

Enhancing the Quality of Patient Care Through Interoperable Exchange of Electronic Healthcare Information

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I. Executive Summary

The Institute of Medicine's (IOM) 2001 report *Crossing the Quality Chasm—A New Health System for the 21st Century*, highlights the U.S. healthcare system's reticence in taking advantage of the information technology revolution "that has been transforming every other aspect of society." The IOM report warns: "In the absence of a national commitment and financial support to build a national health information infrastructure... the progress of quality improvement will be painfully slow." (1) President Bush, in his January 20, 2004 State of the Union speech, agreed that the time to bring advanced information technology (IT) to healthcare is now: "By computerizing health records, we can avoid dangerous medical mistakes, reduce costs, and improve care." (2) The President has backed his support for expanding IT use in the healthcare sector by earmarking \$152 million in his proposed Fiscal Year 2005 budget for healthcare IT initiatives. (3) To underscore the federal commitment to these goals, in April 2004, the President announced creation of a new position to lead the federal effort, the National Health Information Technology Coordinator.

The American College of Physicians (ACP) agrees with the IOM's and President's call to bring the latest advances of information technology to all sectors of the healthcare marketplace, underwritten with federal support and leadership. The biggest obstacles to achieving this goal are the cost and the lack of common medical terminology, coding, and communications software needed to permit the many disparate elements of the currently fragmented healthcare universe to communicate seamlessly, electronically, with ease, confidence, and reliability. Transmitting patient information transparently throughout the healthcare system is known as *interoperability*.

Healthcare information interoperability will help bring a higher standard of quality to the U.S. healthcare system, making care safer and less costly. As such, ACP believes interoperability is a goal well worth the effort, one which will require much careful planning and consensus building, and the dedicated input and commitment of every player in the healthcare marketplace. Achieving this goal will not be easy. It will require overcoming steep barriers of resistance to system change, and a willingness to endure what will surely be a long and taxing process of converting old systems to new. In undertaking this massive endeavor, the process should not be rushed. Standards should be developed cooperatively and voluntarily with active provider input, with the government sharing in the cost of achieving interoperability. It should be required that new interoperable systems be carefully tested before widespread implementation.

In short, the purpose of this policy paper is to highlight the enormous challenges which must be surmounted to attain a truly interoperable national healthcare information system, and to offer specific ACP recommendations for achieving this goal.

II. ACP Recommendations for Achieving an Interoperable National Healthcare Information System

In developing and implementing a national interoperable healthcare information infrastructure, ACP urges the federal government and all sectors of the healthcare market to ensure that the following recommendations are addressed:

- 1. Interoperable health information networks should be created in the United States to ensure the rapid flow of secure, private and digitized information relevant to all facets of patient care.**
- 2. ACP will take a leadership role among the national and state medical societies advocating for public policies and private sector initiatives to create a national electronic health information infrastructure. The American College of Physicians will support this objective by:**
 - a. Advocating for federal legislative and executive branch initiatives to create an electronic health information infrastructure consistent with the policies described in these recommendations.**
 - b. Participating in public and private sector initiatives to support the development and implementation of interoperable electronic health information systems.**
 - c. Facilitating participation by internists in demonstration projects on interoperable electronic health information systems.**
 - d. Providing practice management assistance to internists to help them make informed decisions on acquiring components compatible with interoperable electronic health information systems.**
 - e. Providing clinical decision support tools, such as the Physicians' Information and Education Resource (PIER), which can be integrated into office-based electronic health information systems.**
 - f. Providing physician and technical input into the development and implementation of voluntary quality performance measures and health information systems industry standards.**
- 3. The creation of interoperable healthcare information networks, electronic health records, electronic prescribing, and other e-health technologies must not become another un-funded regulatory mandate on physician practices.**
- 4. Federal policy should support voluntary standards setting, rather than federal mandates on specific e-health technologies or products.**
- 5. Demonstration projects, which contain usability requirements, should be conducted to test the new e-health technologies to ensure the technology is practical and worthwhile in the clinical setting prior to being implemented nationally.**

6. Sufficient time must be allowed for development, implementation, and testing of interoperable healthcare information networks, electronic health records, electronic prescribing, and other e-health technologies, with direct involvement of physicians and other stakeholders in all stages of the design and implementation of the networks.
7. Physicians and other caregivers must be given adequate time and financial resources to acquire the necessary technology, training and skills to incorporate interoperable healthcare information networks, electronic health records, electronic prescribing, and other e-health technologies into their practices. Consideration must be given to the increased personnel costs that will be incurred as a result of these increased technological skill requirements.
8. The physician's responsibility to make patient care decisions and prescribe medications, based on his or her clinical expertise and experience, must be preserved. Electronic health record (EHR), e-prescribing, and other e-health technology must be designed to facilitate access to unbiased and evidence-based decision support tools.
9. Clinicians, researchers, and patients should have access to complete health records available on the interoperable healthcare information network consistent with Health Insurance Portability and Accountability Act (HIPAA) regulations.
10. EHR and e-prescribing systems must dynamically/bi-directionally link to the physician office medical management system, reducing the need for double entry of information such as insurance and demographic information.
11. Insurance companies must place clear formulary codes on insurance cards and e-prescribing systems so that formulary checking can be seamless and accurate.
12. Although EHRs may include certain functions for the collection of data or as reminders, physicians should not be mandated to use each EHR function. For example, physicians should not be required to screen every patient for a disease condition, such as Lyme disease or all drug/diet interactions, simply because a reminder function for this disease is embedded in the EHR. Ultimately, a clinical encounter should be managed based upon a patient's presenting condition and the physician's training and expertise.

13. E-prescribing systems:

- a. must provide a patient medication profile that includes prescriptions from all pharmacy sources in a single unified view. The system would provide a list of every individual prescription filled for a given patient by any pharmacy within a specified time frame from most recent to least recent and indicate which prescriptions have been discontinued.
- b. must be dynamically updated with the most current health plan formularies.
- c. must interact with the final HIPAA Security standards, due to be implemented in 2005, address issues such as what physical safeguards are necessary to guard data integrity, personal authentication, encryption, and patient confidentiality, and address the impact of e-prescribing on access to DEA-controlled drugs, which in many states can only be provided through a triplicate (or other special paper) prescription order.
- d. must not be used as a means for payers and pharmacy benefits managers to pressure physicians to prescribe a different therapy or medication than what the physician concludes is best for a particular patient based upon scientific evidence and knowledge of the patient's medical history.

III. Introduction

While most other U.S. industries almost exclusively use electronic communications to conduct business (e.g., the airline, banking, and retail sales industries), most patient medical data and communications are maintained on paper or on in-house proprietary computer systems (4). This creates a great deal of waste, duplication, and cost to the consumer. According to the *HealthCast 2010* report: "Healthcare has spent hundreds of millions of dollars on disparate systems that can't communicate with each other." (5) A 2003 report by Deloitte Research calls for a "clinical transformation" in how our healthcare system operates and shares patient data:

If we expect to see substantial improvement in quality over the near term, information technology will need to play a central role in the redesign of the healthcare system. Indeed, being able to take advantage of advances in information technology is seen as a critical catalyst or enabling factor in the process of change. The deployment of more sophisticated information technology will be essential to enhancing quality and improving efficiency in the future. (4)

While the United States struggles with the massive task of electronically unifying a highly fragmented healthcare system, England is planning the world's largest overhaul of a health system, committing \$17 billion to wire every hospital, clinic and doctor's office across the country. Some 50 million citizens are expected to get an electronic health record (EHR) by 2005 and, by the end of 2008, the system will handle an estimated five billion transactions a year, including electronic appointments, prescriptions and access of patient records. (6) Similarly, the Canadian province of Alberta is planning to convert all its citizens' health records into EHRs by 2005. (7) Though the task facing both England and Alberta is certainly demanding, gaining provider cooperation for converting to a single EHR system should be much easier than in the U.S., since all providers are already part of a sin-

gle integrated, government-operated health system. So, while building a U.S. national health information infrastructure may seem daunting, attempts to accomplish this even on a much smaller community level, as projects in Indianapolis and Santa Barbara have shown, are extremely complex and difficult to achieve. (8)

The Institute of Medicine's (IOM) 2001 report, *Crossing the Quality Chasm—A New Health System for the 21st Century*, calls for a drastic reorientation of the U.S. healthcare system to one that is patient- and quality-centered, indicating that one essential ingredient of this new 21st century system must be "a national commitment to building an information infrastructure to support healthcare delivery, consumer health, quality measurement and improvement, public accountability, clinical and health services research, and clinical education. This commitment should lead to the elimination of most handwritten clinical data by the end of the decade." (1) ACP's policy recommendations in this paper support the IOM's goal, and include specific recommendations about how to achieve this goal.

A September 2003 survey of information technology (IT) experts concluded that cultivating a national healthcare information infrastructure and improving patient care will depend crucially on adoption of uniform medical data standards and interoperability. (9)

Congress is also rallying around the need for an interoperable national health information infrastructure. In July 2003, Congresswoman Nancy Johnson introduced a bill calling for development of a national health information infrastructure. According to her office's press release, the bill would "dramatically improve healthcare quality by revolutionizing how providers use clinical information to treat patients." The press release continues, "The lack of a national health information infrastructure costs Americans and the quality of our healthcare system tremendously...the Act starts in motion the development of information technology that is comprehensive and interoperable across the country—something that is not possible now." (10)

Furthering this legislative drive, on January 12, 2004, Senator Hilary Clinton announced that she would introduce legislation to "improve healthcare for all Americans and lower healthcare costs" by applying advances in information to modernize and streamline healthcare in the U.S. A key provision of her proposed legislation calls for "building an information technology infrastructure that enables information sharing...including the establishment of voluntarily interoperability standards to ensure different hospital and physician systems can talk to each other, exchange electronic health records, and reduce paperwork." Senator Clinton's legislation also has provisions that would increase research on quality of care, pay providers for performance, and provide the public with comparative performance information on providers. (11)

On March 1, 2004, Representative Patrick Kennedy announced he would introduce new legislation titled "The Quality, Efficiency, Standards, and Technology for Healthcare Transformation Act (QUEST)," which would infuse billions of dollars into a national healthcare IT infrastructure by 2015. The bill calls for, and would fund, the creation of a "fully wireless, fully paperless" electronic health record, standardized reporting, evidence-based medicine regulations and "payment practices to get quality out of the system." (12)

The federal government is also committed to building a national interoperable health information infrastructure (NHII), with leadership being provided by the Department of Health and Human Services (DHHS). As discussed later in this paper, DHHS is actively coordinating collaborative efforts within the government and with the healthcare industry, as well as providing funding for research and demonstration programs. These federal activities are being complemented by several public-private initiatives aimed at making instant electronic access to patient

information and interoperability a reality. ACP is very supportive of the use of such voluntary, carefully developed public-private demonstration programs, as they clearly align with our recommendations that such new technology be based on voluntary standard setting with direct involvement of physicians and other providers, with sufficient time allowed for development, implementation, and testing.

The benefits which instant access to an electronic healthcare information system can provide are numerous and well documented in an October 2003 Government Accounting Office (GAO) study of healthcare organizations' use of IT. Benefits included "improved quality of care, reduced costs associated with medication errors, more accurate and complete medical documentation, more accurate capture of codes and charges, and improved communication among providers that enabled them to respond more quickly to patients' needs." Other positive effects included reduced hospital lengths of stay, a dramatic 53% reduction in rejected claims, a major administrative saving replacing paper medical records with electronic health records (EHRs), and improved patient clinical care resulting from health screening reminders. (13)

A World Healthcare Congress forum held in January 2004 showed just how strong consensus is on the benefits of bringing IT to the U.S. healthcare arena. Speakers, who included U.S. health officials, lawmakers and health industry leaders, all touted the benefits of information technology in controlling costs and improving patient safety. However, factors such as cost, lack of standards and the culture of the healthcare industry inhibit technology adoption. (14)

Most notable remarks/conclusions at this world forum included: (14)

- Senate Majority Leader Bill Frist stated policy makers and the federal government must create standards and incentives to help providers implement technologies such as CPOE (Computerized Physician Order Entry) systems and electronic medical records. Frist also urged that data on medical mistakes need to be gathered electronically so that doctors can share best practice information without fear of litigation.
- Error-reducing technologies such as CPOE are becoming increasingly more important for providers, concluded Dr. Peter Kongstvedt, vice president of Cap Gemini Ernst & Young's health consulting managed care practice. However, Kongstvedt warned that many individual physicians are reluctant to purchase the technology for their own practices because of declining incomes during the past five years, resulting from lower federal health program reimbursements and fee freezes from health insurers.
- DHHS Secretary Tommy Thompson said that adoption of technologies such as CPOE, drug bar coding systems and EHRs could save the United States \$100 billion per year through fewer deaths and disabilities caused by medical errors. Thompson added that these technologies also could make it easier for public health officials to detect disease outbreaks and possible biological or chemical terrorism events.
- George Halvorson, CEO of Kaiser Foundation Health Plan, called for the creation of a single electronic health record, which would enable physicians to access a patient's medical history and provide researchers with a better source of quality data.
- According to a survey of 106 executives from health insurers, hospitals, drug companies and other large employers at the forum, 79% think IT is an effective way to contain costs while implementing safety and quality guidelines recommended by the Institute of Medicine.

IV. Statement of the Problem

The U.S. healthcare system is highly fragmented, both in terms of the numbers of unallied healthcare providers and health plans from which care may be obtained, and in terms of the vast array of disparate, proprietary non-communicating healthcare information systems in use. The biggest problem is that, for virtually every component of care—drugs, lab results, digital imaging, disease classification, procedures performed, and electronic health records—there are multiple terminologies in use within each component. For drugs alone, there are at least 12 separate systems for naming medications, their ingredients, dosage, and route of administration. (8)

Another major and even more primary obstacle which must be solved is the lack of a Unique Patient Identifier, urgently called for by many groups, most notably the IOM and the Healthcare Information and Management Systems Society (HIMSS). According to HIMSS, “without a patient identifier, whether unique or voluntary, true data interoperability is not possible.” (15)

Even with the June 2003 breakthrough requiring the U.S. healthcare system to begin using Health Level Seven (HL7) standards for messaging and exchange of clinical and administrative data (16), true interoperability will first require gaining consensus on a single Unique Patient Identifier and establishing a universally accepted terminology for each of the many healthcare components referenced above. In essence, patient data can now be sent from one health system to another using HL7 messaging standards; however, the data contained in the message may not be understood, because the core terminologies are different. A good analogy would be sending an e-mail message in English over the Internet, to a recipient who only speaks Spanish.

To date, industry-wide agreement has been achieved in only one of these healthcare components: laboratory data. The Logical Observation Identifiers Names and Codes (LOINC) system, built over the past decade by laboratorians and informaticists, is the name of this comprehensive standard laboratory test terminology. However, actual implementation of this new universal language for defining laboratory results is still a long way off, as many clinical labs continue to use in-house, idiosyncratic systems. (17) (18)

There is no lack of effort in trying to develop universal standards sets in other healthcare components. (16) The problem is in attaining consensus, which is often tedious and slow. A prime example of this is the years' long debate, still unresolved, as to whether the U.S. should shift from the disease coding system ICD-9-CM, which is over 20 years old, to ICD-10-CM, which has been in use outside the U.S. for many years. While some groups strongly oppose the change, claiming it would greatly increase administrative hassles, the American Health Informatics Management Association (AHIMA) has a polar opposite view: “AHIMA believes that adoption of a replacement for the ICD-9-CM diagnosis codes is an absolute necessity, because the code set is more than 20 years old and has become obsolete.” (18)

This difficulty in achieving consensus on new health data standards clearly has a long history linked to our healthcare system's fragmented structure and the unwillingness of providers to part with systems with which they are familiar. One solution being pursued by DHHS is to offer a system known as SNOMED-CT (Systematized Nomenclature of Medicine-Clinical Terms), free of charge, through the National Library of Medicine's Unified Medical Language System. (19) Produced by the College of American Pathologists, SNOMED-CT is a comprehensive and precise clinical reference terminology that healthcare providers, healthcare information technology suppliers, providers, payers, purchasers and institutional researchers can use to improve

the comparability of data. With terms for more than 344,000 concepts, SNOMED-CT is the most comprehensive clinical terminology available. (20)

The large number of initiatives and entities pursuing interoperability, as shown in the following two sections, can be seen as both good and bad. Clearly, there is no lack of interest or energy on this topic, which is a sign the market is ready for change. However, the sheer volume of different initiatives, demonstrations, and groups participating make coordination of these activities very difficult, which is why ACP is advocating so strongly for active federal leadership and sufficient start-up and ongoing funding to make interoperability a reality.

If and when the day arrives that all components of the U.S. healthcare system have agreed on a common set of medical terminology standards—the next big step to achieving interoperability will be to ensure that all segments of the healthcare industry voluntarily adopt and use the new standards, and commit to maintaining all clinical and administrative data in a digital format, and sending and receiving this information using HL7 messaging standards. Only then will it be possible to achieve the goal of providing seamless, high quality care to patients regardless of healthcare setting.

The ACP recommendations in this paper are designed to lay the foundation for universal adoption and use of common data standards to improve interoperability of healthcare information. Winning support for new health data standards must come from voluntary input and agreement of all sectors of our healthcare system. In the medical community, national and state medical societies must take a leadership role in advocating for a national health information infrastructure. Through this policy paper and its direct participation in ehealth initiatives, ACP is demonstrating its commitment and leadership in this most vital of endeavors.

V. The Vital Role of the Federal Government in Achieving Interoperability

The IOM's 2002 report, *Leadership by Example—Coordinating Government Roles in Improving Healthcare Quality*, makes an urgent call for the federal government to take a strong leadership role in this effort, specifically that the "federal government take steps to encourage and facilitate development of the information technology infrastructure that is critical to healthcare quality and safety enhancement, as well as to many of the nation's other priorities, such as bioterrorism surveillance, public health, and research." Yet, the IOM report predicts the best outcome when the federal government does not mandate solutions or act alone: "Indeed, its (the federal government's) efforts will be far more effective if carried out in close collaboration with healthcare leadership from the private sector." (21) This voluntary, cooperative approach to establishing interoperability standards is a basic tenet which underlies all of ACP's foregoing recommendations.

ACP cannot underscore how vital federal financial backing is for this effort. Physicians are already strained to the limit dealing with the morass of federal regulations and inadequate reimbursement. Asking physicians to take on one more unfunded federal mandate, such as paying for conversion to an interoperable healthcare system, not to mention the enormous disruption this would cause to patient care, would all but doom this effort before it gets off the ground.

The federal government has begun to pursue a national electronic healthcare system. In November 2001, DHHS's National Committee on Vital and Health Statistics (NCVHS) issued its report entitled: *A Strategy for Building the*

National Health Information Infrastructure (NHII) (22). As shown below, it provides a detailed framework and recommendations for building an NHII, with the federal government providing leadership and support for achieving this initiative's goals.

A. National Health Information Infrastructure (NHII)

The National Health Information Infrastructure (NHII) is:

- an initiative set forth to improve the effectiveness, efficiency and overall quality of health and healthcare in the United States.
- a comprehensive knowledge-based network of interoperable systems of clinical, public health, and personal health information that would improve decision-making by making health information available when and where it is needed.
- the set of technologies, standards, applications, systems, values, and laws that support all facets of individual health, healthcare, and public health.
- voluntary.
- not a centralized database of medical records or a government regulation.

National Health Information Infrastructure is important to:

- improve patient safety (alert for medication errors, drug allergies, etc).
- improve healthcare quality (includes having the availability of complete medical records, test results and x-rays at the point of care, integrating health information from multiple sources and providers, incorporating the use of decision support tools with guidelines and research results, etc).
- improve bioterrorism detection (NHII will enable real-time aggregation of health data to detect patterns).
- better inform and empower healthcare consumers regarding their own personal health information.
- better understand healthcare costs.

The scope of NHII dimensions are represented by three overlapping circles, each representing a particular focus with overlap into the adjacent areas. Additionally,

- the scope would include healthcare research. The three dimensions are:
 - Personal health: includes a personal health record that is created and controlled by the individual or family, plus non-clinical information such as self-care trackers and directories of healthcare providers. The confidentiality of personal health records and consumers' control over their own records are basic tenets of this vision, consistent with the DHHS privacy regulations.
 - Healthcare delivery: includes information such as provider notes, clinical orders, decision-support programs, digital prescribing programs, and practice guidelines. Healthcare providers will retain responsibility for their own patients' medical records.
 - Public health: enables sharing of information to improve the clinical management of populations of patients such as vital statistics, population health risks and disease registries.

The major role of DHHS in the NHII initiative is one of leadership—a facilitator in the development of the NHII to bring about the collaboration between stakeholders in the private and public sectors and among all levels of government. The federal government can play a major role in helping to adopt standards for communication and interoperability between systems, incorporate privacy and security matters, and fund projects where there is evidence that specific projects have benefited healthcare. (23)

The objectives of the NHII can be met by:

1. Using Information Technology to enhance connectivity and knowledge sharing (via appropriate system architecture and use of data standards).
2. Fostering collaboration between the public and private sectors (include all relevant stakeholders in the health sector—patients, citizens, practitioners, public health officials, managers, policy-makers, and researchers).
3. Encouraging capital investment and promoting market-based solutions.
4. Having the federal government assume a leadership role in guiding its development through appropriate funding, use of incentives, application of standards with attention to privacy issues (confidentiality and security).
5. Using evidence of effectiveness (patient safety, quality, cost, access) to guide future directions in changes to our healthcare system.
6. Providing incentives for collecting data electronically.
7. Using “Lessons-learned” from other National systems (Canada, United Kingdom, Australia) and ongoing projects.

The timeline for accomplishing NHII's objectives is 10 years. (24)

At a February 2004 meeting of the NCVHS Workgroup on the NHII, DHHS's Senior Advisor on the NHII, William Yasnoff, MD, PhD, announced a doubling of federal spending for NHII activities in the President's proposed Fiscal Year 2004-2005 budget. While \$50 million is being spent in Fiscal Year 2003-2004 for demonstration projects primarily through grants from DHHS's Agency for Healthcare Research and Quality (AHRQ—see details in B. below), the President's budget proposal is calling for more than \$100 million to be spent in the next fiscal year, with half allocated for AHRQ demonstration projects, and the other \$50 million going to the Office of the DHHS Secretary for development and implementation of local health information infrastructure projects.

In March 2004, a special stakeholders meeting to help define a “high level set of requirements” for the NHII was held in Washington, D.C., with physician representation provided by ACP. ACP is also sponsoring and participating in DHHS's annual NHII conference (July 2004), which provides a yearly update on NHII progress and goals, with this year's conference entitled: “Cornerstones for Electronic Healthcare.”

B. Current Federal Activities Aimed at Building an Interoperable NHII

While the NCVHS Workgroup on the NHII serves as the statutory advisory body to DHHS on the NHII's direction and goals, DHHS's Council on the Application of Health Information Technology (CAHIT) is directly coordinating federal agencies' role in achieving interoperability. Formed in 2003, CAHIT is composed entirely of government staff and has direct responsibility for coordinating DHHS activities and investments in health information technology, including collaborative work with the healthcare, public health, and healthcare research communities. (18)

Two interoperability initiatives launched by DHHS in 2003 were: making the SNOMED-CT clinical nomenclature free of charge, as mentioned above, and an ongoing effort with IOM and HL7 to develop a standardized model of an EHR. ACP applauds DHHS's financial support for making SNOMED-CT publicly available, but would urge not to mandate any single nomenclature without substantial provider input and field testing. (16) In addition, DHHS's Agency for Healthcare Research and Quality (AHRQ) announced funding for several community-based demonstrations aimed at developing exemplary models of health system connectivity and interoperability. (25)

The biggest and most ambitious Federal effort to develop health information interoperability standards is known as the Consolidated Health Informatics (CHI) initiative. Underway since 2002, it is focused solely on developing interoperability among Federal health programs, involving about 20 partnering federal agencies. The CHI is the healthcare component of President Bush's eGov Initiatives, the goal of which is to make it easier for citizens and businesses to interact with the government and save taxpayer dollars. CHI's strategy is to first achieve interoperability within all Federal healthcare agencies and departments and, once accomplished, to catalyze and "encourage and attract adoption of similar standards by other public and private sector entities." (18) (24)

The CHI will build heavily on the experience of the U.S. Department of Veterans Affairs (VA), which has a highly evolved internal electronic patient information and communications system, known as VistA (Veterans Health Information Systems and Technology Architecture). (24) The IOM has given a powerful endorsement to the VA system as "one of the best in the nation" and promoting its consideration as a foundation piece to the NHII. (21) The members of the CHI are also participating in a number of projects — individually and as part of the Consolidated Health Informatics group — looking to establish widespread use of electronic health data systems and programs including electronic health records. (18)

Growing out of the CHI effort, in March 2003, the DHHS, the Department of Defense (DoD), and the Veterans Administration (VA) announced the first set of uniform standards for the electronic exchange of clinical health information to be adopted across the federal government. (24) These standards will be a major foundational component of the NHII and require all federal agencies, as part of new systems development efforts, to:

- Adopt Health Level 7 (HL7) messaging standards to ensure that each federal agency can share information that will improve coordinated care for patients such as entries of orders, scheduling appointments and tests and better coordination of the admittance, discharge and transfer of patients.
- Adopt certain National Council on Prescription Drug Programs (NCDCP) standards for ordering drugs from retail pharmacies to standardize information between healthcare providers and the pharmacies. These standards already have been adopted under the Health Insurance Portability and Accountability Act (HIPAA) of 1996.
- Adopt the Institute of Electrical and Electronics Engineers 1073 (IEEE1073) series of standards that allow for healthcare providers to plug medical devices into information and computer systems that allow healthcare providers to monitor information from an ICU or through telehealth services on Indian reservations, and in other circumstances.
- Adopt Digital Imaging Communications in Medicine (DICOM) standards that enable images and associated diagnostic information to be retrieved and transferred from various manufacturers' devices as well as medical staff workstations.
- Adopt laboratory Logical Observation Identifier Name Codes (LOINC) to standardize the electronic exchange of clinical laboratory results. (24)

VI. The Public-Private Role in Achieving Interoperability and Current Initiatives

Described below are a number of key current public-private initiatives aimed at increasing use of interoperable, electronic healthcare data. This is not intended to be an all-encompassing description of all the public-private initiatives, but instead is intended to highlight several of the key initiatives.

A. The Leapfrog Group for Patient Safety

A major voice advocating for an NHII is the Leapfrog Group for Patient Safety, which is composed of more than 150 public and private organizations that provide healthcare benefits. The Leapfrog Group works with medical experts throughout the U.S. to identify problems and propose solutions to improve systems that could break down and harm patients. Representing approximately 34 million healthcare consumers in all 50 states, Leapfrog provides important information and solutions for consumers and healthcare providers. (26)

In 2000, Leapfrog initiated a national effort to financially reward providers willing to address healthcare quality and patient safety concerns, focusing on inpatient care. One component of this national effort is already showing results: reduction of medical errors through use of Computerized Physician Order Entry (CPOE) system. An April 2003 Leapfrog Fact Sheet showed a 55% reduction in medication errors at one hospital which had implemented a CPOE system. (27)

A new Leapfrog initiative currently under development focuses on physicians' offices and addresses key areas identified in ACP recommendations. The initiative, Physician Office Clinical Decision Support (PODS), is being developed in collaboration with the Agency for Healthcare Research and Quality (AHRQ) and the Centers for Medicare and Medicaid Services (CMS). PODS will promote better, safer care in the ambulatory setting through electronic clinical decision support tools. PODS has three components: e-prescribing (an electronic system that provides decision support based on drug reference information and patient-specific information); e-lab results tracking (an electronic system that tracks whether lab results have been viewed and communicated to the patient, and acts as a warehouse to store and retrieve lab results); and e-care reminders (an electronic system linked to a set of nationally recognized care guidelines that will generate periodic reports on care performance and signal deficiencies during patient contacts). (28)

B. The eHealth Initiative and Foundation for eHealth

The missions of both the eHealth Initiative and its Foundation for eHealth are the same: to drive improvement in the quality, safety and efficiency of healthcare through interoperable information and information technology. The eHealth vision for the future includes:

- Interoperable, electronic health records in the office of every clinician and healthcare organization;
- The use of data standards and connectivity to enable secure exchange of data amongst practicing clinicians, hospitals and other healthcare organizations, public health, payers and other key stakeholders;
- Clinicians who have the information they need to make the best clinical decisions at the right time;
- Consumers, patients and caregivers who have the information they need to manage and address their own healthcare needs. (29)

The eHealth Initiative represents many of the stakeholders in the healthcare community with interests in improving the healthcare system through the use of interoperable information systems.

Several of the specific collaborative projects the eHealth Initiative and its Foundation have organized are:

1. Connecting for Health

Connecting for Health is a collaboration of more than 100 public and private stakeholders representing every part of the healthcare system. Connecting for Health was convened under sponsorship of the Markle Foundation to serve as a catalyst for changes that can rapidly clear the way for the private and secure use of health information to improve quality, patient safety and enable patients to become better partners in their care. The Markle Foundation provided the initial funding of \$2 million for Connecting for Health. (30)

In June 2003, this group released the results of its early efforts to bring electronic connectivity to healthcare to improve patient care, lower costs and protect privacy. These accomplishments included:

- Achieving consensus on an initial set of healthcare data standards and commitment for their adoption from a wide variety of national healthcare leaders, including a number of federal government agencies.
- Identifying and studying a number of noteworthy privacy and security practices in order to describe and disseminate feasible solutions currently in use.
- Defining the key characteristics and benefits of consumer-controlled Personal Health Records (PHRs), addressing consumer concerns to allow people to have better access to their health information. (30)

2. Health Collaborative Network

Launched in June 2003, this new eHealth Initiative collaborative project seeks to demonstrate the technical feasibility and value of a standards-based electronic model of data exchange. The Health Collaborative Network (HCN) is a national demonstration project that will show how electronic communications using common standards can help patients receive necessary and timely medical treatment and guard against medical errors, incorrect prescriptions and

adverse drug events. Also HCN will enable public health agencies to receive the information they need to identify and respond to public healthcare threats that range from naturally occurring diseases, such as SARS, to deliberate bioterror attacks. (29)

3. The Electronic Health Record Collaborative

The EHR Collaborative is a group of organizations representing key stakeholders in healthcare, including practicing clinicians, payers, purchasers, researchers, healthcare providers, IT suppliers, information and technology managers, accrediting groups, public health organizations, manufacturers, and public sector partners. The goal of the EHR Collaborative is to facilitate rapid input from the healthcare community in this and other development initiatives that advance the adoption of information standards for healthcare. (29)

4. Accelerating Computerized Prescribing

The overall goal of this initiative is to rapidly expand the adoption of computerized prescribing; in particular, to stimulate the adoption of computerized prescribing by physicians and other practitioners. Consistent with ACP recommendations, the objectives for this initiative call for careful testing of e-prescribing systems and appropriate provider incentives to encourage adoption of this new technology.

The Steering Group for the Accelerated Adoption of Computerized Prescribing in the Ambulatory Environment initiative has developed the following set of key objectives:

- Develop and widely disseminate general design and implementation techniques to providers, manufacturers and other groups that will:
 - Facilitate rapid development of usable, connectivity-ready prescribing tools throughout the healthcare community;
 - Support the workflow of physicians and practitioners;
 - Support safety and optimal care.
- Identify and promote the adoption of a set of financial, regulatory, and other incentives that could make the acceleration of the adoption of computerized prescribing cost-effective and compelling for healthcare providers and all members of the prescribing chain.
- Work with existing and newly-launched implementation and demonstration projects to:
 - Test and evaluate the initiative's recommendations.
 - Confirm and widely promote the value of computerized prescribing.
 - Identify additional barriers that have not been addressed by other initiatives. (29)

5. Connecting Communities for Better Health Program (CCBH)

CCBH is aimed at building multi-stakeholder collaboratives within communities (both geographic and non-geographic) who are using health information exchange and other information technology tools to drive improvement in healthcare quality, safety, and efficiency. This program is being conducted under the auspices of the Foundation for eHealth Initiative, in cooperation with the federal Health Resources and Services Administration (HRSA). Seed funding to establish health information exchange and learning community networks for these collaboratives is provided through a \$3.86 million federal grant.

The response to the CCBH's call for applicants was very strong, with 134 submissions from applicants in 42 states and the District of Columbia. Based on information contained in these applications, the CCBH in December 2003 released a report entitled the "State of the Nation's Readiness for Health Information Exchange." The report showed a groundswell of interest from communities across the nation to achieve CCBH's goals of working together to use information technology for electronic health information exchange. A common theme among respondents was that multi-stakeholder breakthroughs in healthcare IT use would require additional funding such as that provided by CCBH. (29)

C. The National Alliance for Health Information Technology (NAHIT)

NAHIT was formed in June of 2002. The Alliance's purpose is to accelerate the adoption of, and when necessary develop, voluntary information technology standards for the healthcare field—standards that enhance patient safety and improve hospital and healthcare operating efficiencies. The Alliance includes over 75 member organizations representing healthcare providers, information technology vendors, and national health and technology associations (31).

The Alliance's first initiative is to universalize bar coding for the prescribing and provision of medications. According to the Alliance's Chairman: "For patients, bar coding promises to reduce medication errors. When linked with other hospital information systems, it puts in place several fail-safe measures to help ensure that the right patient is getting the right medication with the right dosage at the right time. For healthcare providers, it reduces the cost of billing and inventory control and enhances the work experience for our caregivers by removing burdensome paperwork." (31)

To achieve health system information interoperability, the NAHIT sees the following as vital:

For patient safety and clinical quality improvement, standard nomenclature for clinical events and a data dictionary would be necessary to allow interoperability of clinical and safety systems. Confusion over multiple descriptors for similar healthcare concepts can lead to error and inefficiencies. Standardizing healthcare terms and names across the field are essential prior to implementing information technology solutions that can achieve greater efficiencies. A standard taxonomy

for the categorization and causality of error similar to the one devised by the National Coordinating Council for Error Reporting and Prevention for medication errors would also be required.

The gaps in clinical data standards begin with the lack of standard definitions of clinical events including diagnoses, procedures, clinical findings, therapies and outcomes. Nursing terminology also requires standardization. Electronic data interchange and data transmission standards will also be needed to allow communication between disparate clinical systems. (31)

NAHIT sees the biggest barrier to achieving interoperability as “The perceived need for customization of every system by providers and the need to demonstrate differentiation from other products by developers and manufacturers are the primary barriers to the widespread use of standards in healthcare IT.” (31)

D. Transforming Healthcare Through Information Technology

This is the name of a new demonstration program being sponsored and funded by the Agency for Healthcare Research and Quality (AHRQ), the goal of which is to demonstrate the role health information technology can have on improving patient safety and the quality of care. In November 2003, AHRQ announced the release of \$41 million in grants under this program, to support planning and implementation of health information technology in communities, as well as grants to examine its value. About 100 grantees will participate in the program. (25)

VII. How Interoperable Healthcare Data Can Improve Care—Examples from Two Very Different Settings

As noted in the introduction, the potential benefits of using interoperable healthcare data are numerous. Quality of care rises when providers have instant access to complete health information on a patient, while the chance of making a medical or medication error is reduced. Monitoring of quality of care over time, and implementing appropriate corrective measures, is also greatly enhanced. Administrative inefficiency and duplication within the healthcare system is minimized, lowering overhead and freeing up staff to spend more time on patient care. Access to care increases, as greater healthcare system efficiency and productivity combine with decreased overhead to drive down the cost of delivering care. Patient and provider satisfaction is enhanced, as care becomes more patient and quality centered. Health research on best practices and measuring of provider performance is greatly boosted, meeting the demands of a market hungry for objective guidance in choosing treatments and the purveyors of care.

These benefits are exemplified by the experiences, presented below, of two very different settings of care—the Veterans Health Administration (VA), and the small physician practice.

A. The Veterans Health Administration (VA)

With the advantage of being a closed, integrated comprehensive network of hospitals and clinics, the VA has been at the vanguard of using electronic health data since the 1980s. In 1996 the VA implemented its Veterans Health Information Systems and Technology Architecture (VistA), supplemented a year later by its computerized patient medical record (CPMR). Respectively, these systems support information exchange across multiple clinical disciplines and lines of business and permit instantaneous clinical documentation and information retrieval. The goal of these systems is to standardize quality, facilitate access to care, decentralize decision-making, improve information management, and optimize patient functional status. VistA provides a complete structure for all administrative, financial, clinical, and infrastructure applications in VA facilities (8)

As the largest healthcare provider in the nation, the VA has deployed VistA at 1300 sites across the country, including nearly 170 medical centers. The system includes more than 100 modules, including an EHR, CPOE, bar code medication administration, a complete picture archiving and communication system, and lab and pharmacy systems. VistA provides “an easy to use, yet powerful, graphical interface which allows healthcare providers to quickly and efficiently access complete patient information, leading to improved patient care and outcomes. (32)

The VistA software has been implemented in hundreds of U.S. Department of Defense facilities around the world, as well as throughout the U.S. Indian Health Service. VistA, after translation, has also been implemented in a number of foreign countries, including Finland, Egypt, and Germany, and it is being used at a number of mental hospitals in Washington State. (32)

The VA has actively encouraged adoption of its VistA software in the public domain, available by request to the VA through the Freedom of Information Act. Making the VistA software readily available to other organizations is just one component of a long-range collaborative VA strategy known as HealthePeople, the goals of which are to increase availability and use of (a) high performance health systems and (b) high performance, interoperable health information systems to greatly improve health for people in the U.S. and other nations. (32)

A 2004 report entitled *Establishing an Electronic Infrastructure* states: “it is not practical to transfer the VistA system to other venues...due to the system’s robust but outdated platform.” The author does note, however, that “although the VA and DoD experiences are not completely applicable to outside systems, both organizations have shown that computerized, networked systems *are* possible, they *do* work, and they *can* improve patient care and patient safety.” (8)

B. Experience in the Small Physician Office

Even without widespread interoperability, the powerful benefits of a combined electronic health record (EHR)/practice management/e-prescribing system for the medical office have been demonstrated in the ACP Discussion Paper: *The Paperless Medical Office: Digital Technology's Potential for the Internist*. (33) This paper shows that physicians can improve the quality of care delivered, reduce medical errors, and be more productive, more efficient, and more profitable by using digital communication technology. Though the cost of implementing such a combined EHR/practice management system varies widely, the average start-up cost fell into the \$20,000 to \$40,000 per physician range. Recouping this investment averages about one year, with the practices studied noting some disruption to practice operations and productivity during system implementation. The process of converting paper medical records into a computerized system was perhaps the biggest challenge and time consumer, and one which requires meticulous physician oversight to avoid omission of key patient information.

ACP believes that moving practices from paper-based to digital electronic operations holds many benefits, for patients and physicians alike. Consistent with ACP recommendations 8 – 13, it is important that new EHR/practice management/e-prescribing systems, no matter how automated, preserve a physician's responsibility and judgment in making patient care and medication decisions. This judgment extends to overriding automated clinical reminders which may not be pertinent or critical at the time a patient is seen. While decision support software is a useful new tool which can enhance and expedite care, it is not intended as a substitute for professional judgment or as a mandatory set of clinical guidelines which can be used to assess professional competency or liability.

To encourage wider use of such technology, ACP believes it is vital that the federal government give physicians sufficient financial incentives, flexibility, and time to cover start-up costs and the disruptive impact learning and converting to a new system has on staffing and productivity.

For many, the benefits of such an in-house EHR/practice management/e-prescribing system clearly justify such an investment; however, the full potential of going digital cannot be realized until all players in the medical marketplace communicate digitally, instantly, and with the transparency only complete interoperability can provide. This is why ACP calls for a nationwide interoperable healthcare information network in Recommendation 1.

VIII. Conclusion

While other industries such as banking and the airlines can seamlessly exchange data on customers and ongoing operations, U.S. medicine still is fragmented into myriad subsystems that cannot communicate in the same language with each other. Not only is such fragmentation duplicative, inefficient, and costly—it puts at risk the quality of care which can be delivered to patients. A military veteran who is unconscious and needs emergency care has the potential to receive the benefit of more appropriate care at a Veterans hospital, where his/her complete medical history is instantly accessible, than if he/she were taken to another hospital which has absolutely no medical data on this patient. There is already substantial evidence showing that instant electronic access to a patient's medication history can prevent dangerous and potentially deadly drug interactions.

The goal of interoperability is to create a single health record for every patient that is in the public domain, accessible from any computer with an Internet connection, and to allow seamless digital transmission of patient health data amongst all parties in the healthcare universe—while still ensuring patient confidentiality and compliance with all provision of the Health Insurance Portability and Accountability Act of 1996. The benefits in terms of enhanced quality of care, reduced medical errors, increased administrative efficiency and reduced overhead, increased productivity, higher patient and provider satisfaction—make the massive effort to achieve interoperability a worthy undertaking.

In the long run, interoperability should have even more global benefits for the U.S. healthcare system and population at large. First, it will serve as a great public health benefit which can better track disease outbreaks and potential bioterrorism. Second it could help drive out much of the duplication and waste which has given the U.S. healthcare industry a black eye, with year after year of double digit inflation. The healthcare inflation spiral could also be reduced by a reduction of medical errors and medication mistakes. It is also possible that the number and dollar value of malpractice suits will be reduced, with providers better protected from making mistakes in the first place (through online clinical decision and medication aids), and with the added protection of computer recorded documentation of episodes of care. ACP encourages the movement towards interoperability and has made a series of recommendations in this paper designed to stimulate and support acceptance of interoperability.

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