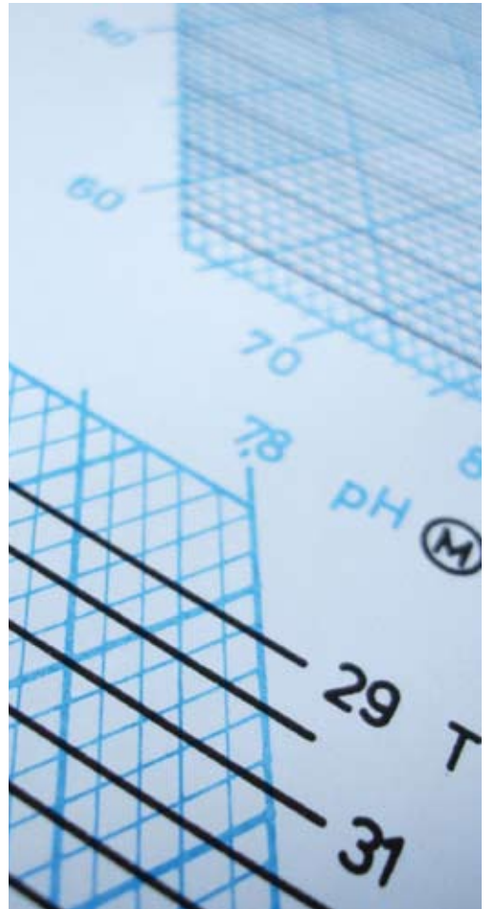
What Healthcare Can Learn from the Banking Industry

Not so long ago, financial institutions could not share information. The turning point came when the industry agreed on seven transaction standards, for debits, credits, money exchange, and inquiries, for example. Standards for electronic records gave birth to innovations ranging from ATM machines to e-tailing to online tax software. Standards also enabled consolidation. The financial institutions with the best technology acquired other banks, leading to the emergence of state-level banks, followed by regional banks, then national banks, and now global banks. Healthcare can learn from the experience of the financial services industry. Today, tens of thousands of people are paid by providers to make sure payment is received, and by payers to make sure that requested payments are legitimate.

The real promise of the EMR is to ensure that physician orders are paid electronically, eliminating $500 billion in annual healthcare costs for manual payment processing. The $500 billion is the incentive—not the ability to look up a healthcare record for the relatively few people who present unconscious in the ER.

Low-Hanging Fruit from EMRs

The state of Colorado looked for an application of EMRs that would provide immediate returns. They chose saving lives in the ER, which requires only a few data points to be available in real time, such as penicillin allergy, cardiovascular disease, and diabetes. Other information not needed for saving lives in the ER, such as old chest X-rays, are delivered not in real time, but on a best-effort basis.



Who Owns the Data?

Data for each person's EMR is widely distributed, across all physicians, hospitals, and pharmacies the person has visited—easily 10 in a few years. It is not practical for a healthcare provider to connect to tens of thousands of physician practices, hospitals, and pharmacies, and data aggregators could provide a valuable service. The U.S. model is that whoever creates the data has the right to assign that data to others. Some pharmacy chains, for example, regard their prescription data as a source of business intelligence that confers a competitive advantage. These pharmacies might resist sharing their information unless compelled by regulation. Although 80% of all prescriptions written in the U.S. flow through McKesson's network switches, McKesson cannot provide the data to any organization other than the one that contracted with the company to provide those transactions.

Big Role for Cell Phones?

With a smartphone and a web-based email account, individuals can aggregate multiple email accounts into one inbox. Why couldn't the healthcare record be similarly aggregated?

Trust

The Office of the National Coordinator for Health Information Technology (ONC) is currently collaborating on guidelines for the transport of data between providers, to ensure that data arrives as it was sent. Arguably, the payer community is most financially vested in ensuring that EMRs are populated accurately.

Misaligned Incentives

If one were to completely ignore the altruistic motivations of physicians, the economic motivation is to treat as many people as possible, with the most complicated conditions. The incentive for patients is to pay as little as possible, which encourages them to prefer employers that will bear the largest amount of their healthcare cost. The incentive for employers is to minimize the cost of treating sick people. The payer, who essentially represents the employer, has an incentive to influence people to not take expensive treatment. Although financially motivated to promote wellness, payers are stymied because they are so far removed from the patient and have a contentious relationship with providers. Nonetheless, many payers are implementing wellness programs. Ultimately, however, patients have to be motivated to change their behaviors, and under the current system, they have no economic incentive.

Infrastructure Requirements for Telemedicine

Telemedicine increases storage capacity requirements, as patients increasingly interact with their physicians using high-definition video. The industry needs to decide what telemedicine session data needs to be stored, and for how long.

On Including the Genome in the EMR

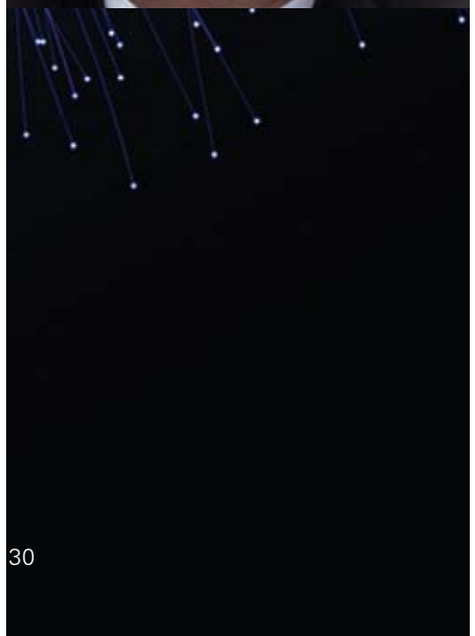
The personal genome doesn't use much data, and could easily be stored. Current research focuses on determining whether a medication will succeed based on the genome. A drug was recently taken off the market despite the fact that it succeeded well in 99.5% of the population, because it caused death in the .05% of the population that produces a particular protein. As researchers begin developing drugs that are specific to a genome, it will be essential to include the results of molecular diagnostic workups in the EMR.

The Coming Consolidation

When penalties are imposed for lack of compliance with acceptable use of the EMR, unprepared institutions will lose significant revenue and become economically unviable. This, in turn, will increase the patient population of the organizations that are prepared.

Looking Into the Future: 21st Century Medical-Grade Infrastructure

Summary of comments by Andrew Thompson, Co-Founder and CEO, Proteus Biomedical



In 1919, 25 to 40 million people died from Spanish influenza, the worst pandemic in history. The current healthcare system emerged at that time to address lethal diseases killing young people in the prime of life. The system succeeded, reducing the number of U.S. deaths from pneumonia from 3% to .1%, a 93% improvement.

The 21st century brings very different healthcare challenges, which the old system never anticipated and does not address. Chief among the challenges are aging, urbanization, and affluence.

Aging, Urbanization, and Affluence

People in the U.S. and U.K. currently have the same life expectancy, 79 years. And yet the U.S. healthcare system spends about $7,000 annually on every person, while the U.K. spends $3,200 per person, less than half. In China, life expectancy is only slightly lower, 75.5 years, and healthcare costs are $94 per person. In all three countries, three generations are alive at any time—not the case in the U.S. in 1919.

Today's global pandemics are diabetes, dementia, and depression. All three are influenced by individual lifestyle choices, and are not well suited for cost-effective treatment in capital-intensive "sick-care" systems staffed by expensive and scarce professionals.

Tackling 21st century pandemics requires new ideas, technology, and financial models. Global spending on technology and healthcare are roughly the same, at $4.5 trillion. Why does debate rage about healthcare reform, but not technology reform? The likely answer is that technology innovation makes products better, more affordable, and more accessible. Every year we get more for our money. Contrast that with healthcare spending, where innovation makes services marginally better—but far more expensive. Every year we get less for our money.

Another marked difference between technology and healthcare innovation is that technology innovation is more likely to work. Cardiac defibrillators cost $30,000 apiece, and yet roughly 94 percent of recipients will never experience a therapeutic benefit. Similarly, sales of a popular cholesterol drug, total $13 billion annually, and less than 10 percent of people who take it experience a therapeutic benefit.

The healthcare challenge is not to invent new therapies, but rather make them work for the entire global population of 6.8 billion people, not just the affluent few.

What Healthcare Can Learn from the Technology Business Models

Four billion people have purchased cell phones, many of which cost $50 or more. And yet many of these cell phone owners will never see a doctor. What is different about the approach of the two industries? The answer is that the technology industry has defined its cost structure based on the financial capacity of most people.

In contrast, the healthcare industry has defined its cost structure on the financial capacity of the richest 10 percent. Six billion people are excluded from the global healthcare system. This is a travesty in the 21st century, when our challenge is global access, sustainable innovation, chronic disease management, and wellness.

Opportunity: Making Sure People Take Their Medication

The global pharmaceutical industry is a $750 billion industry. Medication is a very cost-effective way to treat disease—but only if people take it. For example, consider heart failure, the highest source of costs in the U.S. healthcare system. Each emergent admission costs approximately $25,000, and the most frequent reason for emergent admission is failure to take medications that have already been prescribed. At the Stanford Cardiomyopathy Center, the likelihood of readmission for the same cause within 90 days is 50%.

Conclusion

To advance, the healthcare system needs new technology, new financial models, and new ecosystems:

- New Technology
  The Internet and the mobile phone have emerged as the most important technologies for 21st century healthcare.
- New Financial Models
  As an example of a new business model, Proteus Biomedical does not make money from drugs, but rather from the data, network, and hardware used to monitor the efficacy of the drug on the particular patient.
- New Ecosystems
  To make simple products that appeal to providers and consumers, IT vendors might need to form new partnerships with companies that offer telecommunications, software, healthcare delivery, and more.

Innovation Spotlight

Empowering Patients and Family Caregivers

Imagine a drug system that fulfilled the following functions:

- Informs whether a medicine is real or not. (In most of the world, 50% of medicines in the supply chain are fake, leading to unnecessary deaths.)
- Indicates whether you need a different dose.
- Tracks wellness measures such as sleep and exercise
- Allows people to set alerts and reminders for medications, self-tests, doctor visits, and so on.
- Empowers family and friends to help support the person and manage the disease
- Provides financial rewards for taking medicines, exercising, and staying well

Proteus Biomedical has completed nearly 4,000 patient days of trials with this type of system, for heart failure, hypertension, mental health, tuberculosis, and other conditions. Patients swallow a computer chip made from the same food ingredients contained inside a multivitamin, which costs a fraction of a penny. Once inside the body, it sends a digital signal through the body that is received by a small band aid that measures heart rate, heart rate variability, respiration, body angle, temperature, and step count. An algorithm processes these metrics to measure sleep and exercise hours. Comparing this "wellness signal" with the therapeutic signal (drugs taken) provides a quantitative measure of how well the patient is faring on the medication.

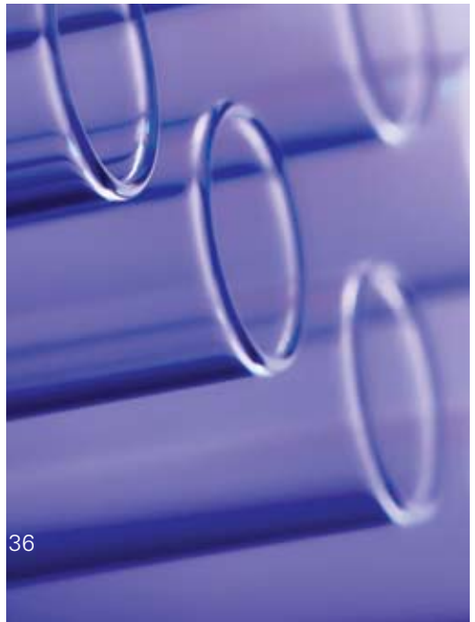
When a patient passes within 20 feet of a phone, the information is transmitted to the service provider, who processes the raw data and sends back results.

The patient owns the data and is free to share it with people who can help you manage the disease, including friends, family, or physicians. Families of people with conditions like diabetes, bipolar disorder, and Alzheimers and related dementias can monitor the person's condition.

The goal is to personalize therapy and make it work for the individual, and empower the hundreds of millions of people who are sick or caring for someone who is sick. This represents the largest group of healthcare workers in the world.

New Business Models in Healthcare

Panel Members: Elinor MacKinnon, SVP and CIO, Blue Shield • John Harris, Chief Strategy Planning Officer, UCSF Medical Center • Risa Stack, Partner Life Sciences Practice, Kleiner Perkins Caulfield and Byers • Robert Burgelman, Professor of Organizational Management, GSB Stanford • Stefanos Zenios, Professor of Operations, Information and Technology, GSB Stanford



Nonsensical Dynamics for Healthcare Business Model

Currently, the U.S. healthcare system has business models for technology providers, healthcare providers, and payers. All of the models presuppose a third-party payer system, which produces odd dynamics (Table 1).

Business Model for Acute Care Hospitals

Acute care hospitals will struggle to transition from a fee-for-service reimbursement model to becoming an accountable care organization. In a fragmented fee-for-service environment, providers overinvest in systems for billing, collection, claims adjudication, and under invest in care coordination systems and IT in general. At UCSF Medical Center, IT represents about 3% of the overall budget.

Summary of Comments

Table 1

SUPPLIER	PROVIDER	PAYER
Sell to physicians, who are reimbursed by payers	Bill primarily for labor	Make money by managing costs and acquiring new customers
	Make the most money from treating patients with complex conditions	Competitive advantage is scale
	Do not make money to prevent illness and keep patients out of the hospital	
	Competitive advantage is scale	

Business model for acute care hospitals

Acute care hospitals will struggle to transition from a fee-for-service reimbursement model to becoming an accountable care organization. In a fragmented fee-for-service environment, providers overinvest in systems for billing, collection, claims adjudication, and under invest in care coordination systems and IT in general. At UCSF Medical Center, IT represents about 3% of the overall budget.

The contradictions of the payer business model

The healthcare industry currently operates in a business-to-business environment. And yet 80% of people receive care recommendations from their friends. Promoting access can cause demand for primary care physicians to outstrip the supply, as seen in Massachusetts.

Business Models for Consumer Healthcare Applications

The business model for drug and device development is well defined, the model for consumer applications, less so. Will consumers pay a monthly fee for iPhone Apps for managing diabetes and other chronic diseases? For healthcare rating sites?

Contributions from Businesses Outside of Healthcare, or "Cross-Boundary Disrupters"

Costs rise in step with complexity, and the healthcare system is becoming increasingly complex. Therefore, entrepreneurs have an opportunity to identify distinct processes within the system and make them more cost effective. A frequent pattern is that a startup pioneers the technology, and then an established company capitalizes on it.

As an example, a company other than Apple invented the MP3 format, but Apple made money. These phenomena are known as cross-boundary disrupters. An example is retail-based clinics operated by retailers such as Wal-Mart. Approximately 1,000 Wal-Mart clinics are operating in 37 states, primarily delivering acute care and inoculations to younger people and people who do not have a personal primary care physician. Overall customer satisfaction seems to be high, although physician organizations have expressed concerns.

Wellness Programs

Larger self-insured employers are introducing aggressive patient management programs. People with diabetes, for example, have a significantly smaller co-payment if they participate in the managed care program. It works because the employer has a financial incentive to introduce managed care.

Who Will Benefit from the EMR?

One outcome of the EMR might be to close down small providers because they can't demonstrate meaningful use, driving consolidation. Is that outcome good or bad for consumers?

Potential EMR Cloud Services

Providers can benefit even from simple innovations, such as a cloud-based service for small practices to use for patient scheduling and practice management. Service providers are beginning to introduce such services.

The healthcare ecosystem currently operates as a business-to-business model, not a business-to-consumer model. Mobile technology and social networking may be the forces that change it to a business-to-consumer model.

Consumer-directed healthcare
Consumer-directed healthcare can be viewed as an attempt to reinstate the traditional business model, in which the consumer, not the supplier, drives demand. (Consumer-driven healthcare refers to empowering consumers, not their doctors, employers, or insurance companies, to decide how their healthcare dollars will be spent.) But the downfall of consumer-directed healthcare is that consumers have not been willing to pay for access to Internet rating sites.

Carrot or stick?
A panelist noted that the carrot is less effective than the stick for wellness programs. "It did not work to pay employees to visit the doctor. It did work to penalize them when they didn't go to the doctor."

Making consumers more accountable
A potential solution is a business model that provides access to good healthcare at a cost that consumers can afford to pay completely out of our pocket. People are willing to spend time researching a smartphone purchase, so why not a healthcare provider?

Somehow we need to foster the mentality that you care as much as about your healthcare as much as you care about your computer peripherals. The difference in healthcare, of course, is that visiting the doctor is not something that people are innately excited about and therefore will enjoy researching.

Financing and Business Model Innovation

Recommendations from Deep-Dive Workshops

Challenge of Aligning Objectives

One challenge in innovating healthcare financing and business models is to more closely align the objectives of the different stakeholders: consumers, employers, providers, and payers. The objectives for consumers and their employers already align. Both want good health—in the employer's case, to reduce costs and improve productivity. However, the alignment stops there, because in a fee-for-service model, payers and providers are motivated to treat more patients, with more expensive procedures. They may be internally motivated to promote wellness, but financially they are not.

Proposed Solutions for Aligning Incentives

Ideas for better aligning the incentives include:

- Wellness programs: Already in place at many large employers, wellness programs are succeeding. In the three years since a major North American retailer introduced a wellness plan, its healthcare costs have remained constant while other employers' costs rose 7-15%. The challenge is how to extend these benefits to mid-sized employers, who typically cannot afford self-insurance.
- Financial rewards based on employee behavior: Behaviors might include exercise programs, for example.
- Matching pay to performance: Providers, too, would be rewarded for certain behaviors

Challenge of Engaging Consumers

Before the healthcare system can evolve from a business-to-business model to a business-to-consumer model, consumers need to become engaged in their own healthcare.

Opportunities to engage consumers arise at different steps in the health process. An opportunity to engage consumers when they are seeking treatment is to provide an easy-to-use web tool, similar to Yelp, that matches symptoms to service providers. An opportunity when consumers receive service is to provide monitoring tools that show whether they are actually receiving the treatment that the doctor suggested, or that compare the results of the different interventions.

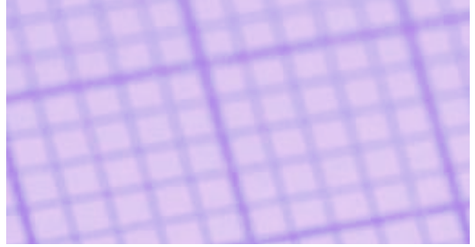
Ideas for Business Models

Outcome-based payments rather than fee for service.

Two-tier health insurance system. Providers would pay only for catastrophic care, and consumers would pay for routine care out of pocket.

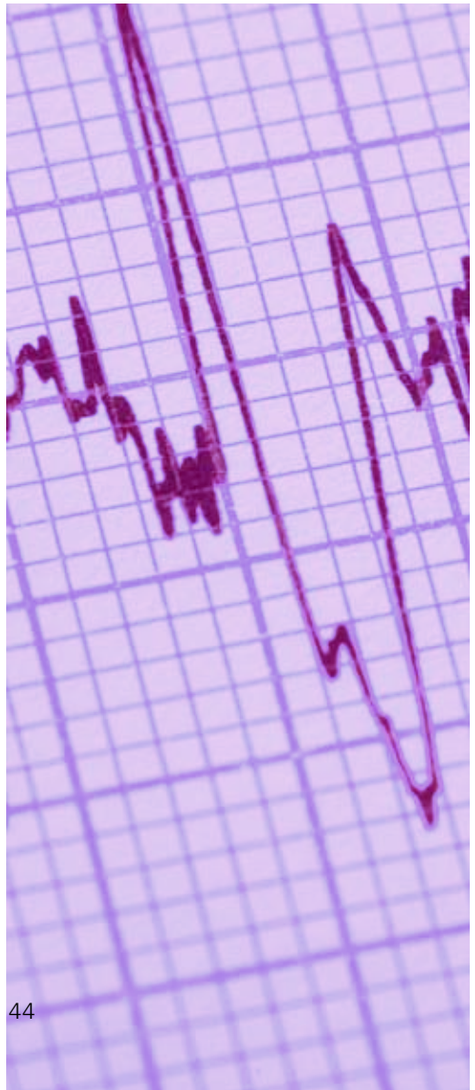
Discounted insurance based on healthy behavior.

High-volume diagnostic centers and high-volume treatment centers, reducing costs through economies of scale.



Health Data Integration Through Interoperable EMR

Recommendations from Deep-Dive Workshops



Benefits of the EMR, by Priority

- Better treatment with less risk
- Cost reduction by eliminating duplicate procedures
- Availability of trusted patient information
- Quality medical information: accurate, consistent, and complete
- Discovery of population-based best practices if diagnostic, treatment regimen and outcome records are available
- Building block for integration with other clinical and ancillary system, enabling consumer-directed healthcare and new business models
- Enabler for coordination of care across organizations
- Awareness of key elements that the physician needs to know about individuals
- Enables capacity for changing demographics, including an aging population, by providing greater access

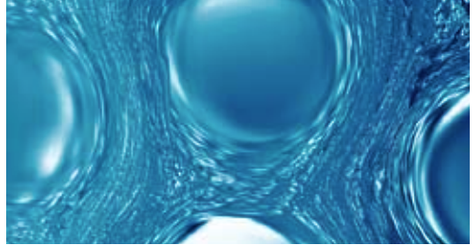
Key Obstacles

- Poor data quality of existing data records: an error in the EMR has a larger and faster deleterious effect than an error in a paper record
- Lack of standards for semantics, identity, and vocabulary
- Providers' and consumers' fear of identity theft and loss of privacy
- Providers' aversion to change, and small providers' cost concerns
- Identity abuse, as when multiple people use the same card

Potential Solutions to Obstacles

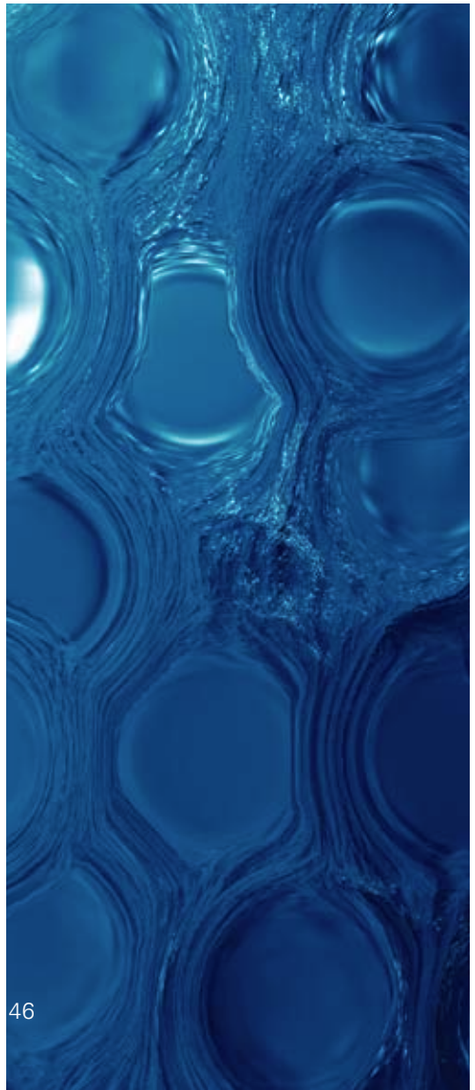
- Develop reconciliation tools to convert untrusted data into trusted data
- Choose one standard set of codes and vocabulary on the clinical side
- Establish a think-tank to focus on personal identity

An EMR is a building block for everything we want to see happen in healthcare reform.



Inefficiencies in the Healthcare System

Recommendations from Deep-Dive Workshops



Current Inefficiencies

- Lack of personal accountability by consumers
- Not enough reimbursement for the uninsured, causing consumers to have to pay for more than their own care
- Price not linked to cost
- Excess capacity, as in billing tens of thousands of dollars for services for someone who is dead on arrival
- Consumer attitude that someone else will pay, and layers of administration that increase cost
- Litigation and defensive medicine
- Eldercare entitlements: is this why healthcare in the U.S. costs double healthcare in Europe?
- Need for innovation versus need for cost control

In the U.S. we have a social consensus that the older population should have access to free healthcare, but we do not have a consensus on inoculating our children. That's strange, because inoculating children is cheap and caring for people in their 80s is expensive.

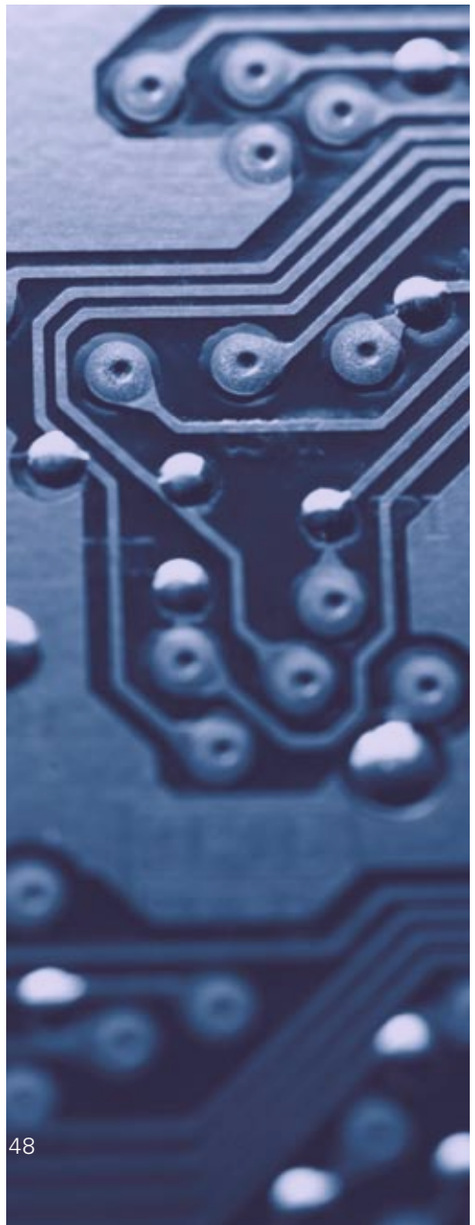
Root Causes of Inefficiency

- Dysfunctional market, with financial incentives not aligned to value
- Lack of transparency
- No rationing: the U.K. rations care, and healthcare costs are half of U.S. costs
- Litigation

Proposed Solutions

- Establish national goals. Are the goals to prolong life? Make life comfortable in later years? Apportion more care to people with longer probable lifespan?
- Foster personal accountability for behavior that affects health. Should a smoker receive publicly funded healthcare for lung cancer if the EMR says that the doctor has been asking the patient to quit for five years? Should an overweight person pay higher premiums?
- Provide attorneys for medical malpractice suits, and pay them the same way district attorneys are paid—a straight salary.
- Use technology to increase utilization of physicians' time. Examples include email-based exchanges with physician assistants, using self-monitoring devices for the home to reduce clinic visits, and using internal monitoring devices to ensure medications are taken and effective
- Replace fee-for-service reimbursement with another option—possibly capitation, meaning a fixed payment per patient.
- Use federally funded insurance for good primary care and catastrophic care, but require consumers to pay for other services out of pocket

Selections from Q&A Session



Source of high administrative costs?

Healthcare information is orders of magnitude more complex than banking information. Therefore, codifying and translating healthcare content poses a bigger challenge. Today, 30 to 40 cents of every healthcare dollar is still spent on administration, and 25 to 30% of claims are paper-based, and approximately 66% of clinical records are paper-based or film-based.

Examples of innovative IT?

Healthcare innovation comes in three forms: lower costs, higher quality, and expanded access. Telemedicine is an example of an innovation that addresses all three goals. It expands access to specialists in rural areas. And it increases quality and reduces costs of home healthcare for people with chronic disease.

Another innovation is a health-image-sharing system. Doctors who have no prior affiliation can agree to share information, similar to the way people befriend each other on social networking sites. Participating hospitals connect a plug-and-play appliance directly to their Picture Archiving System (PACS), which uploads images to a cloud environment, saving hospitals from storage costs.

How can we provide access to the world's 6.8 billion residents?

A high-cost infrastructure is not the answer because even the richest country in the world cannot afford it. Improving global healthcare requires radical changes. For example, the cell phone may well become the go-to source for medical images.

The 20th century was very much about the enterprise. The 21st century is very much about individuals. The center of the discussion about healthcare needs to be the consumer, not the professional.

Source of high administrative costs?

Healthcare information is orders of magnitude more complex than banking information. Therefore, codifying and translating healthcare content poses a bigger challenge. Today, 30 to 40 cents of every healthcare dollar is still spent on administration, and 25 to 30% of claims are paper-based, and approximately 66% of clinical records are paper-based or film-based.

Number-one priority to reform healthcare?

Developing a reliable and interoperable EMR must be a priority. The EMR will almost certainly improve patient safety and care quality. However, the more immediate goal is reducing administrative costs, and that can't happen until information can be exchanged more reliably.

Four billion people use cell phones, making it among the most important utilities on the planet. The cell phone could become the backbone for a new delivery system, used for diagnosis and treatment.

One delay in implementing an EMR might have to do with organizations simply converting from paper silos to electronic silos. The other is organizations' neglecting to transform their workflow processes to capitalize on the EMR.

Explain more about disruption.

The organizations delivering the most innovative and cost-effective healthcare solutions in 2015 or 2020 might be search engine companies or retailers. Healthcare organizations can expect to see competition from other types of organizations that are more attuned to 21st-century innovation.

What's in store for healthcare IT providers?

Consolidation is imminent—and desirable. In industries with a handful of technology vendors, each can earn sufficient revenue to fund R&D and innovation. But in healthcare IT today, dozens of vendors compete, and no one player has more than 10-12% of the market. Consolidation is needed.

Healthcare spends far less on IT than any other information-based industry. Most capital goes toward building projects that drive revenue rather than IT projects that improve patient safety. Therefore, IT vendors in the healthcare space have a less lucrative market and a more complex problem to solve. Now that the federal government is funding R&D, we may be at the tipping point to achieve the necessary consolidation and R&D investment to create a viable business opportunity.

Today's wildly successful IT innovations, such as photo-sharing sites and iTunes, do not require learning to use. In contrast, innovations for healthcare require physicians to invest time. Vendors can keep in mind the need to deliver high value without a highly complex interface.

Conclusion

The EMR is the starting place to improve healthcare quality and costs, not the solution. Even when EMRs are in place, the industry will still need to innovate to address the larger source of costs, which are chronic diseases and behavior such as eating and exercise. Examples include devices for monitoring and drug delivery. Without an EMR, applying those innovations becomes more difficult.

Is there cause for optimism? One panelist responded,

> "I'm optimistic. Open standards and EMRs are about information and knowledge. Regardless of the applications that win in the marketplace, and whether they're running on a cell phone or a server in the hospital, the value of the data grows exponentially when it's recorded in a format that both parties can exchange and understand. The vision of the EMR is that physicians and researchers can actually understand the health of the entire population."

This event was made possible by the CTO Forum Advisory Board.

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