

The Problem and the Solution

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The Problem and the Solution

“The day is not far off when we can walk into a medical clinic and not be handed a clipboard to enter the same information you’ve filled out a hundred times.”

Mike Leavitt, Secretary, Department of Health and Human Services

The Problem with the Paper System

The healthcare system: Did you know it could be better?

Your life should not depend on your ability to memorize. Yet to some extent today, it does.

On a business trip, you wake up with strange, painful symptoms in the middle of the night. You take a cab to the emergency room where doctors try to help you. They need to know your medical history.

And you ... don’t know. Or can’t remember. Or never knew the details.

Although your airline ticket confirmation number, your rental car record, and even your cellular phone bills and calling history are available 24/7 on-line, your medical records are locked away in filing cabinets somewhere, partially hand-written and partially typed, stored in paper folders, and stacked alphabetically.

At four in the morning, that person with the key to your medical information is fast asleep and, in this case, a thousand miles away. How would you reach him or her? Would you call your doctor’s answering service and hope someone will go down to the office? Perhaps it can wait until morning—but wouldn’t it be better for the doctor treating you now to have that information now?

Meanwhile, that emergency room doctor is asking you to remember as much of your history as you can ... while your stomach is in a knot ... or your head pounds ... or the pain in your chest begins to creep into your jaw and down your arm.

Scenes like this play out daily in America in emergency rooms, in the backs of ambulances, in doctors’ offices and hospitals, in walk-in clinics and neighborhood

health centers. Sometimes it's merely inconvenient, and a healthcare provider can contact another provider to get the necessary information—a few hours or days do not make a difference. But often there is no time for delay. Not after a serious car accident. Not during a stroke or heart attack. Not in a medical emergency far away from home. Not after a natural disaster or a terrorist attack.

Interoperability or connectivity—constant, instant access to your medical information—is the only answer. Although such access is available for everything from shopping to helping with homework, it is not available for medical records.

Yet it ought to be. And the technology to make it available already exists.

The most basic information about your health—medicines you take, tests you've had, doctors you've seen, vaccinations you've received, illnesses you've had—ought to be available at your fingertips. And at your doctors' fingertips.

But it isn't. Not for you. Not for your children. Not for your parents. Not for your wife, husband, partner, or best friend.

Not unless you carry it around yourself—and who carries copies of their own x-rays and medical charts? And even if you did, could you possibly carry them around wherever you go on the chance you might be injured and need them?

Individuals who rely on the medical system may find themselves in a dire situation: the most critical information about health and quality of life—the data that would and should guide future treatment—can't be accessed in a timely manner by many healthcare providers.

The cost comes in wasted time, diminished quality of care, duplicate testing, needless expense, unnecessary worry ... and, worst of all, in lives lost.

The paper-based system is not good enough anymore

Consumers don't realize how much benefit there is in having an interoperable system of medical information. Most people don't even realize such a thing is possible. And not knowing the need for such a system, people certainly don't know that the technological answer to the need is within reach. The public has accepted that medical records are kept in paper files in metal cabinets, and that's the way it is.

“ The learning and knowledge that we have, is, at most, but little compared with that of which we are ignorant. ”

Plato, Greek Philosopher



Making the connection. ATMs and on-line banking provide universal access to your financial records. Oil service centers keep service records on your car accessible nationwide. Airlines keep track of your flight history, your seat preference, your payment history, and your frequent-flyer miles—and you can access them yourself on-line, too.

This technology should be applied to healthcare immediately. It means more than convenience: this technology will save lives.

The paper-based system of medical information currently in use has no connectivity, no ease of access for either patients or providers, and limited security and tracking of access. It is a barrier to improved treatment, and it diverts critical resources to bureaucracy and administration when they could be put to better use for direct patient care.

The problems with paper

Problems with the paper-based system run the gamut. Some are just inconvenient: waiting for vaccination records before a parent can take a child to camp or enroll the child in school, or making a trip across town to take the child's records to another doctor. Others are critical: for example, treating a patient with a chronic condition or who is in a life-threatening situation far from home, but unable to supply the healthcare provider with detailed medical information.

The problems affect both healthcare providers and patients. For instance, doctors must be sure that access to paper records is limited to authorized personnel and must keep track of physical files that can be inconvenient to move around. Patients suffer because there are health benefits available that a paper-based system cannot support: post-visit interaction with a doctor by electronic communication; the ability to track one's own health information and more closely follow detailed treatment plans; and, of course, the ability to provide a physician with instant access to critical information, especially in an emergency.

The inconvenience of paper-based systems

- **Difficulty sharing medical history and lab results with other doctors.** When doctors do consultations, accept new patients, or review lab results, paper-based information is almost always involved. That means information is

“We live in the Information Age, but our healthcare industry is stuck in the Stone Age.”

Senate Majority Leader Bill Frist

transmitted via fax machine, telephone conversation, courier, or mail. All these methods have the potential for misread or misheard data, lost information, delay, and breaches of security.

- **Inconvenience of securing vaccination records for camp and school enrollment.** Almost every childhood activity outside the home requires proof of vaccination. That means a trip to the doctor's office for the patient or the parent. A paper-based system costs your family time.
- **Recounting medical history for every new doctor.** Nearly every new healthcare provider a patient sees will need to review his or her medical history. People move and travel more than ever, so this need is especially acute. No one can be expected to remember his or her entire medical history, and the record will be remembered even less accurately when a patient must see a new doctor in an emergency.
- **No support in caring for aging parents far away.** Many adults find themselves taking care of their aging parents, and they often have to do so from far away. Medical information is almost always written down or conveyed in conversation, leaving long-distance caregivers with an additional burden. They have no convenient way to keep track of prescriptions, interact with a physician, review test results, or be sure that the parent is following the doctor's treatment plan.
- **No easy way of getting quick answers to follow-up questions.** Doctors want to help patients as much as they can, especially with matters such as following the treatment plan, providing more details about a condition, or finding general information about lifestyle choices. But the lack of connectivity means that patients have to wait by the phone or play "telephone tag" with their healthcare providers instead of using e-mail or accessing on-line articles that physicians and others have made available.

The lack of confidentiality in a paper-based system

- **Confidentiality is hard to preserve using paper.** Patients do not want their sensitive, personal medical information stored in a way others can easily access. Doctors are committed to honoring the trust patients place in them, and they are bound by laws, regulations, and rules of ethics to protect confidentiality. But under today's paper-based system, privacy is most often a

“President Bush wants to maximize the benefits of information technology—electronic medical records—so that doctors and nurses can better monitor treatments and reduce errors and patients can go from doctor to doctor with their complete medical history.”

First Lady Laura Bush



“The single biggest problem in communication is the illusion that it has taken place.”

**George Bernard Shaw,
Winner of the Nobel Prize for
Literature in 1925**

matter of locks and keys: paper records are kept in file cabinets on the premises of a healthcare provider, and older records may be stored off-site. When records are being accessed—when doctors and nurses are referring to them during an office visit, for instance—privacy is often a matter of trust: notes regarding patients are kept in file folders that rest in plastic trays attached to an exam-room door, or on a billing clerk’s desk, or in a pile awaiting lab results.

- **No way to keep track of who sees paper records or to keep unauthorized people out.** Unlike electronic records, paper records can be examined without any record of who looked at them, when a person looked at them—or copied them—and why. While security is always a priority for administrative staff and medical librarians, a record casually left out for even a few moments can easily be examined or even copied by unauthorized persons.

Patients, especially those with serious illnesses or those who have confided compromising secrets to their doctors, understand that if their information is exposed, they could be irreparably harmed. They fear the loss of a job, embarrassment at home or work, bias, and the inability to get insurance coverage.

Lack of access in the paper-based world

- **No instant, constant access to your healthcare information.** Paper records have to be carried from place to place, faxed, or summarized in a phone call. The only way this transferred information is preserved is if it has successfully been received and placed in your medical file.
- **No guarantee for information backup.** Your paper-based records could be destroyed by fire, flood, or other catastrophe, like Hurricane Katrina, or they could be damaged or stolen. Unless the doctor has made copies of every paper in the filing cabinet, that part of your medical history is lost.

Possible compromises to quality of care from a paper-based system

- **Illegible handwriting in records and prescriptions.** Paper records are a mix of typed text and handwriting, and prescriptions are usually written completely by hand. Illegible handwriting in healthcare information can

mean the loss of potentially important data when someone returns later to find that he or she cannot read the information written. In addition, pharmacists may make mistakes filling prescriptions because of illegible handwriting, or may have to spend extra time calling the doctor's office to get clarification about a prescription. The Institute for Safe Medication Practices estimates that pharmacists make more than 150 million calls to physicians each year to clarify what was written on prescriptions.¹

- **Patients with chronic conditions cannot easily get the information they need.** Short of conducting their own research in a medical library, patients have no way of learning how to take better care of themselves or better understand their condition in light of details from their medical test results and treatment.
- **Recalls are slowed or may be incomplete.** When medical devices and drugs are recalled, either by the Food and Drug Administration or by the companies that manufacture them, there is no system in place to quickly and efficiently contact physicians and their patients to advise them what to do.
- **We are missing out on powerful public health tools, especially against bioterrorism.** Healthcare monitoring based on information technology is crucial in fighting bioterrorism, tracking disease, and supporting medical research. This information should be available quickly, on a day-to-day basis, and accessible at our nation's hospitals and research facilities.

Barriers to connecting health information

A connected healthcare system will overcome a lot of challenges, but implementing that system brings about challenges of its own:

- **Fear of change.** Doctors' methods and work habits are key to their ability to help patients. Doctors understand implicitly that changing those habits can affect the quality of care they deliver; but once a physician has embraced technology, he or she can help drive further interoperable efforts to improve healthcare.

Americans Embracing Technology

People initially bought cell phones for emergencies only, but today they are in common use. We wonder how we got along without them. Consumers may initially demand connectivity because it seems like a vital element of a safe and efficient healthcare system—which it is. But once it is in place, the convenience and security it makes possible will make it hard for us to imagine what life was like before it.

¹ Institute for Safe Medication Practices. "Electronic Prescribing Can Reduce Medication Errors." August 2005. <<http://www.ismp.org/msaarticles/whitepaper.html>>

- **Cost.** A question from every healthcare provider is: Where will the money come from to pay for this? The answer is that some will come in the form of direct savings and some in the form of governmental and private incentives.
- **Connecting vendors.** Vendors—the companies that sell electronic health-care systems—often try to protect their market share by making sure their systems will not interact with anybody else’s system. Vendors have financial incentives to work against each other, not with each other. But with the establishment of common standards, and as healthcare providers and the public realize that interoperable systems can save lives, pressure will grow for vendors to give their clients systems that can connect to one another. And, since the technology already exists, vendors will be able to provide connected systems faster and more easily than ever before.
- **Lack of standards.** Besides allowing vendors to create systems that don’t “talk” to each other, the lack of standards discourages significant investment or effort toward an interoperable healthcare system. The Institute of Electrical and Electronics Engineers sets standards for computers and Underwriters Laboratories ensures that appliances meet safety specifications. Without an industry-recognized body for healthcare, the government will need to set those standards, coordinate their establishment among groups now pursuing them, or act as a catalyst for the creation of standards through some other method.

Legal considerations

Legal considerations are of special concern, especially regarding those laws that make it illegal to set up business deals that would promote interoperability. The Inspector General for the Department of Health and Human Services has addressed the Federal “anti-kickback” law:

On the books since 1972, the Federal anti-kickback law’s main purpose is to protect patients and the Federal healthcare programs from fraud and abuse by curtailing the corrupting influence of money on healthcare decisions. Straightforward but broad, the law states that anyone who knowingly and willfully receives or pays anything of value to influence the referral of Federal healthcare program business, including Medicare and Medicaid, can be held accountable for a felony. Violations of the law are punishable by up to five

years in prison, criminal fines up to \$25,000, administrative civil money penalties up to \$50,000, and exclusion from participation in Federal health-care programs.²

Changes in the law created “safe harbors”:

Because the law is broad on its face, concerns arose among healthcare providers that some relatively innocuous—and in some cases even beneficial—commercial arrangements are prohibited by the anti-kickback law. Responding to these concerns, Congress in 1987 authorized the Department to issue regulations designating specific “safe harbors” for various payment and business practices that, while potentially prohibited by the law, would not be prosecuted....

Safe harbors immunize certain payment and business practices that are implicated by the anti-kickback statute from criminal and civil prosecution under the statute. To be protected by a safe harbor, an arrangement must fit squarely in the safe harbor. Failure to comply with a safe harbor provision does not mean that an arrangement is per se illegal. Compliance with safe harbors is voluntary, and arrangements that do not comply with a safe harbor must be analyzed on a case-by-case basis for compliance with the anti-kickback statute.³

Safe harbors such as those addressing investments in large, publicly held healthcare companies or investments in small healthcare joint ventures, referral services, and certain settings in managed care need revisiting to remove roadblocks that discourage physicians, hospitals, other healthcare providers, and payers from working together to invest in interoperability.⁴

In addition, the “Stark Law” merits adjustment, either by statute or by regulatory clarification. By prohibiting referral of Medicare patients between physicians who have a financial relationship, the law not only cuts down on kickbacks—a desirable goal—but also makes it impossible for doctors and hospitals to join

² Office of Inspector General, Office of Public Affairs. *Fact Sheet: Federal Anti-Kickback Law and Regulatory Safe Harbors*. DHHS. November 1999.

³ *Ibid.*

⁴ *Ibid.*



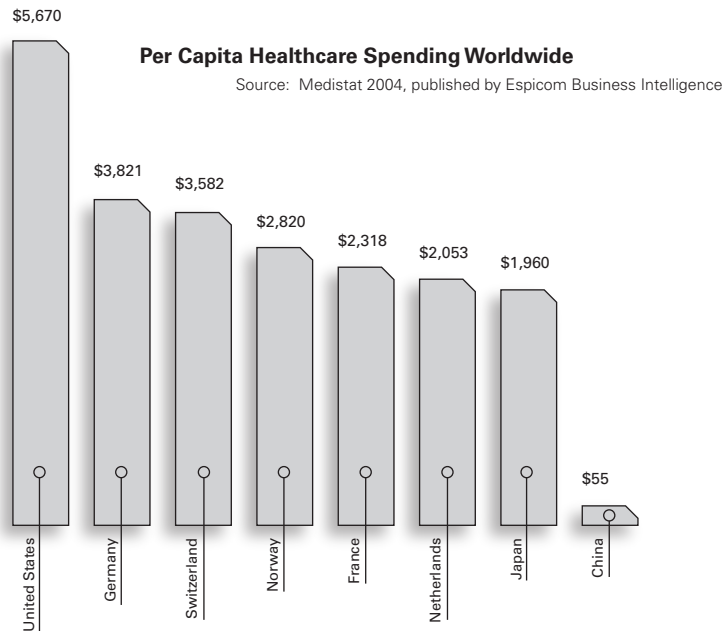
together to acquire interoperable systems at anything but considerable financial sacrifice.⁵ Greater precision is needed.

Connecting around the world

- **The United States is far behind other countries.** Several countries have already invested in electronic tools to reduce costs and improve healthcare. Many countries are now developing strategies and investing in interoperable tools to connect their health systems and reap even greater benefits from information technologies. Although the United States leads the world in healthcare spending per capita, our technology lags far behind other nations.

“Americans are spending \$1.7 trillion on healthcare every year, accounting for 15.3 percent of our gross domestic product, at an average cost of \$5,670 per person. Our lagging health IT infrastructure compounds the problem, contributing to fragmentation, waste, and inefficiency.”

Statement by Senate Majority Leader Bill Frist and Senator Hillary Rodham Clinton



- **The United States leads the world in healthcare spending per capita.** Germany, in second place, spends roughly 60 percent of what the United States spends. France, in fifth place, spends about 40 cents per person for every dollar spent in America.⁶

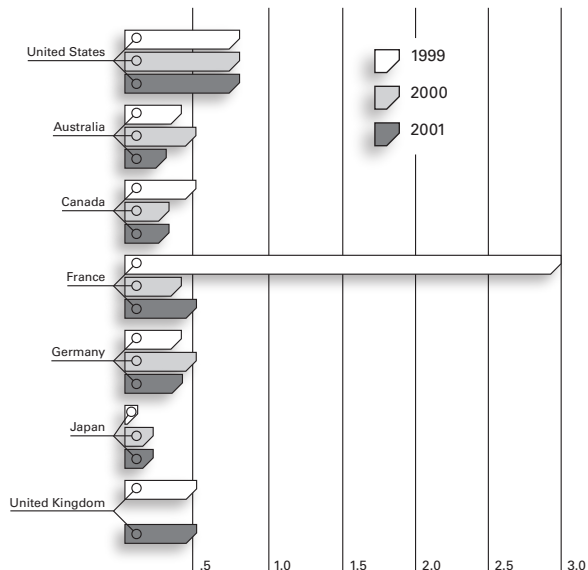
⁵ American Academy of Physical Medicine and Rehabilitation. *Stark II Analysis and Summary: Introduction*. 2005. <<http://www.aapmr.org/hpl/pmrprac/starkb.htm>>

⁶ Information from Medistat 2004, published by Espicom Business Intelligence.

Deaths Due to Mistakes in Surgical and Medical Care

Deaths/100,000 Pop.
(Standardized Rate)

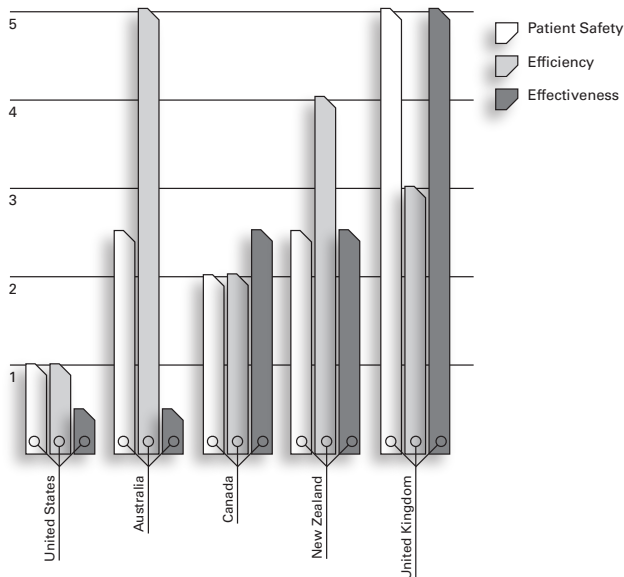
Source:
OECD HEALTH DATA 2005,
June 2005



We're Not the Best

(Rank in Surveys of 1,400 Adults and 750 Sicker Adults; Ranking of 0 is the Worst, Ranking of 5 is the Best)

Data:
2004 Commonwealth Fund International Health Policy Survey of Adults Experiences with Primary Care



“It may seem a strange principle to enunciate as the very first requirement in a hospital that it should do the sick no harm.”

Florence Nightingale, Founded Modern Nursing and Helped Improve the Care Provided by Hospitals (1820 – 1910)

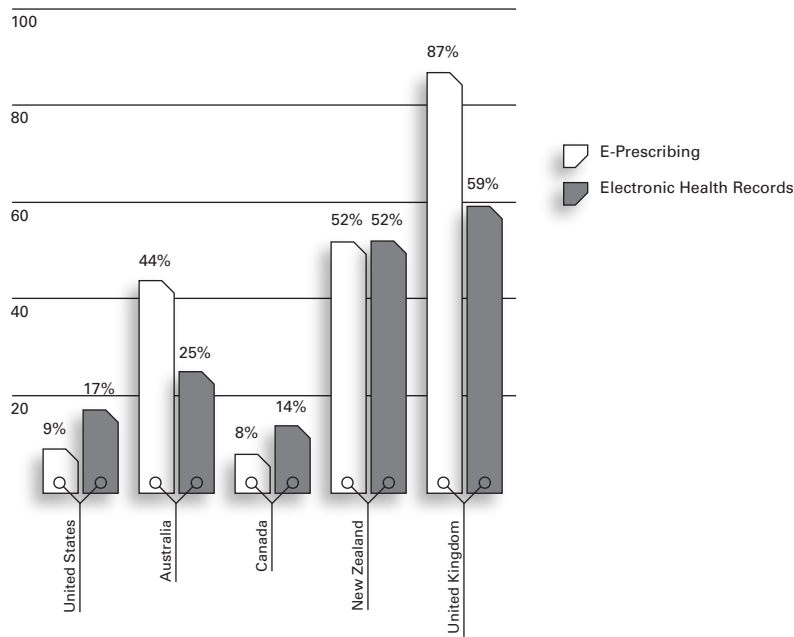
- **Yet the United States is far behind the world in quality of care and has the highest death rate due to medical error.** The Nation is behind the United Kingdom, Australia, Canada, and New Zealand in patient safety and efficiency of treatment.⁷

⁷ 2004 Commonwealth Fund International Health Policy Survey of Adults Experiences with Primary Care, conducted March through May 2004.
<http://www.cmwf.org/surveys/surveys_show.htm?doc_id=24540>



Percentage of Physicians Worldwide Using E-Prescribing and Electronic Health Records

Source: Harris Interactive Survey, 2001



- **One reason for all the spending and the lack of success may be that the U.S. healthcare system lacks connectivity.** Only 17 percent of physicians in America use electronic healthcare records, and only nine percent use electronic prescription systems (e-prescribing). Yet in the United Kingdom, nearly six out of 10 physicians use electronic health records, as do about half of the physicians in New Zealand and Australia.⁸

Nations on their way to interoperability

- **United Kingdom:** The United Kingdom uses electronic healthcare records, but interoperability is limited. Successes in interoperability include exchanging pathology reports and sharing emergency information.⁹ The common care record enables all of England to link up health information and produce integrated information about a person's state of well-being.¹⁰

⁸ Information from the Harris Interactive Survey, 2001.

⁹ British Computer Society. "Comprehensive Computerised Primary Care Records Are an Essential Component of Any National Health Information Strategy: Report from an International Consensus Conference." *Informatics in Primary Care* 12 (2004): 255-64.

¹⁰ United Kingdom Department of Health. "A Guide to the National Program for Information Technology." *NHS Connecting for Health* <<http://www.connectingforhealth.nhs.uk/>>

- **New Zealand:** New Zealand uses electronic healthcare records, but interoperability is limited. Yet “New Zealand has many of the ... components [necessary for interoperability]: secure health information networking ... a unique patient identifier, well-developed privacy and security legislation, and a national standards organization.”¹¹ “The New Zealand health sector ... is second only to the United Kingdom in terms of primary care use of electronic healthcare records, double that achieved to date in Australia (25 percent) and triple that of the U.S. (17 percent).¹²
- **Sweden:** Sweden’s healthcare system is widely digitized, but not able to freely exchange information. Still, more than 90 percent of general practitioners use electronic healthcare records.¹³
- **Canada:** Canada has committed over a billion dollars to the development and implementation of interoperable electronic health records, and aims to have infrastructure solutions in place in half of Canadian jurisdictions by 2010.¹⁴
- **Denmark:** Denmark has had an interoperable system since the late 1980s. Currently, the majority of general practitioners, laboratories, and hospitals are connected to one another, although patient referrals and a few other types of messages are still sent on paper.¹⁵

¹¹ Karolyn Kerr. “The Electronic Health Record in New Zealand—Part 1.” *Health Care and Informatics Review Online*. 8, no. 1. March 2004.

<<http://www.enigma.co.nz/hcro/website/index.cfm?fuseaction=articledisplay&featureid=040304>>

¹² Ibid.

¹³ “Increasing use of electronic prescriptions in Sweden.” *European eGovernment News*. April 27, 2005. <www.europa.eu.int/idabc/en/document/4221/353>

¹⁴ “About Infoway.” *Canada Health Infoway*, 2004. August 2005. <<http://www.infoway-inforoute.ca/aboutinfoway/index.php?lang=en>>

¹⁵ ACCA and Medcom, in collaboration with the European Commission Information Society Directorate-General. *The Cost of Electronic Patient Referrals in Denmark Summary Report*. 2004.



A System for Biosecurity

The Center for Biosecurity at the University of Pittsburgh Medical Center (UPMC) is a model for preparing for outbreaks of disease. Its system is an inbound call center for medical information. The call center allows UPMC to know what hospitals within the network have open beds or other resources that can be shared. All 7,000 physicians in the UPMC system can call a number and speak to an expert within minutes. Such a system can also serve as a command and control center should a disaster occur, having been tested in emergencies including fires, floods, and breakdowns in hospital ventilation systems. Western Pennsylvania healthcare providers, public health officials, and law enforcement officers can access the system.¹⁶

The Solution—Interoperability

“The first rule of any technology used in business is that automation applied to an efficient operation will magnify the efficiency. The second is that automation applied to an inefficient operation will magnify the inefficiency.”

Bill Gates

Don’t reform! Transform instead

Healthcare must always be about people, not about a system. Even though people working in the healthcare system have great concern for patients, there are not always ways built into the system to encourage personalized attention and “second looks” at difficult choices. However, a connected system of health information would make that more possible by creating new and better ways to personalize information and interact with medical information. How? By making critical information more readily available for review on an individual basis.

A connected system of healthcare information will be a major shift—but it will come about through incremental change. Those changes will be more than automated or more efficient versions of what we already do. There will be new ways to support and even provide healthcare: replacements and refinements for existing processes, procedures, and work habits that will improve outcomes.

An interoperable system will enable faster and more efficient care by connecting the healthcare providers who take care of you with critical, personalized information. It will better integrate research, new best practices, and pharmaceutical information into the common practice of medicine. As new technology makes your health more a part of the decision of treatment, an interoperable system will make your information available in a timely way. And the concept of evidence-based care will become a more integral part of the practice of medicine.

The push for making medical records systems “talk” to one another is focused on the needs of patients, doctors, nurses, and others involved in treatment, allowing for personalization, adaptability, and individual choice on all parts.

¹⁶ Fred Baldwin. “Nine Tech Trends.” *Healthcare Informatics Online* (February 2005): 13.

A system that works best for everyone will be built with allegiance to no particular method, program, or model, but with flexibility for the choices and needs of patients, doctors, nurses, and other healthcare providers.

The convenience of connecting

- **Allows doctors and other healthcare providers to share medical history, lab results, and other pertinent information.** The ability to share information makes consultations easier and permits the consulting physician to review the complete picture of a patient's healthcare as needed. Patients can follow up on the meaning of lab results; record comments about their diet, exercise, and other lifestyle choices; and address questions to their doctors without having to schedule an appointment or a phone call.
- **Easier to secure vaccination records for camp and school enrollment and provide records to other doctors.** Schools and camps usually require confirmation of vaccinations. An interoperable system means the necessary records are available to any authorized person. Treatment while away from home or after a move no longer requires the physical transportation of records, just authorization by the patient for a new healthcare provider to access health information.
- **Better support for adults caring for aging parents.** Adults caring for their aging parents—especially those doing so from far away—can more easily review material made available by their parent's doctor, discuss medical choices, monitor the parent's compliance with a course of treatment, check to see that prescriptions are filled, and stay in contact with on-site caregivers and nurses.
- **Easier to work with doctors after diagnosis and treatment.** An interoperable system allows patients to more easily contact their doctors to confirm adherence to a treatment plan, to ask questions, and to learn more about their condition.

“Information technology is a pivotal part of transforming our healthcare system. We are at a critical juncture. Working in close collaboration, the Federal government and private sector can drive changes that will lead to fewer medical errors, lower costs, less hassle, and better care.”

**Mike Leavitt, Secretary,
Department of Health and
Human Services**



Confidentiality is easier to preserve

- **Easier to limit unauthorized access.** Connected systems provide more consistent and measurable security than paper-based systems. Instead of filing cabinets, locks, and guards, electronic records are kept behind log-ins or biometric sensors.
- **Easier to track who views your medical information.** Anyone who attempts to log-in to the system and review private healthcare information will have to provide authorization. Unlike paper records, which can be misplaced or copied, electronic records can be constantly monitored and their access tracked. Patients concerned about the unauthorized release of personal information will realize a level of security that is, in healthcare, thus far unknown—because even those who attempt unauthorized access will have left their electronic “fingerprints” in the system.

Easier and more secure access

- **Records are always available with instant access.** Interoperable electronic health information systems provide constant access to data for authorized users. If a doctor or patient needs a medical history, lab results, or radiological images at any time, the information can be reviewed instantaneously.
- **Records less likely to be lost.** Electronic healthcare information stored on an interoperable system will be preserved in backup copies, so it is highly unlikely that records would be lost.

Improved quality of care

- **Notes, prescriptions, and data are always readable.** Paper records are written at least partly by hand, but electronic records are stored as digitized text, visual image files, and matrices of standard options. There will never be any doubt about text recorded in the electronic information.
- **Patients with chronic conditions can take better care of themselves.** Those with chronic conditions such as diabetes can benefit from improved interaction with their healthcare providers and increased access to healthcare

information. With an interoperable system, those patients will be able to more easily contact their healthcare providers, allowing those patients to more effectively manage issues of day-to-day care. When healthcare providers establish on-line links to articles and information about various conditions, their patients gain tools for maintaining their health.

- **Notification of recalls can be carried out faster.** When the Federal Drug Administration, a manufacturer, or other authorized party issues recalls or advisories about medical devices and prescription drugs, an interoperable system can help identify and notify doctors and patients far more quickly than an individual search through medical files by healthcare providers.
- **Connectivity makes powerful public-health tools possible.** With an interoperable system, authorized groups can conduct advanced biosurveillance—the acquisition and study of anonymously sourced data for trends, the appearance and movement of disease by geography and demography, the efficacy of treatment, early warnings of epidemic disease outbreak such as West Nile or avian influenza—and ascertain whether trends in data suggest the possibility of biological or chemical attack.



Paving the Way to Interoperability

An interoperable medication record for every American

Having an electronic medication record for every American is a critical step toward achieving true interoperability in healthcare, giving treating physicians the information they need when they need it, allowing more effective care for their patients. It will bring all the medications an individual is currently taking to the doctor's attention at the time important decisions about new prescriptions are being made. With tens of millions of Americans relying on so many different medications to manage everything from elevated blood pressure to high cholesterol, a physician needs a patient's accurate and up-to-date medication list to prescribe the right medication at the right time for an individual's specific health concern, while avoiding the potentially harmful effects of a negative drug interaction.

Consider the following example of how one physician's practice might benefit from a patient's medication record.

2005: A portrait of today's state-of-the-art electronic medical record system

No interoperability

Dr. Vivian Schilling wants to provide her patients with important information about their health. She also wants to have access to information that can help her be a better doctor. She uses an electronic medical record system in her office that allows her to access patient information from her desktop computer, tablet personal computer, handheld computer, or from home. Dr. Schilling is one of the 10 to 30 percent¹⁷ of more than 871,000 practicing physicians in the United States¹⁸ who currently use a full version of an electronic medical record system.

A unique user name and password securely connects Dr. Schilling to a patient's electronic "chart" right in her office, during a visit. While she talks to her patient, she enters information directly into the electronic medical record, documenting every detail of the case as the patient describes symptoms and concerns. She can do so without the potential problem of illegible handwriting because, depending on the device she uses, she can speak, type, or have her writing converted to digitized text.

¹⁷ *Advanced Studies in Medicine* 4, no. 8 (2004): 439.

¹⁸ 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> >

Each time Dr. Schilling sees a patient, she reviews and updates the information in the electronic medical record. She also uses the system to view the results of imaging studies and laboratory tests she has ordered to help guide her treatment decisions. And as she determines the best course of care for her patient, the system provides another layer of safety by automatically presenting a series of alerts—potential concerns for a patient that the physician might wish to consider—based on the patient’s age, sex, health condition, and medication.

When Dr. Schilling chooses medication, she uses the system’s pharmaceutical database, which contains thorough information about each of the drugs she could prescribe. With this tool, she can determine the appropriate prescription and avoid allergic reactions, unnecessary side effects, and potentially harmful interactions between drugs.

The electronic medical record system also gives Dr. Schilling the ability to review all the patients she treats as a single group, so whenever new medication information is released, she can quickly identify all the individuals taking a given medication and quickly provide them with important information that could impact their health. For example, when the U.S. Food and Drug Administration issued a public health advisory about the withdrawal of Vioxx® from the American market, each of Dr. Schilling’s patients who were taking Vioxx® were identified through the system and notified within 24 hours to stop taking the medication.

Dr. Schilling understands that patients who feel connected to her as their physician, and who are educated about their own individual health concerns, are more likely to be actively involved in maintaining their health over time. They make better lifestyle choices, tend to eat better, watch their weight, and avoid significant health risks by getting enough exercise and not smoking.

For example, when patient Betsy Clemmons arrives for her first office visit, Dr. Schilling invites her to enroll in a personalized on-line service that provides tools for health management. Describing the system as an “on-line connection to her own electronic medical record,” Dr. Schilling tells Betsy about the things she will be able to do, such as viewing information the doctor has entered in the electronic medical record about Betsy’s health issues; reviewing information from past appointments, including any patient instructions the doctor recorded; receiving the results of tests almost as soon as they are released; requesting new



appointments and prescription renewals; and receiving reminders about when her next health screening or tetanus shot is due—and all this will be available from any Internet connection, any time, day or night.

Perhaps most important, the tool contains links that provide Betsy with reliable information about the issues that matter most to her. For example, Betsy has a history of diabetes in her family. As Dr. Schilling is ordering a blood glucose screening at this first appointment, when Betsy gets home and logs in to the on-line tool, she can click on links to read in detail about diabetes, better understand how she might avoid it, and see how others manage the disease. Of course, Betsy's personal information is encrypted and secure. No one but Betsy, Dr. Schilling, and the nursing and office staff directly involved in Betsy's care can access it.

Although the system significantly improves Dr. Schilling's ability to provide superior medical care, its effectiveness is limited because the information in it is limited to Dr. Schilling's practice. Ideally, a patient's vital medical information should be accessible to any physician treating that patient, no matter where the patient may be when care is needed. Still, Dr. Schilling's system is an important first step toward an interoperable medication record.

2006: Smart personal medication record

Stage 1: Limited interoperability

In 2006, Betsy becomes interested in having her own personal medication record. She wants to include prescriptions from all her physicians, along with over-the-counter medicines she takes on her own—not just prescriptions from Dr. Schilling.

Betsy finds a secure, password-protected on-line service that allows her to enter her medication history and access it at any time. She enters the medications she is currently taking, along with her known allergies, history of drug interactions, and other health conditions. All information will be entered manually by Betsy, but if she enters the Federal Drug Administration's medication product code found on the label of her prescription bottles, official and complete drug information will be automatically linked to Betsy's record. With this, she can be alerted automatically if any of the drugs she is taking are recalled, no matter who prescribed them.

Betsy can grant access to her medication record to anyone she chooses, including physicians and family members. She can print out her medication history when going to a new physician or print out a copy to keep in her wallet in case of an emergency.

The ability for consumers to have a personal medication record is a vital step toward an interoperable medication record. In this stage, anyone who has access to the Web will be able to access their own record 24 hours a day.

2008: Electronic dispensing record

Stage 2: Increased interoperability

In 2008, the medication record becomes more connected to other physicians and information. When Betsy buys medication, the dispensing information is forwarded by the claims adjudicator or pharmacy to a secure clearinghouse. Betsy (and any provider she authorizes) can access this aggregate record of medications via a secure Web site. This automated electronic dispensing record replaces the smart personal medication record of 2006, described in the previous section.

Medicines are now recorded automatically in the record. Betsy doesn't have to remember to do it. All of her providers automatically see what each of them has prescribed. Whenever a medicine is dispensed, it is checked for interactions with Betsy's allergies and with her other medicines. Full information about each medication—including dosing, side effects, interactions, lab conflicts, allergy alerts, disease contraindications, pricing, and drug image identification—is only a click away with this electronic dispensing record. Notification about medication recalls is immediate and automatic.

Betsy and each of her providers will be able to quickly and easily access all drug information in a single, aggregated record. However, the record is still not connected to practice-based e-prescribing systems. Dr. Schilling and any other healthcare provider must open a second display to manually check the aggregated record. During the prescribing process, automatic alerts are still limited to medications prescribed by that practice.

“The only limit to our realization of tomorrow will be our doubts of today.”

Franklin D. Roosevelt



2010 and beyond: Interoperable medication record

Stage 3: Complete interoperability

In 2010, Dr. Schilling's office will have a fully interoperable medication record. The electronic medical record of 2005 has been retrofitted to use the standard drug names recognized by all systems. Over the last five years, all of Betsy's other providers have adopted standards-based e-prescribing systems. Providers and pharmacies instantly update each other on every change in medication information and prescriptions in real time. Finally, e-prescribing and dispensing are connected.

Dr. Schilling now has all the advantages of interoperability while maintaining the user-friendly electronic medical record interface of 2005. She can access patient records from home or in the office, allowing her to provide care for patients at any time. For example, when Betsy is admitted to the emergency room, Dr. Schilling, as her primary care physician, is able to connect to Betsy's information from her home. She sees both her outpatient medications and the intravenous solutions being used in the emergency room, and she gives a well-informed opinion of the treatment that should be taken.

Dr. Schilling's electronic medical record allows her to select medications from a drug information database that is updated automatically, at least daily. It includes direct links to all information in the electronic drug label.

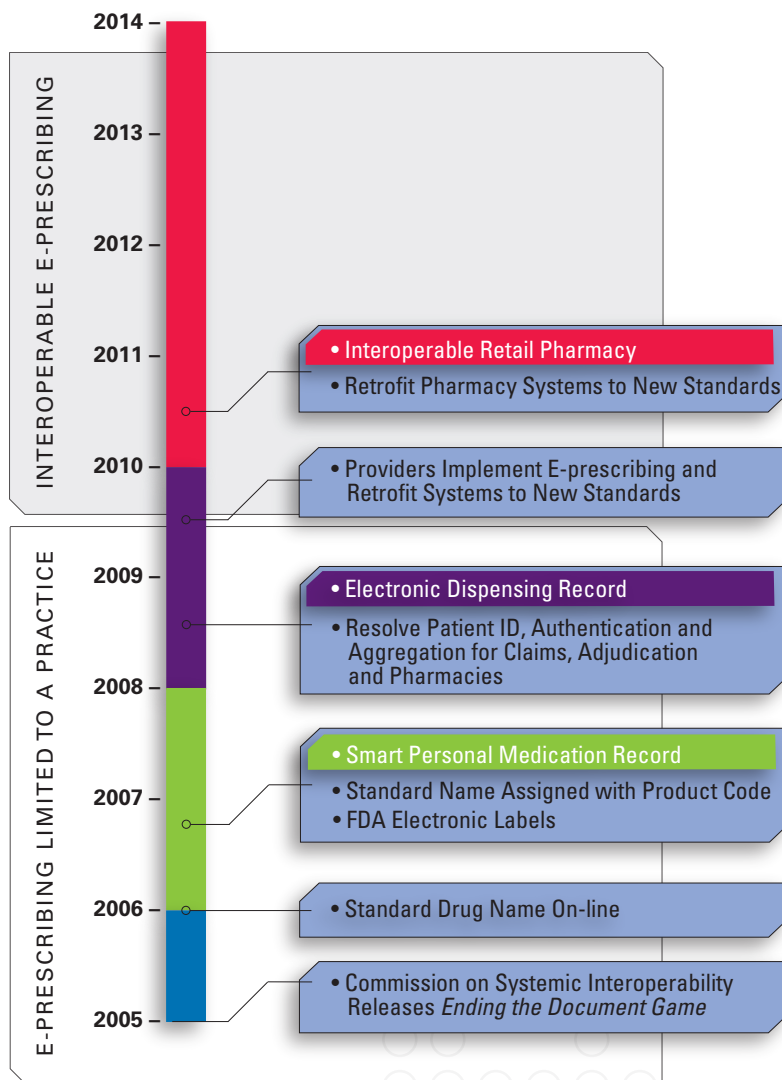
With full interoperability now in place, Dr. Schilling can prescribe medications and treat her patients using evidence-based guidelines, concise and easy-to-use clinical care guidelines based on the most updated and accurate medical information available.

For instance, Dr. Schilling often will use evidence-based guidelines in treating pneumonia, asthma, or sinusitis. Having this information available gives Dr. Schilling the information needed to achieve a diagnosis, estimate a prognosis, choose the best therapy, determine potential harm, and provide the highest quality of care in a timely and efficient manner. Information is automatically tailored to avoid drug interactions and comply with the formulary (i.e., the list of medicines qualified for coverage) from the patient's insurer. With an interoperable medication record, the check for interactions is repeated at dispensing to catch changes in the patient's medication list since the prescription was first written.

By 2014, with Betsy's permission, de-identified (i.e., anonymous) abstracts of her medication record, lab tests, and diagnoses are reported to a prescription reporting database for automated postmarket surveillance. Bioinformatics algorithms check regularly for unexpected patterns to help identify safety concerns that might be missed by premarketing trials. These trials often exclude patients who may be at greater risk of certain adverse effects but will likely receive a drug when it is on the market. Premarketing trials that assess safety or efficacy also do not always detect relatively rare adverse events. Through interoperable electronic prescription reporting, the public has the best available tools for storing and analyzing safety reports and possible adverse drug events.

In 2010 and beyond, the benefits of a full interoperable medication record are realized. The building blocks of interoperability that were utilized in 2006, 2008, and 2010 provided the interface, framework, and content for the interoperable medication record. Dr. Schilling and Betsy can now have a better doctor-patient relationship by using all available information technology tools in an interoperable framework.

Timeline to an Interoperable Medication Record for Every American



Interoperability—Why Now?

“By computerizing health records, we can avoid dangerous medical mistakes, reduce costs, and improve care.”

President George W. Bush

People are dying

In 2000, the Institute of Medicine released a landmark report estimating that 44,000 to 98,000 people die each year from medical errors in this country,¹⁹ many of which can be caused by missing or incorrect information and delays in access. In a more recent study released by Health Grades, Inc. (a healthcare ratings, information, and advisory services company) the number was estimated to be 195,000 people killed by medical error annually.²⁰ There should be a wide-spread demand for a connected system, but neither the public nor the healthcare industry is calling for it. This is because many healthcare providers and even more members of the public are not aware that such a system is possible. Put simply, interoperability will save lives.

The government is supporting this initiative right now

For the first time, the President has formally made a high priority of creating a national system of interoperable healthcare records.²¹ To support this goal, the Medicare Modernization Act included authorization for the Commission on Systemic Interoperability and a mandate for this report, which is a survey of interoperability and a guide to achieving it. In addition, the Office of the National Coordinator for Health Information Technology has been established to implement the President’s vision for widespread adoption of interoperable electronic health records within 10 years.

¹⁹ L. Kohn, J. Corrigan, and M. Donaldson. *To Err Is Human: Building a Safer Health System*. Committee of Health Care in America, Institute of Medicine. 2000.

²⁰ Ibid.

²¹ United States White House, Office of the Press Secretary. *President Discusses Health Care Information Technology Benefits*. January 27, 2005.

<<http://www.whitehouse.gov/news/releases/2005/01/20050127-7.html>>

The technology now exists and is continuously becoming easier to use

Interoperability relies on technologies that already exist: broadband, personal computers, wireless systems, e-prescribing platforms, biometric security devices, electronic imaging software and hardware, touch-sensitive screen input devices, advanced database programming and querying techniques, increased memory and data storage capacity, and simplified network administration software.²²

Success stories show the system works

Successful implementations cited in this report include efforts in:

- CareGroup, a six-hospital integrated system in Massachusetts;
- Cummings, Georgia, clinics associated with Dr. James Morrow;
- McLeod Regional Hospital, South Carolina;
- Miami, Florida, pediatric cardiology practice of Dr. Evan Zahn;
- New England Health EDI Network;
- Sonoma County, California;
- The Veterans Administration; and
- Wishard Memorial Hospital in Indianapolis, Indiana.

Additionally, more than 300 other efforts and initiatives are identified in the chapter, “Existing Efforts: Connecting the Country.”

²² Kenneth Adler. “Why It’s Time to Purchase an Electronic Health Record System.” *American Academy of Family Physicians: News & Publications*. November/December 2004.
<<http://www.aafp.org/fpm/20041100/43whyi.html>>



People want interoperability

When people learn about connected systems and their benefits, more than 70 percent of the public say they would use one or more features of a personal health record. In particular:

- Seventy-five percent say they would e-mail their doctor;
- Sixty-nine percent would track immunizations;
- Sixty-nine percent would monitor their record for mistakes;
- Sixty-five percent would transfer information to new doctors; and
- Sixty-three percent would look up and track their own test results.²³

The technology is ready, and the evidence for the value of connectivity is clear. For the last 27 years, both government and private industry have studied the problem and made hundreds of recommendations.²⁴ There is still no system in place. It is time to end this aimless trek and implement an interoperable system of healthcare information. Healthcare without connectivity is extracting a price in resources, quality of life, and lost lives too high to continue to pay.

It is time for healthcare providers to receive the tools they have been missing and for consumers to claim the benefits they need and deserve.

²³ Connecting for Health Collaborative. *The Personal Health Working Group: Final Report*. Markle Foundation. July 1, 2003.

²⁴ See Appendix C for a complete list of past recommendations.