The Healthcare Delivery System
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Digitizing the Healthcare Delivery System

"In a digital healthcare system, providers can have the information they need right at the point of care. Computer algorithms can catch mistakes and prompt to ensure consideration of latest scientific developments. Public health officials can be alerted nearly immediately of unusual patterns that might indicate a natural or bioterror infectious outbreak, or to catch the next Vioxx® before tens of thousands are put at risk. Researchers would have vast new databases to learn more about what works."

Congressman Patrick Kennedy

Information Saves Lives

For patients of Dr. Evan Zahn, immediate access to personal medical records can mean the difference between life and death. That is why, in 1995, he and his colleagues decided to "go digital."

"We make decisions [based on images]," said Dr. Zahn, a pediatric cardiologist in Miami, Florida. "We realized that there was virtually no information-sharing among members of our discipline. We were still running, looking for lab slips, and if I wanted to see an x-ray I had to go find it in its envelope. The kids we deal with are for the most part critically ill—we deal with little babies with very bad heart disease—and we needed detailed information quicker than that. Often when people relay things verbally, the details are left out. We needed a free ex-change of information."

Today, Dr. Zahn and his colleagues can instantly share digital images of their pa-tients' hearts and other medical data with other doctors around the state. They use the system before, after, and even during surgery.

"When I want to know something about the inside of the heart that I can't see, and the child's on bypass, and time is critical, the computer is in the operating

room and one of the technicians can just punch it up. We've even been working on voice recognition so that ultimately I won't even need a technician. I'll just be able to say, 'Angiogram on John Smith, show frame 16,' and it will do just that."

The system works over any Internet connection. "I can actually put up my laptop tonight when I'm watching the game in my living room and pull up all the same information that I can at work," he said. "I could sit at my computer and go on the Internet anywhere in the world, and I have a database and a log-in and a password. It's encrypted, and it's HIPAA [Health Insurance Portability and Accountability Act] compliant. I can go in and I can work with any of my patients. I get digital images of their operation; I can even view a 30-second delay of their monitor in the intensive care unit, looking at their heart rate, respiration, oxygen saturation, and a number of other things.

"In the bad old days, which still goes on in most places, the doctor performing a procedure would call me—provided I wasn't out of town or unavailable—and I would pick up the phone and try to describe what I saw. We wanted a system where we would have instantaneous access to that type of data.

"Today I was doing a case, and I wanted one of my partners in Orlando, about 250 miles away, to render a second opinion. I just told him to go to the monitor and look at the case I was doing—it was almost in real time—and review with me the images of this little boy so we could make an accurate decision about where to go.

"You only get one chance at it to make this right, and if you do it wrong, it's potentially fatal. If you do it right, you're going to save this baby an open-heart surgery and all the complications from that. This child had a very unusual anatomy, and it didn't look quite right. I wasn't comfortable taking my chances performing the procedure based on the information I had—even though this is all I do, and I've done it a lot for a long time.

"I wanted somebody else's opinion, but the only person I trusted with something like this was 250 miles away. It was as simple as ringing him up on our speaker-phone from the lab. He was in his lab in Orlando. We have desktop computers, and we share a common network. My images immediately were uploaded to the network, and all he had to do was click on the patient and look at a few frames, and he basically agreed with where I was going to put it. We put it in and the baby did great.

"But I don't know that I would have proceeded with it without a second opinion. That's one of about a million examples I can give you. We rely on this type of image-sharing and information-sharing all the time. We share data about the patients, and not just images.

"I can look at all those things, including digital images of their operation as it is occurring. For every kid that comes in here, I know exactly who he or she is, exactly what he or she had done, I have pictures of everything, and I can talk to their physician and make a logical decision about what needs to be done. They don't have to rely on me being able to fax a piece of paper, or the parent's recollection. They just go in and they look at the whole hospitalization, everything you can think of—labs, progress notes, admission notes, operative notes, catheterization pictures, echocardiogram pictures—everything you would want to take care of a child with heart disease.

"Take a child with complicated heart disease. I get called to the emergency room to evaluate them. All their heart surgery was done eight miles away at another institution, but I can't get any information from them: nobody knows what I'm talking about; it's 11 o'clock at night. Without the information, their heart is a black box to me. It's a terrible way to treat patients.

"I understand people's fear of this, and the privacy issue. But I think we'll look back on this period in 20 years and not be able to imagine it having been any other way.

"The value that our society and individuals will get from the ability of having their medical information viewed at multiple sites by multiple healthcare providers who are trying to help them is going to so far, far outweigh any problems, that I think it will go down as one of those things that we can't believe we ever lived without."[1]

❝I think it will go down as one of those things that we can't believe we ever lived without.❞

**Dr. Evan Zahn,
Pediatric Cardiologist**

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[1] Evan Zahn. Commission on Systemic Interoperability staff interview. July 2005.

Benefits to the Healthcare Delivery System

"We have the most advanced medical system in the world, yet patient safety is compromised every day due to medical errors, duplication, and other inefficiencies. Harnessing the potential of information technology will help reduce errors and improve quality in our health system."

Senator Hillary Rodham Clinton

Classes of benefits

The bottom line for healthcare providers is to improve the quality of care for patients. An interoperable system helps achieve that: it reduces time spent on administrative tasks, phone calls, and office business, and provides immediate access to more complete information about patients. That means:

- More complete information available for treatment decisions;

- New and more efficient options for patient interaction;

- Enhanced ability to demonstrate performance consistent with regulations and recognized professional standards;

- Potential for reduced operational costs and more effective use of resources;

- Reduced or streamlined management responsibilities;

- Less paperwork;

- Automation of repetitive tasks; and

- Better efficiency in dealing with other providers and outside parties.

Benefits Appear at All Levels, from Emergencies to Routine Office Visits

The benefits of interoperability will appear everywhere—because secure access will be available from any location that has an Internet connection. This means electronic healthcare information will be available in ambulances, emergency rooms, doctors' offices, hospital rooms, staff rooms, nurses' stations, and clinics.

In fact, benefits to healthcare providers fall into four categories:

- Quality of care;

- Administrative efficiencies;

- Patient communication; and

- Public health and security.

Quality of care

- **Enhanced doctor-to-doctor communication.** With an interoperable system of healthcare, physicians can instantly share test results with other doctors, healthcare providers, labs, pharmacies, and clinics. The system will also allow doctors to highlight particular parts of the record and "point" or "link" that information to other parts of the patient record—in practice, any physician authorized by the patient will be able to look at a patient's chart with another physician who is far away. This will naturally streamline the process of consultation and improve healthcare delivery.

- **Available in any geographic location.** Physicians and other healthcare providers will be able to review the complete medical history of a patient, regardless of the location of either the patient or the provider. An individual on vacation on the West Coast who lives on the East Coast could go to any doctor and have their information available instantly. At each visit, healthcare providers add to the record, so no matter where and when the record is examined, it will be up-to-date.

- **Available in any treatment setting.** Access to medical histories will be available in any treatment environment: in an emergency room, in an exam room, in locations around a hospital, in a doctor's home or office, in public and private clinics—anywhere an Internet connection is available.

❝ In medicine, seconds can mean the difference between life and death. If you have a heart attack tonight and are rushed to the hospital, your life depends on timely access to accurate and current information. That's why it makes no sense that today's healthcare is not advancing in the Information Age; it's stuck in the Stone Age. **❞**

Senate Majority Leader Bill Frist

- **Improved emergency room support.** Doctors in emergency rooms (ERs) often have to work without any patient history at all. Treating an ER patient with no records can be like trying to navigate a country road in the dark with no headlights. However, interoperable tools can be physicians' "high beams" that help them make the best decisions. Since many patients use the ER as their primary care facility, and ongoing and consistent treatment for such patients can be difficult, an interoperable system could reduce suffering and save lives. In addition, the consistency the system provides can help caregivers personalize the experience for the patient. That will help doctors and nurses to encourage patients to form relationships with healthcare practices and clinics, instead of waiting until a problem becomes so severe that it requires emergency treatment.

- **Immediate access to lab results.** A connected, interactive system of healthcare will allow physicians to review test results as soon as they become available—no more waiting for a phone call or fax. Even the most basic system will provide doctors with the ability to "query the database"—to look for patterns that appear only under intense scrutiny and to find patterns and clusters of data that indicate other problems or treatments. By itself, the interconnectivity of lab information with drug information can provide more comprehensive data at the time of care. Today, such information is not available at the time of initial treatment, meaning that more refined treatment has to be postponed until the necessary data have been collected in one place—and that is just what an interoperable system is designed to do.

- **More evidence-based medicine.** Interoperability will promote evidence-based medicine[3] by giving doctors access at any time to databases that offer updated clinical decision support. Interoperable systems will be equipped to provide protocols for various medical situations. Physicians will choose protocols as they see fit, and as outcomes are measured, the data can be used to revise best-practice standards. Interoperable health systems will improve this process in ways never before possible.

A Lack of Information

In healthcare, having the correct information about a patient is crucial, and getting to medical information quickly can save lives. But one Stanford University study showed that 81 percent of the time, physicians lacked the necessary information to make informed medical decisions.[2]

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[2] P.C. Tang, D. Fafchaps, and E.H. Shortliffe. "Traditional Hospital Records as a Source of Clinical Data in the Outpatient Setting." *Eighteenth Annual Symposium on Computer Applications in Medical Care*. Washington D.C. (1994): 575–79.

[3] Also known as "best-practice guidelines."

An Example from Emergency Care

When a 40-year-old female arrived at Indianapolis's Wishard Memorial Hospital, all Dr. John T. Finnell knew was she had lost consciousness while waiting to see a doctor in an outpatient clinic.

Dr. Finnell used her driver's license number to pull up an electronic record listing the patient's recent hospital visits. The listing showed the woman had been diagnosed with a seizure disorder, and she had not been taking her prescribed medication. With this information in hand, Dr. Finnell was able to treat the woman appropriately.

If there had been no accessible medical record indicating the most likely cause of her unconsciousness, Dr. Finnell would have administered drugs to stop her breathing, then inserted a breathing tube and ordered tests.

If the file had not been accessible via an electronic network, the delay in securing a paper file—which could have been any number of places—would have taken hours.

"When you're in an emergency and you can't find information about a patient, everybody suffers," said Dr. Finnell.

If Dr. Finnell had not had access to crucial information about the 40-year-old woman who was rushed into his ER, would he still have been able to save her life? Would he have been able to avoid the potential negative effects of his treatment? Would he have been sued if he had not?

Though it cannot be known for certain what would have happened without the electronic record, what happened when the record was available is a matter of fact. Dr. Finnell received the information he needed to come to the aid of an unconscious patient by sparing her redundant testing and risky emergency procedures. Access to her healthcare information helped him to save her life.[4]

In addition, digital systems are much easier to update than medical textbooks, which will speed the adoption of superior science into practice. Under the current system, the delay between new discoveries and their incorporation into common practice is, on average, 17 years.[5] With some 10,000 clinical studies conducted each year, medical knowledge is doubled about every 42 months.[6] But medical studies are often duplicated because one researcher does not know what another is doing, and they may not learn of work similar to their own until a scholarly article is published. This delay in sharing information causes resources to be wasted and ultimately delays the delivery of new and better treatments to patients.

- **Enhanced support for management of chronic disease.** The treatment of chronic conditions often involves multiple physicians and healthcare providers. The proportion of a typical medical practice focused on treatment of chronic conditions is growing every year, as our healthcare system is

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[4] Susannah Patton. "Sharing Data, Saving Lives." *CIO Magazine.* 2005.
[5] Ruth Larson. "Medical Advances Can Outpace Doctors: Retraining Not Enforced, Critics Say."
   Washington Times, March 21, 1999.
[6] Ibid.

transformed from a base of infectious to chronic conditions.[8] Already, half the U.S. population lives with chronic disease.[9] A connected healthcare system will make it easier for patients to find information to help them prevent such conditions, since many chronic illnesses are preventable. With patients and doctors in more frequent and casual contact—made possible by interoper–ability—patients can make better lifestyle choices to avoid chronic disease or improve their management of it.

- **Improved prescription writing and pharmacy interaction through e–prescribing.**

    ◦ When prescriptions are transmitted to a pharmacy through an interoperable system, there is no question about legibility or the loss of a paper prescription.

    ◦ Doctors can find out whether or not a patient filled or refilled a prescription.

    ◦ There will be less opportunity for those who try to obtain multiple prescriptions from many doctors or commit other fraud.

    ◦ Healthcare providers can rely on the same kind of safeguard as pharmacists to prevent drug interaction.

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[7] "Thedacare, Inc. – Touchpoint Health Plan". 2005. Center for Health Transformation. August 15 2005.
   <http://www.healthtransformation.net/Transforming_Examples/Transforming_Examples_Resource_
   Center/139.cfm>
[8] Ibid.
[9] Ibid.

Chronic Disease and Rural Health Management

More than 125 million Americans suffer from at least one chronic medical condition.[7] Chronic conditions are a special problem for residents of rural America because of the typical distances separating patients from doctors' offices, hospitals, and emergency responders. Compared to those of patients in cities and suburbs, office visits for rural residents require more coordination, planning, and time.

Casual contact with healthcare providers is not as easy to make in rural areas as it is for patients in more-densely populated areas. This is important because seemingly minor symptoms for chronic-condition patients are often indicators of situations that need immediate attention to prevent long-term consequences. City- and suburb-dwellers can more easily contact their doctors about these "minor" symptoms and get early treatment. But the prohibitive distances and circumstances of many rural dwellers can cause them to put off seeking attention for such symptoms until the next scheduled doctor's visit. Such delays can have serious health consequences.

But a connected system would help to change that. Rural patients and their doctors would gain greater access to care because the distance from a doctor's office and the formality of a doctor's office visit would both be significantly decreased.

Administrative efficiencies

- **Many outcomes.** Connectivity leads to the creation of communication tools that were previously impossible. New ways to synthesize, share, and transmit data naturally suggest new applications to enhance administrative efficiencies.

- **Less duplication of work.** Establishing files for patients and keeping them up-to-date can require significant time and effort from both staff and patients. Time to fill out forms has to be built into appointment time, even for returning patients. A connected system of healthcare information supports individual data that can be shared by all providers. If a patient's psychiatrist orders a liver test, the general practitioner could review the results instead of ordering another test. A patient with a complete medical history on file with their doctor can make that record available to a new doctor for consultation or when the patient moves to a new town.

❝ … Draw from your errors the very lessons which may enable you to avoid their repetition. **❞**

Sir William Osler, Canadian Physician (1849 – 1919)

Financial Pressures

The financial pressures on physicians are severe. Reimbursements are more tightly controlled, the rate of inflation in the medical field is higher than the overall rate of inflation, and insurance costs are soaring.

In 1999, total physicians' administrative work and costs equaled $72.6 billion, $261 per capita or 26.9 percent of physicians' gross income.[10]

The *New England Journal of Medicine* reports that 31 cents of every healthcare dollar goes toward administrative costs and other expenses.[11] These expenses are from a variety of sources, but interoperability can contribute to reducing them.

Up to $500 billion is spent on unneeded or duplicative care, which is nearly one-third of annual U.S. healthcare spending.[12]

Byproducts of Interoperability

1. Advancement of telemedicine
2. Computerized physician order entry
3. Disease registries
4. Electronic health records
5. E-prescribing
6. Monitoring of chronic diseases
7. Personal health records
8. Secure e-mail messaging

[10] S. Woolhandler, T. Campbell, and D. U. Himmelstein. "Costs of Health Care Administration in the United States and Canada." *New England Journal of Medicine* 349 (2003): 768–75.
[11] Ibid.
[12] Statement of Mike Leavitt, Secretary of the Department of Health and Human Services, before the Committee on the Budget, United States Senate, July 20, 2005.

- **Improved workflow and streamlined processes.** Electronic systems save time and money in standard business activities such as payroll, human resources tracking, attendance, billing, transcription, accounting, and inventory. When applied to healthcare, those benefits will expand to include:

  ○ Reduction of the number of documents lost in transmission, especially via fax or postal mail;

  ○ Reduction in spending on printing, transcription, faxing, mailing, scanning, duplicate data entry, and shredding;

  ○ Elimination of the problem of illegible handwriting and signatures;

  ○ Greater ease of sharing information with other providers;

  ○ Reuse of information instead of reentering; and

  ○ Flexible and instant reporting and tracking capabilities.

- **Easier accommodation to changes in paperwork requirements.** An electronic and interoperable system accommodates changes in regulatory filing requirements with fewer changes to procedure—the system can incorporate new filing requirements. For instance, data may be requested automatically or mined from existing information. It is even possible that a vendor could make changes needed in the office or hospital software without any administrative effort on the part of the staff in the hospital or physician's office.
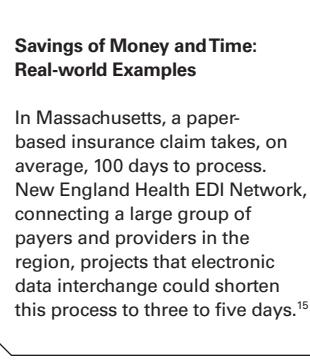
- **More competitive practice benefits.** "The reality of today's healthcare environment is that providers are competing for every patient, every employee, and every dollar."[16] Healthcare providers can increase their ability to compete not only by offering benefits directly to patients, but by

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Savings of Money and Time: Real-world Examples

CareGroup, a six-hospital integrated delivery system, has saved more than $1 million annually from implementing a Web-based electronic medical record retrieval system that improves workflow processes. The group anticipates a 33 percent annual increase in revenues from higher customer retention and attraction rates.[13] CareGroup has seen cost and process time reductions in a range of hospital operations: clinicians need less time to find and retrieve records, the admittance process is quicker, and the average overall stay is shorter.[14]

Savings of Money and Time: Real-world Examples

In Massachusetts, a paper-based insurance claim takes, on average, 100 days to process. New England Health EDI Network, connecting a large group of payers and providers in the region, projects that electronic data interchange could shorten this process to three to five days.[15]

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[13] InterSystems Corporation. "CareGroup Healthcare System Expects System Projects Multi-million Dollar ROI from CareWeb Application Built on Caché e-DBMS Technology." Press release, April 10, 2000.
[14] Ibid.
[15] Hearing before the Subcommittee on Oversight and Investigations of the House Veterans' Affairs Committee. 108th Congress, Second Session. March 17, 2004, 108-32. "Hearing VI on the Department of Veterans' Affairs Information Technology Programs." Written testimony of John D Halamka, MD, MS, 59–68.
[16] Daniel Fell. "Seven Steps: Using Marketing in Healthcare Technology Planning." *HealthLeaders News*. May 23, 2005.

enhancing elements of the practice that will become apparent to patients over time. The return on investment in interoperable systems may appear not only as an increase in the number of patients, but also as better retention of doctors and other employees.[17]

Patient communication

- **Better interaction with patients.** Electronic networks make it easier for doctors to review patient information, find patterns in patient history, provide patients with relevant information, monitor adherence to treatment, consider patient questions and concerns in advance of visits, and prepare more thoroughly for a patient visit. This results in a savings of time and trouble for the provider and the patient, as well as a more focused and need-oriented experience for the patient.

- **Better doctor–patient relationships.** Electronic networks that operate over the Internet facilitate the frequent and relatively simple exchange of information without the need for expensive and time-consuming office visits or even phone calls. When doctors have electronic networks, they can closely monitor patient progress and more often form practical, effective partnerships with patients. Additionally, the ability of doctors to direct patients to reliable health information across such networks would provide patients with the opportunity to review important and detailed information about their condition and use that information to better care for themselves. The result can be a more engaged patient, working with a healthcare provider toward better health outcomes such as better care for chronic conditions, better initial diagnosis and treatment, and interaction focused on specific problems and solutions toward better health maintenance.

- **More time for contact with patients.** In offices and hospitals where electronic systems are in place, doctors appear to have more time for patients and spend less time performing administrative duties and waiting for information. According to a physician interviewed by Commission staff, patient e-mails have relieved his practice of numerous phone call obligations. The doctor describes the telephone as the "most expensive piece of equipment in the office."

66 The two words "information" and "communication" are often used interchangeably, but they signify quite different things. Information is giving out; communication is getting through. 99

Sydney J. Harris,
American Journalist (1917 – 1986)

A Lack of Information

"The proportion of physicians saying they do not have enough time to spend with patients rose nearly 24 percent between 1997 and 2001."[18]

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[17] Ibid.

[18] Sally Trude. *So Much to Do, So Little Time: Physician Capacity Constraints, 1997-2001.* Center for Studying Health System Change, 2003.

By using e-mail, he can answer the five to 18 messages he receives each day in about 10 minutes. Naturally, he recommends an office visit for patients whose complaint needs more attention; otherwise, an e-mail answer saves the patient the trouble of coming in.[19] Doctors, and especially patients, believe that medical errors are prevented when physicians have more time to spend with patients.[20] This suggests that doctors who effectively use information technologies in their practices will have more time to spend with patients, both in the clinical setting and through nontraditional means of communications such as e-mail. This allows doctors to direct patients to reliable health information on the Internet so patients can take time to review important and detailed information at their leisure.

Public health and security

- **Improved public health.** Right now, there is no automated tracking in the United States for patterns and locations of patient diagnoses and treatment. If this information were available, it could support medical research and medical practice. Such data are even more important for activities such as biosurveil–lance, quick response to outbreaks of disease or to chemical or biological attacks, and improved monitoring of adverse drug effects.[21] An electronic health information exchange would provide more thorough monitoring of adverse drug effects, and citizens could be automatically notified if their medication was no longer safe to take.

- **Tracking research and disease incidence.** Without a connected system of healthcare information, there is no way to accurately track trends of disease and injury. Tracking how a disease spreads helps health officials understand the size of the threat. By looking at how quickly diseases spread through a particular area, officials can accurately determine the number of vaccinations needed to control the disease throughout the Nation. With interoperable tools at their fingertips, public health agencies can more efficiently and effectively control and contain the spread of diseases.

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[19] Commission on Systemic Interoperability staff interview with James Morrow, MD, February 2005.
[20] Robert J. Blendon. "Views of Practicing Physicians and the Public on Medical Errors." *New England Journal of Medicine* 347, no. 24 (2002): 1933–40.
[21] T. Brewer and G. Colditz. "Postmarketing Surveillance and Adverse Drug Reactions: Current Perspectives and Future Needs." *Journal of the American Medical Association* 281, no. 9 (1999): 824–29.
[21] Connecting for Health Collaborative. *Financial, Legal and Organizational Approaches to Achieving Electronic Connectivity in Healthcare.* Markle Foundation, 2004.
[23] Commission on Systemic Interoperability staff interview with James Morrow, MD, February 2005.

❝ The health of the people is really the foundation upon which all their happiness and all their powers as a state depend. **❞**

**Benjamin Disraeli,
Former Prime Minister of England**

On-line Tools and Chronic Disease Management

One study noted, on-line chronic disease management tools have been shown to significantly improve patient compliance with medication regimens, from compliance rates of 34 percent to 63 percent without the tool, compared with 93 percent to 95 percent with the tool.[22]

Savings of Money and Time: Real-world Examples

With the implementation of an interoperable electronic record system in his Cummings, Georgia, clinics, Dr. James Morrow calculates a savings of $33.15 per patient visit. This savings had been invested in widening the facilities' services and medical capabilities. The result of the savings, the system, and the investment: the clinics' patients do not need to come into the office as frequently and can now find all of their care—and all of their records—in one place. In addition, patients avoid unnecessary lost days of work and improve their interaction with their doctors, thus improving their healthcare.[23]

• **Better tools for first responders.** A connected system would also support individual responders. Emergency workers would be able to get the most up-to-date information on vaccines and treatment for biological threats. They could more efficiently coordinate with hospitals and clinics, and all healthcare providers could more easily find up-to-the-minute information to provide care and to help contain a health crisis or epidemic.

The Four Levels of Interoperability [24]	
Level 1: **Nothing**	Traditional data-sharing: Information is either physically mailed or communicated over the phone.
Level 2: **Basic**	Very simple use of technology such as scanning paper documents and e-mailing or faxing them. No ability to update or amend electronic documents.
Level 3: **Interpreter**	Information is structured, but data standards do not exist. As a result, computer programs (often called "middleware") are used to interpret and translate data for processing.
Level 4: **Superior**	All data are standardized and coded. All systems can send and receive information using a uniform format and vocabulary.

Adoption and Implementation

"Knowing is not enough; we must apply. Willing is not enough; we must do."

Johann Wolfgang von Goethe,
German Poet, Dramatist, Novelist, and Scientist (1749 – 1832)

Overcoming cultural barriers by phasing in the system slowly

The key to successful adoption of an interoperable system is to gradually phase in functionality. The first features should be nondisruptive and prove to be time- or cost-saving—they should enable information access without requiring redesign of work procedures and data entry. For example, access to a browsable chart—transcribed reports, lab data, scanned paper—is a fundamental yet nondisruptive change that could be the main feature of the first implementation. The next step might be to add simple intrateam messaging, then e-prescribing, then structured notes and orders.

In this way, users gain time and cost savings in the first steps, then give back some of the time in exchange for quality improvement in the latter steps. For instance, cost savings may come through improved reimbursement, either as a result of coding, participation in pay-for-performance programs, or through improved productivity.

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[24] E. Pan, D. Johnston, and J. Walker. *The Value of Healthcare Information Exchange and Interoperability.* Center for Information Technology Leadership, 2004.

Making healthcare providers a part of the effort

Healthcare providers must realize that adopting interoperable electronic healthcare information is in their best interest in terms of time and professional convenience.

In particular, the rollout of the system should engage doctors, nurses, and other healthcare providers in the identification of electronic healthcare implementation priorities that will allow better use of their time while directly caring for patients.

Those in charge of implementing a system must remember that doctors currently are using procedures that work for them. Those procedures may not be particularly efficient procedures, but they get the job done; and for most managers, a proven system that is not quite perfect is worth much more than the promise of a more efficient system—especially when that system demands an intense conversion effort.

Adoption Statistics

Reported rates of adoption vary widely, and not necessarily because the rates are actually different. At this early stage of interoperability, language and definitions are not universal, so the terms in survey questions mean different things to different respondents: one clinic's "complete implementation" is another clinic's "first step."

- Only about 10 to 30 percent[25] of the more than 871,000 practicing physicians[26] in the United States use a "fully automated" system of electronic medical records.

- In the 2003 National Hospital Ambulatory Care Survey, 22 percent of physician offices, 30 percent of outpatient departments, and 40 percent of emergency rooms had adopted electronic medical records.[27]

- In the 2002 HIMSS/AstraZeneca Clinician Wireless Survey, 72 percent of respondents had no electronic medical records deployed in their facilities, eight percent of respondents had some deployment, and 21 percent had complete deployment in all departments.[28]

- In the 2003 Commonwealth Fund National Survey of Physicians and Quality of Care, 35 percent of physician offices with 10 to 49 physicians, and 57 percent of offices with 50 physicians or more had adopted electronic medical records.[29]

- In 2002, 13 percent of hospitals and 14 to 28 percent of physician's practices had electronic health records.[30]

Although statistics are not consistently reliable for the reasons mentioned above, the trends noted by the Commission indicate that adoption and implementation exist in early stages.

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[25] *Advanced Studies in Medicine* 4, no. 8 (2004): 439.

[26] American Medical Association. *Physician Characteristics and Distribution in the U.S., 2005 Edition* and prior editions. <http://www.ama-assn.org/ama/pub/category/12912.html>

[27] C. Burt and E. Hing. *Use of Computerized Clinical Support Systems in Medical Settings: United States, 2001–03.* Division of Health Care Statistics of the National Center for Health Statistics, 2005.

[28] *2002 HIMSS/AstraZeneca Clinician Survey.* Healthcare Information and Management Systems Society, AstraZeneca, 2002. <http://www.himss.org/content/files/surveyresults/Final%20Final%20Report.pdf >

[29] *The Commonwealth Fund 2003 National Survey of Physicians and Quality of Care.* Harris Interactive, 2003. <http://www.cmwf.org/surveys/surveys_show.htm?doc_id=278869>

[30] *2002 HIMSS/AstraZeneca Clinician Survey.* Healthcare Information and Management Systems Society, AstraZeneca, 2002. <http://www.himss.org/content/files/surveyresults/Final%20Final%20Report.pdf >

Doctors and their staffs deserve to have their concerns addressed with clear and simply stated information about benefits, potential delays, and realistic timetables. The more quantitative data available to make the case—in terms of saved money and especially increased time made available to care for patients—the more likely providers will support the switchover to an interoperable electronic healthcare system.

Financial barriers

Even for early adopters, the shift to a connected system will be an evolutionary process that will require updates, replacements, and changes in software, hardware, and procedures as standards and practices are refined. This alone is a discouraging truth, and it is compounded by the fact that healthcare providers face competing capital demands and have relatively limited resources. Financial incentives should be considered in various forms.

❝ By creating national interoperability standards, we will give healthcare providers the confidence that an investment in health IT is an investment in the future. **❞**

Senator Hillary Rodham Clinton
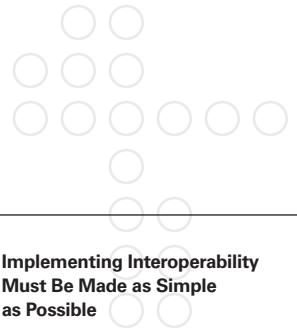
Good news: much of the technology already exists

The necessary technology already exists and in some places is already in use. *The Washington Post* described the daily use of a system in a recent story:

> At 9 a.m., Dr. Julio Panza begins his rounds at [a] coronary care unit…. Residents and fellows review the status of the 14 patients in the unit. Panza takes notes and records his diagnoses and orders with a pen, as doctors have for centuries.

> Discussion turns to one particularly vexing case, a patient admitted the previous afternoon with chest pains. Panza turns to a computer screen and calls up the patient's lab results, which have been transmitted by lab machines. Another click and he can see what medicines have been dispensed from the unit's automated medicine cabinet. Yet another click and the group watches a video of what happened the day before as doctors threaded a thin wire through the patient's arteries and installed three tiny stents to keep the passageways open. Panza clicks again to find details of previous hospital visits and learns that the patient was a heavy smoker and a diabetic.

What the folks at the [facility] have discovered is that most of the makings of an electronic medical record are already available in digital form at most hospitals. By investing a relatively small amount of time and money, they've collected it all in one database and designed an easy-to-use interface that allows nurses, doctors, medical researchers, and finance staff to organize it in almost any way they want.[31]

Conversion

The transition from a paper-based system to an electronic interoperable system will require changes in the way physicians and their staffs work. Procedures that are now carried out on paper will have to be translated and modified to fit the electronic system—although the expectation is that these new procedures will be faster and simpler. Conversion will therefore require physician and employee training. It will also require the establishment and adoption of standard terminol-ogy—that is, a common language for the description and exchange of data.

While efficiency will drastically improve simply by automating much of what is painstakingly done by hand now, the full benefits of interoperability will not be realized if workflow patterns do not change with the introduction of technology.

Certification

Healthcare accounts for nearly 16 percent of the U.S. economy,[32] and as the industry embraces information technology, more and more vendors will compete to sell their products to doctors, hospitals, and clinics.

Given the complexity of the systems and the myriad choices that will be available, few if any people will be equipped to both practice medicine and study these systems well enough to make a completely informed decision best suited to their circumstances.

Implementing Interoperability Must Be Made as Simple as Possible

The new procedures and systems that make interoperability possible must be straightforward in their adoption, transparent in their influence and benefit, and in line with the priorities of the business of being a healthcare provider. The new procedures and systems should also require as little adjustment in practice as possible. The concerns of healthcare providers should be respected as they are given the opportunity to adopt more efficient and resource-saving systems into their daily practice.

American Health Information Community

On June 6, 2005, Department of Health and Human Services Secretary Mike Leavitt announced the creation of the American Health Information Community (AHIC) that will serve as a standards and policy advisory board for the healthcare industry. It will focus on accelerating the work necessary to reach widespread implementation of health data standards.[33]

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[31] Steven Pearlstein. "Innovation Comes From Within." *The Washington Post*, March 4, 2005.
[32] Statement of Mike Leavitt, Secretary of Department of Health and Human Services, before the Committee on the Budget, United States Senate, July 20, 2005.
[33] Office of the National Coordinator for Health Information Technology, Department of Health and Human Services. "American Health Information Community (the Community)." August 2005. <http://www.os.dhhs.gov/healthit/ahic.html >

If price difference is not a significant factor, purchasers will most often select those products that have the imprimatur, or certification, of a trusted entity. Product certification would allow doctors to purchase information technology systems knowing that they meet minimum standards of functionality and interoperability.

Certification will increase purchasers' confidence, encourage adoption, and ensure interoperability of systems with each other, as well as facilitate compliance with laws and regulations governing the exchange of healthcare information—much in the same way consumers feel more comfortable buying a car that got a favorable rating in *Consumer Reports*.

Certification should be based on universally recognized standards.

Standards: definition and parameters

Standards are agreed–upon specifications that allow independently manufactured products, whether physical or digital, to work together, or in other words, to be interoperable. Adherence to standards is the reason that any automobile gas tank can be filled at any gas pump, that any web browser can locate any public web page, and that an e-mail sent from an IBM–compatible PC can be read by people using Apple computers and vice–versa.

Unfortunately the standards that support universal web browsing and e-mail ex–change are important, but not close to sufficient for interoperable healthcare. True connectivity for healthcare requires standardization of the format and content of a wide range of health data elements so they can be understandable to computer programs as well as people.

Systems must be able to read and write standard messages to request health data, such as lab test results or complete medical records, and to return data when legitimately requested by patients and authorized healthcare providers. Many key data elements in these messages, including a patient's current problems, medica–tions, allergies, and lab tests, must contain standard vocabulary if the full benefits of interoperability are to be realized.

Over the past five years, considerable progress has been made in selecting the base set of messaging and vocabulary standards needed for efficient exchange of healthcare information. For example, some specific kinds of healthcare data, such

as lab tests results and radiology images, are routinely exchanged in standard electronic messages, but most do not yet use standardized terminology within them. Work has begun to ensure that the standard healthcare terminologies are properly aligned with the message standards and with standard code sets used in billing and statistical reporting. Vendors are beginning to incorporate standard vocabularies into new versions of their health information technology products.

Despite these significant accomplishments, the standards selected have not yet been refined to work together efficiently to create a single coordinated, comprehensive, non-overlapping set. Lacking this single set, system developers have been unable to build the standards-compliant systems that can support all the functions required by the people who will use them. The standards retain gaps that must be filled and some duplication that needs to be eliminated.

The selected standards will need to be tested in a wide range of healthcare settings in order to identify what changes must be made to ensure that these standards are helping patients and clinicians collaborate more efficiently, rather than slowing them down. One way to minimize the potential negative effects of the implementation of standards for doctors, nurses, and other health professionals is to standardize key healthcare data, such as medical devices, drug labels, and test kits at the point of manufacture.

Why we need standards right now

Until a practical and comprehensive set of standards is in place, the United States will never be able to trade the current patchwork of electronic health records and other systems for a system of interoperable healthcare. The lack of easily implemented, usable standards is the primary barrier to creating this system, but fortunately, this is a barrier that can be overcome with focused attention and action. Recent Federal actions to provide leadership for standards completion and implementation and to support robust regional testing of health information exchange will be critical in achieving workable standards.

Healthcare Data Elements

What data elements need to be standardized? Another way to ask this question is, 'What kinds of information do healthcare providers and payers need to know and computer systems need to interpret?' These items will range from basic identifying information to specific information about a patient's condition and history. Some examples will include:

1. Name, birth date, and gender of patient;
2. Family contacts;
3. Presented conditions and dates;
4. Records of allergies and reactions to medications;
5. Physicians seen; and
6. Lab test orders and results.

Standard Product Identifiers and Vocabulary. The standards and vendor products that enable the U.S. system of interoperable healthcare information must support these functions:

- Physician access to patient information, including past diagnoses and treatment, lab results, prescriptions, MRI results, and x-rays;

- Access among providers in multiple care settings;

- Systems that allow doctors to order medications and tests for patients in the hospital;

- Computerized decision-support systems, including best practices;

- Tracking for compliance to support study and revision of best-practice definitions;

- Secure electronic communication among providers and patients;

- Automated administration processes, such as scheduling;

- Automated filing of insurance claims;

- Patient access to health records, disease management tools, and health information resources; and

- Data storage and reporting for patient safety and public-health monitoring efforts.

Infrastructure Issue: Broadband Internet Access

Interoperability will require nationwide broadband connectivity—high-speed access to the Internet-among healthcare providers. This is because access to data for more than a trivial number of patients will call for significant bandwidth—the ability to accommodate many requests for large data files. Dial-up connections will be too slow to meet provider needs. (Patients, however, may be able to rely on dial-up, since they may only rarely need the bandwidth-driven ability to view detailed images and streaming audio or video.)

The level of broadband adoption has surged in the last few years. A study by the Department of Commerce shows that the number of Americans with high-speed Internet connections doubled from 2001 to 2003. Another study by the Pew Project shows a 60 percent increase between March 2003 and March 2004.[34] However, many rural areas have no broadband access and it will be an essential ingredient in fostering the development of health information technology in already underserved areas.

President Bush set a goal for universal affordable access to broadband technology by 2007. He said, "My Administration has long recognized the economic vitality that can result from broadband deployment and is working to create an environment to foster broadband deployment. All Americans should have affordable access to broadband technology by the year 2007."[35]

Federal, State, and private programs to promote the expansion of broadband may resolve this problem well before a connected healthcare system is fully deployed.

Federal preemption

Today, States can—and do—create laws that differ substantially from each other on privacy, security, and the handling of personal information.[36] In this environment, it is not possible to create a single set of procedures and systems that satisfies the regulations and statutes of all States.

This means that two physicians authorized by a patient to share information may not be able to legally do so simply because they are located in different States. Therefore, Federal jurisdiction should be superior to State jurisdiction in matters of medical privacy related to healthcare interoperability.

Legacy systems

"Legacy" systems (usually electronic medical record systems with limited interoperability capabilities) are those systems implemented prior to the introduction of common national standards. These are the healthcare systems in use today.

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[34] John Horrigan. "Pew Internet Project Data Memo." Pew Internet & American Life Project. April 2004.

[35] White House. "Broadband Rights-of-Way Memorandum." Memo to the heads of executive departments and agencies, April 26, 2004.

[36] Stephen A. Stuart. *HIPAA/State Law Preemption Fact Sheet*. State of California Office of HIPAA Implementation, January 9, 2003.

Their data storage, input, and even inventory of data items are unique and often proprietary. Legacy systems present a problem because each one is built for the needs of a particular task or even a particular facility, instead of for industry-wide flexibility. Moreover, many of these systems are designed to prevent interoper-ability with other vendors' applications to protect market share and to encourage purchases by hospital or clinic chains.

Legacy systems will be a part of the overall connected healthcare network, either temporarily or permanently. In either case, these legacy systems will require "middleware"—software and sometimes hardware—that translates the input and output of a system so it can interact with other connected healthcare systems.

Because legacy systems are critical to the business side of medicine, they cannot be shut down while new interoperable systems are being implemented. If a legacy system is being replaced instead of adapted, it must run simultaneously with the new system for a time to ensure constant, reliable access.

Other challenges of implementation

- **Planning for the unexpected.** The transition to a connected healthcare system may not be easy, but the problems on the way to conversion will be more readily accepted by providers if they understand, from the beginning, that unexpected problems will occur, and if they understand, at least in general terms, what types of problems may arise.

- **The timeline for adoption.** Providers are more likely to embrace an interoperable system if they know how long it will take to get the system up and running. No one wants a promise of an early delivery if that promise is not likely to be kept. It is especially important to build in extra time to solve unexpected problems.

- **Education strategy.** Healthcare providers will need to be taught how to use the connected system and why its use is important. If healthcare providers simply believe the system is a new way to fill out forms, they are less likely to acquire the technical skills and knowledge needed to make full use of the new system. When healthcare providers understand the potential for making their job easier, they are far more likely to apply serious effort toward using the tools of the new interoperable system.

❝ If there is no struggle, there is no progress. **❞**

**Frederick Douglass,
American Abolitionist and
Author (1818 – 1895)**

Interoperability costs and benefits

Spending on interoperability is an investment, not just an expense, because it produces a return in the form of saved time, reduced paperwork, increased quality of care, reduced need for treatment, and saved lives.

Since there is no complete implementation of a connected health information system yet, the exact financial savings are only speculation. However, the extent of these returns will depend on how thoroughly the interoperable system is integrated into the facility or practice and the extent to which patients participate.

Ultimately, interoperability will enhance the "culture of care." It changes the structure of an organization by redirecting resources, step by step, toward more patient–centered services. Tasks that once required a doctor or nurse to take time away from direct caregiving become automated at best and less time–consuming at least.

Pay-for-Performance

Pay-for-performance is an initiative to promote quality care. This initiative realigns provider payment incentives to follow care guidelines based on scientific evidence about what actually helps to prevent or treat disease. Pay-for-performance is directly tied to the development of a national health information exchange because tools such as electronic prescribing and electronic information exchange help improve patient care and reduce medical errors.

Confidentiality

"We need a better way to share information. We need a better system so that physicians have at their fingertips all the information they need to do their job—including patient history, the latest research, drug interactions, and everything else they need…. Information, in the hands of the right people, at the right time, drives quality and value. We need to empower patients and healthcare providers to make the right choices. And to do that, healthcare decision-makers—providers, payers, and patients—need to have access to the right information, where and when it is needed, securely and privately."

Senator Hillary Rodham Clinton

Patient consent

Before the interoperable system goes on-line, the rules on consent must be clear. Privacy and security policies should be considered as a part of design, not as an afterthought, and should be based on current law.[37] Legislation and regulation should be regularly considered to reevaluate emerging technologies and capabilities. Policies must be widely agreed to by patients and practitioners alike on the terms and conditions for access to and dissemination of patient data.

The structure and rules of health information networks must support the exercise of patient rights under Federal privacy regulations. Although State privacy rules vary, Federal jurisdiction should be superior to State jurisdiction in matters of medical privacy related to connectivity. Health activities that are not directly covered by the Health Insurance Portability and Accountability Act (HIPAA) need to be associated with this or other privacy rules, by either regulation or statute.

[37] Some laws, such as the Health Information Portability and Accountability Act of 1996 (HIPAA) (Public Law 104-191), may need revision in light of the benefits and concerns that arise under an electronic and interoperable system.

According to HIPAA rules at the time of this writing, a patient's consent is not required:

- When emergency care is needed;

- When a provider is required by law to administer treatment;

- When substantial communication barriers exist and, in a professional's judgment, the circumstances infer the individual's consent;

- For a provider with an indirect treatment relationship to provide services (e.g., laboratories);

- For a health plan to use the information for treatment, payment, or healthcare operations; and

- For a clearinghouse to use the information for treatment, payment, or healthcare operations.

Security authorization devices

Systems of passwords and biometric devices such as fingerprint readers and voice-scanning systems should be used to help ensure data and networks are secure. These security devices and procedures will vary from application to application. For instance, it should be physically easy (but not easier in terms of data protection) to enter authorization on devices to be used primarily in emergency applications. An emergency medical technician working an accident on the side of the road should be able to log in without using a large keyboard or numerous keystrokes. A retinal or fingerprint scan would save time and, therefore, speed treatment.

Punishment for violations

The Federal government has passed laws to punish individuals guilty of identity theft.[38] Electronic information breaches of any kind should be punished at least as severely as similar offenses such as fraud, theft, and forgery. Laws should be

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[38] United States. Cong. Senate. *The Identity Theft and Assumption Deterrence Act.* Public Law 105-318.

enacted with stiff criminal sanctions against individuals who purposefully access protected data without authorization. There should also be clear and comprehensive safeguards to protect anyone whose personal data was improperly accessed or released.

Patient Authentication

Creating a unique number would be the most direct way to establish a patient's identity and this approach is used throughout Europe. However, no approach to personal authentication in computer systems is free of financial costs, management issues, and privacy concerns. A direct approach would involve an administrative infrastructure that may be unacceptable to some at this time for a variety of reasons, including privacy concerns.

This approach could be modified to allow individuals to opt out of the uniform patient identifier. This compromise would let the nation provide a system benefiting individuals who recognize that their need for connected health information exceeds their privacy concerns, while not penalizing those who find privacy more valuable. However, such a compromise would sharply reduce the administrative savings because the system would have to accommodate both sets of individuals. It would also present new liability challenges, specifically involving the potential liability of providers who lacked information in the treatment of a consumer whose information was not available.

An alternative to creating unique personal identification for everyone is to define a national standard set of authenticating information required to receive healthcare. This set of data could be captured when an individual first enters the healthcare system. Such information could include a set of data such as date of birth, school, employment, and insurance policy number.

Individual Access

Medical records should be like money in a bank account: the money belongs to you, while the task of accounting belongs to the bank. By further allowing patients to add comments to specific areas within the record, they can take a proactive role in maintaining their health record while the information remains clear to the healthcare provider.

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In healthcare, changes most often enter the practice of medicine in the form of new drugs and procedures for a single illness or disease. But interoperability or connectivity—the notion of a national or even global electronic health information system—is a change that will affect the overall practice of medicine. Its legion of benefits—better-educated patients, complete physician access to medical histories, and easier consultations, just to name a few—enhance patient care and provider support in all healthcare circumstances. This is a rare thing.

As the Internet affected all facets of daily life, connectivity will enhance all facets of healthcare. At last, healthcare providers will gain tools to support healthy lifestyles of patients. The information gap for providers seeing new patients will be closed. And the costly and time-consuming paperwork that burdens everyone in this field will be significantly diminished—a light at the end of the tunnel that few doctors ever imagined they would see.