Smart Cards in U.S. Healthcare: Benefits for Patients, Providers and Payers

A Smart Card Alliance Healthcare Council Publication

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About the Smart Card Alliance

The Smart Card Alliance is a not-for-profit, multi-industry association working to stimulate the understanding, adoption, use and widespread application of smart card technology. Through specific projects such as education programs, market research, advocacy, industry relations and open forums, the Alliance keeps its members connected to industry leaders and innovative thought. The Alliance is the single industry voice for smart cards, leading industry discussion on the impact and value of smart cards in the U.S. and Latin America. For more information please visit http://www.smartcardalliance.org.

About the Smart Card Alliance Healthcare Council

The Healthcare Council is one of several Smart Card Alliance Technology and Industry Councils, a new type of focused group within the overall structure of the Alliance. These councils have been created to foster increased industry collaboration within a particular industry or market segment and produce tangible results, speeding smart card adoption and industry growth.

The Smart Card Alliance Healthcare Council brings together payers, providers, and technologists to promote the adoption of smart cards in U.S. healthcare organizations. The Healthcare Council provides a forum where all stakeholders can collaborate to educate the market on the how smart cards can be used and to work on issues inhibiting the industry.

Healthcare Council participation is open to any Smart Card Alliance member who wishes to contribute to the Council projects.

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Executive Summary

The healthcare market in the United States is complex, expensive, and fragmented. Due to the combination of managed care, extensive specialization of medicine, and continual changes in healthcare insurance coverage, Americans receive their medical care from a multitude of different providers. From the patient-consumer standpoint, this diversity both diminishes the healthcare experience and impedes the availability of vital medical records. There are over 500,000 office-based physicians in the United States and over 5,000 hospitals.[1] Unfortunately, a patient's medical records are frequently scattered among multiple providers and places of service, and there is often no easy way to get at the records.

This decentralized storage of medical records inevitably leads to higher costs. Laboratory tests, examinations, and prescriptions may be duplicated because one clinician lacks access to the information others have already obtained. Doctors prescribe drugs and therapy they might not have ordered if they had access to a more complete patient record. Managing patient record data and the accompanying burden of documentation therefore creates a very challenging business environment for healthcare providers. It is estimated that 31 cents of every U.S. healthcare dollar are spent on administrative costs.[2] These costs contribute to the staggering $1.92 trillion spent annually on healthcare in the United States.[3] In addition, incomplete information is a leading cause of medical errors that claim the lives of nearly 100,000 patients each year.[4]

In 1991, the Institute of Medicine declared that computer-based patient records are essential to the delivery of safe and effective healthcare in the United States.[5] Since then, numerous studies have documented the potential benefits of electronic medical records (EMRs), both for improving patient care and reducing costs.[6,7] However, more than 15 years later, less than 25% of U.S. physicians report having a fully operational EMR system.[8,9] EMR technology is seen by many as a fundamental building block of regional data exchanges (RHIOs) and a National Health Information Network (NHIN) in the United States. But the slow rate at which technology is being adopted in healthcare has hindered these efforts.

The lack of complete and comprehensive patient medical records is a major challenge to our healthcare delivery system. This deficiency hinders the system's ability to improve both quality and productivity and to manage costs and safeguard data. Some progress has been made in the area of standards development and adoption. The government has facilitated this progress and

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1 American Hospital Association, "Fast Facts on U.S. Hospitals from AHA Hospital Statistics™," http://www.hospitalconnect.com/aha/resource_center/fastfacts/fast_facts_US_hospitals.html, August 30, 2006.

2 S. Woolhandler, T. Campbell, and D.U. Himmelstein, "Costs of Health Care Administration in the United States and Canada," *New England Journal of Medicine* 349, No. 8 (2003): 768–775.

3 The Centers for Medicare and Medicaid Services, 2005 and C. Smith *et al*., "National Health Spending in 2004: Recent Slowdown Led by Prescription Drug Spending," *Health Affairs* 25, No. 1 (2006): 186–196.

4 Institute of Medicine, *To Err Is Human: Building a Safer Health Care System*, Washington, D.C.: National Academies Press (1999).

5 R.S. Dick, E.B. Steen, eds., *The Computer-based Patient Record: An Essential Technology for Health Care*, Washington, D.C.: National Academies Press (1991).

6 Hillestad *et al*., "Can Electronic Medical Record Systems Transform Health Care?" *Health Affairs* 24, No. 5 (2005): 1103-1117.

7 C. Goodman, "Savings in Electronic Medical Record Systems? Do It for the Quality," *Health Affairs* 24, No. 5 (2005): 1124–1126.

8 Manhattan Research, *Taking the Pulse® v5.0: Physician and Emerging Information Technologies*, New York, N.Y., April 12, 2005, http://www.manhattanresearch.com/thepulse2005.htm.

9 Catharine W. Burt, Ed.D., Esther Hing, M.P.H., and David Woodwell, B.A., "Electronic Medical Record Use by Office-Based Physicians: United States, 2005," CDC/National Center for Health Statistics, Division of Health Care Statistics (2005), http://www.cdc.gov/nchs/products/pubs/pubd/hestats/electronic/electronic.htm.

has helped initiate and coordinate efforts aimed at standards certification and at promoting electronic sharing of patient information. However, successful completion of these efforts will take considerable time and require cooperation among stakeholders who often have competing or misaligned interests. There is a compelling need to provide practical and trusted solutions that can have an immediate impact on the communication and exchange of patient health information. Smart cards have the potential to be an appropriate technology solution, both for the present and the future.

A smart health card makes secure and portable exchange of health information possible, allowing patients to retain their personal health records at all times in a convenient and compact format. In addition to identification, demographic, and insurance information, a smart health card can store a wealth of medical information, including a list of health problems, allergies, immunizations, active medications, selected lab results, and recent healthcare interactions. Healthcare providers can read and update a smart health card with new information at the point of care. A smart health card can therefore reduce healthcare inefficiencies and the possibility of medical errors, and empower patients by making them more active partners in the management and maintenance of their healthcare.

Introduction

The healthcare market is poised to move from a paper world to an electronic one. In an era of managed care, specialized medicine, thin financial margins, identity fraud, difficult insurance claims, and government demand for secure, portable, and confidential patient information, the competitiveness of healthcare providers may depend on effective use of information technology (IT). However, increased computerization, reliance on databases, and movement of sensitive patient information require strict controls to safeguard the security and confidentiality of healthcare records.

As the industry advances electronically, data protection is a key concern, fueled in part by legislation such as the Health Insurance Portability and Accountability Act (HIPAA). Current healthcare requires immediate and secure information access without compromised privacy. Smart card technology represents a unique opportunity to provide healthcare solutions that combine secure information access and management with data mobility and patient privacy.

Healthcare administrators are currently major consumers of paper and ink. Keeping patient records, submitting medical claims, making referrals, writing prescriptions, and booking appointments are typically manual processes. The few areas that are automated tend to operate independently of each other. Only a minority of physician practices store patient data electronically. Physicians and other healthcare professionals have a stubborn affinity for using paper-based media to collect and retain patient data.

The use of smart cards can reduce healthcare paperwork and protect patient records. The smart card can hold encrypted patient information and use a digital signature or a biometric template to reduce ambiguity about the cardholder's identity. The use of smart cards can also reduce the incidence of fraud in health benefit claims—a significant issue for the Federal government. And while HIPAA does not call for the use of specific technologies, it is likely that many healthcare enterprises will choose smart card-based solutions because of their ability to support secure data handling and reduce fraud.

Smart card technology can also improve the healthcare insurance process. Currently, eligibility verification and claims processing are too often characterized by redundant information collection, multiple reimbursement forms and lengthy delays. Paper-based manual processes greatly increase the risk of human error which results in significant avoidable costs to insurers, national health agencies, and healthcare providers. Too often, these processes result in significant delays in referral, treatment, and reimbursement for insured patients.

Smart cards can provide clean data for eligibility verification and claims processing. They not only can prevent administrative errors and streamline the payment process, they can also prevent medical errors that arise when one practitioner doesn't know what another has been doing. Test results conducted by one practitioner can be available to all practitioners. Before prescribing a drug, a physician can review a patient's recent diagnoses, allergies, and prescription history and be aware of any over-the-counter drugs that could conflict with the proposed course of treatment. In the long run, the data carried by smart health cards not only can prevent illness and save lives, they also can save the healthcare industry billions of dollars.

Today, many patients lack control over their health records. Smart cards are among the few electronic devices that enhance both control and privacy. No one can read what is contained on the smart card's microchip or use the card to access computerized records without a personal identification number (PIN) and authorized hardware and software. Further, smart cards interact reliably with a wide range of systems. They can operate over the Internet to verify information in a carrier's database, and they can be read and updated offline at a physician's office, when medical clerks prepare electronic claims for submission to an insurer.

Moreover, the ability of smart cards to disaggregate data and encrypt information can protect an individual's right to privacy while still allowing multiple healthcare facilities to share patient

information more efficiently. Smart cards can carry important health information and participate in the health information system's billing and collection functions. Smart cards can also play a key role in areas such as clinical research where provisions for confidentiality and patient control of data access encourage patients to participate in research studies.

Regardless of whether the smart health card stores critical medical data and clinical information or acts as a secure key to open distributed repositories of patient information, it is a concept whose time has come. Smart cards are a practical enabling technology that can enhance the privacy and confidentiality of patient information. They are intuitively easy to use and work in a very similar manner to credit cards, which have become so ingrained in our society

This paper describes the challenges within the healthcare industry and the clear opportunities for the use of smart card technology in health care. In recent years, there has been a pronounced effort to establish and refine standards for maintaining and moving healthcare data. With continual advances in smart card technology and increased awareness of its practical solutions, the healthcare industry's use of this technology is gathering momentum. This paper cites some examples of smart card use and suggests additional applications for consideration. A plethora of new healthcare applications await discovery and implementation.

1 Healthcare in the United States

The chief stakeholders in the U.S. healthcare system are patients, providers, and payers. Most agree that the key to delivering safe, personalized medicine is communication among all three groups. The U.S. government is by far the biggest payer, and it strongly promotes the idea of sharing health information across entire communities by tying them together electronically. When that goal is realized, a person's private, clinical, and administrative health information could be available and revised anywhere at any time.

The key to this vision has been the adoption of the electronic health record (EHR). One major challenge of realizing the vision of the EHR is that less than 25% of clinicians are using electronic medical records (EMR), one of the essential ingredients needed to support regional electronic health records. In regions of the country with higher utilization rates of electronic medical records, the next challenge is to manage the data flows and integration points from one health system stakeholder to another. In the current models being discussed the most important piece to the success of the regional electronic health record is overlooked: the patient.[10]

1.1 Overall Health of the Nation and Its Impact on Interoperability

A recent U.S. Department of Health and Human resources report[11] shows that the health of the nation is improving. Both longevity and the quality of life are increasing but unfortunately are accompanied by increased prevalence of chronic conditions. Increased longevity exacerbates the challenges of storing and retrieving health information, because chronic illness usually implies additional care from a more diverse group of providers, more complex payment schemes, and a more complicated data flow.

1.2 Healthcare Use and Its Impact on Interoperability

People use healthcare services for many reasons:

- To treat illnesses, injuries, and health conditions
- To prevent or delay future healthcare problems
- To reduce pain and improve quality of life
- To obtain information about their health status or prognosis

Recognizing these usage trends can help project future healthcare access needs and expenditures. Access to healthcare is determined by the supply of providers and the ability to use and pay for care. Between 1994 and 2003, the percentage of the population under 65 years old with no health insurance coverage fluctuated between about 16–18 percent. The percentage of the population with private health insurance decreased between 1999 and 2003. This decrease was offset by an increase in Medicaid coverage, resulting in little change in the percentage of uninsured.[12] One Center for Information Technology Leadership (CITL) study identified $78 billion in annual savings, while another study estimated $44 billion from the widespread implementation of IT used in ambulatory care settings.[13] These savings could

[10] GAO, "Health Care: National Strategy Needed to Accelerate the Implementation of Information Technology," GAO-04-947T, Washington, D.C., July 14, 2004.

[11] Karen Davis, "Time For Change: The Hidden Cost of a Fragmented Health Insurance System," invited testimony, "In Critical Condition: America's Ailing Health Care System," Senate Special Committee on Aging, March 10, 2003.

[12] National Center for Health Statistics, *Health, United States, 2005 with Chartbook on Trends in the Health of Americans*, Hyattsville, Maryland, 2005.

[13] Center for Information Technology Leadership, "The Value of Healthcare Information Exchange and Interoperability," Boston, 2004, and "The Value of Computerized Provider Order Entry in Ambulatory Settings," Boston, 2003.

theoretically be applied in some form to provide a level of health insurance for those who have none. However CITL concedes that these estimates are based on a number of assumptions and impeded by incomplete data, and therefore may not provide a precise measurement of savings to the already existing national health system (CMS, Centers for Medicare and Medicaid Services). However, they do represent a realistic target for solutions presented in this paper.

1.3 Expenditures and Health Insurance

The United States spends more on healthcare per capita than any other country, and such spending continues to increase rapidly. Much of the spending is for care that controls or reduces the impact of chronic diseases and conditions that affect an aging population. In 2003, national healthcare expenditures in the United States totaled $1.7 trillion, a 7.7 percent increase from 2002. Since 1995, the average annual rate at which prescription drug expenditures have increased has outstripped the rate of increase for any other type of health expenditure, indicating the growing importance of prescription drugs.[14]

The source of payment for personal healthcare varies according to the type of care provided. In 2003, government sources were the primary payers of hospital and nursing home care, accounting for about three-fifths of these types of services. Private health insurance paid for almost one-half of physician services and prescription drugs.[15]

This situation creates a dilemma. On the one hand, few providers create the EMRs required to increase the safety and quality of care, our population is aging and consuming more healthcare services, and the care we require is becoming more expensive. On the other hand, reimbursements are dwindling, and experts say that the healthcare payment system is moving toward consumer payment structures. No one wants to fund the interoperability effort required to move to EMRs. The reason that is always given is return on investment, or ROI.

Demonstrating ROI for clinical applications such as EMRs is a challenge because of the difficulty of defining appropriate metrics. Information is available that demonstrates the national advantages of EMRs. For example, “Studies have demonstrated that ambulatory electronic health records (EHR) potential cost savings of $78 billion the effects of EHRs include reducing laboratory and radiology test ordering by 9 to 14% lowering ancillary test charges by up to 8%, reducing hospital admissions, costing an average of $17,000 each, by 2-3%, and reducing excess medication usage by 11%.”[16] Despite these savings, such information does little to help convince the solo practitioner or the rural hospital that cannot afford an ambulatory documentation system to participate.

Effective metrics must collect and associate data measuring financial, clinical, and quality (patient satisfaction) parameters for all patient care services. The current standard metrics are solely financial/cost parameters. Another challenge is the absence of reproducible results. Academic medical centers are far more capable of implementing advanced clinical IT systems than are community hospitals, where most of the physicians who have admitting privileges are solo practitioners.

The need to reduce medical errors, improve safety, and reduce costs has shifted the focus of the U.S. healthcare system from managing healthcare costs to managing through the use of technology. The 1990s encouraged a national move toward managed care in an effort to reduce rising healthcare costs. This move was driven mainly by the health insurance industry. The last several years have seen a different approach. Efforts have been made across the United States to improve patient safety and quality of care through technology-based solutions that make patient information available at the point of service. These efforts have focused on creating

[14] The health spending projections were based on the 2004 version of the National Health Expenditures (NHE) released in January 2006 by the Centers for Medicare & Medicaid Services, Office of the Actuary.
[15] Ibid.
[16] GAO, GAO-05-309R, "Health and Human Services' Estimate of Health Care Cost Savings Resulting from the Use of Information Technology," February 17, 2005.

personal health records, payer-based patient records, and EMRs. However, each one of these efforts is typically undertaken separately and independently, with little or no coordination. Many experts in the field of healthcare IT have proposed solutions for this lack of implementation coordination. Proposed solutions range from the radical "centralized data repositories" to federated infrastructures that require the use of record locator services (RLS). Both of these approaches have their merits and challenges, but neither on its own has proven to be the Rosetta Stone. However, "hybrid" combinations of these two approaches using smart cards hold promise for achieving true interoperability among patients, providers and payers.

2 Defining Benefits: Patients

In today's medical environment, patients are the only ones who do not have access to their own medical data. Today's systems store redundant information in many places. Records are maintained by each physician treating a patient, by every institution serving a patient, and by any insurer who covers the service. However, the patient has virtually no access to the data, no ability to determine what is in the various databases, and no way to change anything that is incorrect.

U.S. healthcare is being pushed to a point where change is imperative from the patient's perspective. The first of 76 million baby boomers will turn 65 in the next 4-5 years. This aging population has grown up with continuous technology advancements and greater levels of information access. As consumers, this group of patients has driven investment in remote banking, contactless payment cards, mobile phone purchases, and, especially, consumer selection and financing options for healthcare.

These same patients see more than one provider during any course of treatment and tracking health information from all of these sources is nearly impossible. For example, the primary care physician will refer a patient to a specialist who prescribes therapy. The therapist then completes that treatment and sends the patient back to the primary care provider who most often does not have a complete and accurate record of the events documented by the other two providers. As baby boomers are growing older and living longer, they are having more complex encounters with the healthcare system requiring input by several providers for treatment or care. Baby boomers' comfort level with new technology and the Internet will drive investments and change in the healthcare system as banks, payers and providers strive to upgrade their businesses to meet patient demands for better, more efficient information access.

2.1 Key Industry Trends

It has been estimated that 6 million Americans participate in some type of consumer-driven healthcare financial account.[17] The need for secure identity access and availability of personal health information, using channels to which the participants have become accustomed, is growing. Today's consumer expects to enjoy secure access to portals that offer services such as payment over the Internet and advanced banking functions. Easy access to a consolidated menu of capabilities has become a standard. A recent survey suggested that healthcare payer organizations recognize that servicing this population will require interactions to move away from traditional channels, such as call centers, into Web-enabled channels, such as portals.[18] When this requirement is combined with the rising costs of healthcare and the continual need for health plans to innovate to serve this population, healthcare payers will see a growing need for a consumer smart health card.

2.2 Consumer-Driven Healthcare: Creating a Need

Health cards based on smart chip technology, combined with appropriate medical applications and data, can allow individual patients to maintain and control access to their own medical records. This health card is distinguished from other types of cards by its ability to transport confidential data securely from cardholder to practitioner and by the convenience of providing data immediately. Patient information can be accessed and controlled by the patient, using a card reader connected to the provider's computer or to the consumer's computer at home. Transaction audit trails tracking both card access and modification can be captured and

[17] HealthLeaders-InterStudy, a company of Decision Resources, Inc., "Consumer-Driven Healthcare Creating Need for Smart Medical Debit Cards," October 11, 2006

[18] Datamonitor, "U.S. Healthcare Technology Decision Maker Panel," December 29, 2005.

documented. Security features restrict access to data stored on the card through the use of a password or PIN, making the smart card a more secure method of verifying a patient's identity.

2.3 Greater Levels of Functionality

Technology advances that free the smart card from dependence on reader-based technology will open alternative channels of interaction to the consumer market. Advancements in chip technology will drive new options, such as the use of mobile phones for wireless connectivity, resulting in both reduced expenses (no physical connection to a smart card reader) and increased ease of use. Such ease of use and expanded security and access management can allow the more advanced consumer demographic to use portals, assert identity, and control access to medical data stored on the smart health card chip. Wireless connections can provide the necessary security and authentication processes required for acceptance and adoption, with the smart card making these services transparent to the users.

But perhaps the most significant advantage to patients will come in the form of improved medical care. The smart card's ability to store pertinent medical records can give providers immediate access to medical histories, current conditions, and prescription drug information. The instant availability of recent lab test results can eliminate redundant testing and delays. Adding payment capabilities will give patients the ability to manage their healthcare investment accounts and services using a single integrated form factor.

Storing cardholder information, including primary physician and coverage information, on a chip that is accessible using a mobile phone can improve access to treatment when a cardholder is traveling, moving, or changing primary providers. The smart card chip can eliminate the need for transcription of medical history or insurance information and inform a provider's office staff of the extent of coverage, thus reducing costs and streamlining service.

2.4 Consumer Demand for Improvements

Today's consumers are demanding improvements in healthcare services. Patients are faced with more situations that require medical information to be shared freely among different providers. Traveling, moving, consulting specialists, or changing primary providers are all situations in which healthcare consumers require a way to transport the information needed to dispense quality medical care easily and securely. In today's work environment, a large number of consumers have multiple insurance policies or plans, suggesting the utility of a single card that is secure and controlled by the patient—a card that can store medical records securely while providing immediate access to providers. More importantly, the card must also be an essential component in the customer interaction between healthcare organizations in a primarily online consumer-directed market. Smart chip technology can provide the basis for this essential component.

3 Defining Benefits: Healthcare Institutions and Providers

From the initial registration and admission of a patient through the processing of medical claims and billing, healthcare institutions are increasingly burdened by the cost and complexity of healthcare administration. The combination of a highly fragmented healthcare marketplace, characterized by a myriad of health plans and a variety of reimbursement models, with an ever-changing landscape of regulatory compliance, has made healthcare a difficult business.

Administrative costs are an important consideration for all healthcare institutions. They have a significant financial impact on the organization and often compete with other operational priorities. For most institutions, the revenue cycle is highly dependent on the front-end registration/admission process, which drives much of the downstream claims process.

Patient registration is the administrative step that establishes a patient's identity, which is what links the patient to medical information gathered during the course of care. Reducing identity errors during registration greatly improves the billing and collection processes, enhancing revenue capture. Incomplete demographic or insurance information is one of the most common reasons for claim denial. Of the errors that contribute to pending and denied claims, up to 70% are attributable to the registration process. These errors can result in millions of dollars in lost or delayed revenue and necessitate the additional expense of reviewing and resubmitting old claims, which often require detailed chart reviews and contact with patients and physicians for information.

Smart health cards can provide an institution with positive visual identification of a patient (a photograph) and a direct link to the patient's medical record number, which can be printed or included in a barcode on the face of the card. More detailed demographic and insurance information can be stored on the smart card chip, which can make registration more efficient and accurate. The integration of smart cards into the registration and admissions process should provide more reliable patient identification and more accurate and efficient links to existing medical records, improving the information gathering process.

For these reasons, the use of smart cards can greatly reduce the medical record maintenance costs associated with duplicate or overlaid patient records. (Duplicate patient records result when a new record is created for a patient who already has a record. Overlaid records are when two patient records are incorrectly combined.) It is estimated that in an average hospital, 5-15% of all patient records are duplicates. Erroneous record information is an issue for all healthcare institutions. In addition to incurring administrative costs to clean up the errors, erroneous records can have disastrous clinical and legal consequences. The presence of erroneous patient data greatly increases the risk of medical errors and adverse events. Overlaid records can represent a liability to an institution years after the error has occurred, exposing care providers and their institutions to the threat of malpractice suits.

Emergency medicine often deals with time-critical medical interventions. The rapid availability of medical information during an emergency can save a patient's life. This is another advantage of the smart health card. Smart cards can store information about medical conditions, allergies, and current medications—information that can be critical to a successful clinical outcome but that is often unavailable in an emergency.

It seems clear that having an integrated view of a patient's current medical history allows for better care and can also reduce the incidence of unnecessary testing and unnecessary hospital admissions. However, most healthcare providers, even if they maintain medical information electronically, have no means of sharing that data with other providers, let alone assembling an integrated view. Healthcare still relies heavily on traditional modes of communication (phone, fax, and mail), as well as on using the patient as the courier of needed medical information. Very often records are simply not available. Because clinicians must then rely on a patient's memory,

they often have no recourse but to repeat tests and procedures to assess and treat patients properly.

Such scenarios are quite common and greatly increase costs and decrease continuity of care. Smart health cards can help bridge the information and communication gaps that exist between healthcare providers without the prerequisite of an EMR or integration with a data exchange. Minimal infrastructure is required to read a smart card (a reader and viewer software). Information is exchanged securely and under the control of the patient who owns the data exchange vehicle—the smart card itself.

4 Defining Benefits: Payers

The healthcare community, including payers, has been slow to adopt Web/Internet technology, including smart card technology. Because of the changing healthcare landscape, however, payers are currently reevaluating their role in healthcare delivery. New technologies and changing healthcare models are encouraging payers to develop an enterprise IT strategy that can provide a single business, data, and technology foundation. This strategy has two key goals—improve the health of members and improve the business. In other words, payers are poised to leverage technology to realize the administrative savings that can result from streamlined business processes and better patient care.

Smart cards have a place in a payer's enterprise IT strategy, representing as they do a secure, portable electronic file capable of linking all entities in the healthcare community. Smart health insurance cards can improve data security and confidentiality, restricting access to sensitive healthcare information by storing access rights as keys that are used to authenticate the cardholder and control access. Managing when and where a person's private health information is accessed and making that information more readily available to those who have the need to know it reduces administrative overhead for everyone involved, including the payer. The implementation of a smart health insurance card can automate manual tasks, from eligibility and coverage updates to claims processing, and reduce the time taken by administrative procedures such as verifying patient insurance status and eligibility.

4.1 Card Features

Smart cards can:

- Identify the cardholder.
- Store information describing the cardholder's legal and business relationship with an insurance company.
- Store the cardholder's health insurance status.
- Identify the cardholder's primary care physician.
- Store data describing health system activity.

Smart cards can also store an extensive clinical record, including claims data and personal annotations from the patient to further extend the record's usefulness. All information can be stored on a smart card and secured and administered by the patient.

4.2 Benefits

The greatest benefit of systems integration and smart card technology is rapid access to previously unavailable information. Smart cards sustain both an accessible patient record and a hybrid approach to the creation of this record. The use of a decentralized architecture combines local autonomy with global coordination, ensuring a secure and accurate patient health record. Centralizing card management and core data functions allows cards to be replaced easily and supports usage audits to prevent fraud.

The following benefits can be realized using smart cards:

- Eligibility and coverage can be updated automatically and virtually, eliminating the administrative headache of updating employees' booklets each month. Because physicians can have access to a patient's entire health summary, the paperwork required for health record and lab result requests can be eliminated.
- Electronic prescriptions can be stored directly on the card, eliminating paper transactions and the potential errors associated with them, as well as the potential for fraudulent prescriptions.

- Redundant tests can be eliminated and utilization management tools can be real-time, not retrospective.
- Needed information stored on the smart card can be accessed directly, reducing or eliminating provider service calls, wait times, and postage and processing costs.
- Paper-intensive health insurance claims systems can be streamlined, eliminating paper and expediting the processing and reimbursement of claims to the insured.
- Cardholders can extend the validity or report the loss of cards themselves, using (for example) self-service terminals located throughout a community's healthcare organizations. Lost cards can be reissued by the payer and mailed to the users.
- If a cardholder wishes to change primary care physicians, the new physician can make the change on the card, which can automatically update the cardholder's record and notify the former primary care physician of the change.

The digital storage of information and automation of paper-based processes should result in cost savings and reduce the errors associated with manual data entry and handwritten documents. A network of databases maintained by the payer and the payer's technology project partners can link all parties involved in health insurance administration. Employers, health professionals, and insurance companies can update databases and smart cards automatically and regularly. Members can receive a smart card automatically through the network. During a patient visit, physicians or other providers can immediately view patient eligibility and coverage information and the patient's primary care physician designation. Data pointers stored on the patient's card can enable the physician to access patient health information stored on the card and in remote databases located elsewhere. After the patient visit, the healthcare office manager can generate electronic health insurance claims directly from the data stored on card, eliminating all paperwork previously required by such transactions.

4.2.1 Plans

Healthcare plans can benefit from the use of a smart health insurance card in numerous ways. For example, the card can allow plan providers to replace proprietary systems, such as legacy managed-care information systems. In addition, direct access to cardholder information means decreased provider service calls, fewer call center staff, shorter wait times, and lower postage and processing costs.

A smart health insurance card can provide accurate and complete claims submission processing, which reduces errors and the requirement for administrative staff. The card can consolidate or replace current expensive products and leverage investment in current legacy systems.

Finally, use of such a card can improve relations with member subscribers (patients) and providers through participation in cost-containment efforts.

4.2.2 Health Plan Members

Health plan members, acting as consumers, are the newest entrant and probably the most influential player in the healthcare model. One of the most striking results of the information flow produced by current technology is consumer empowerment. Consumer empowerment is changing the relationship between the patient, the physician, and the payer, shifting responsibility from the hospital to the office or home. A new smart card-based delivery model can increase consumer satisfaction by increasing efficiency at the provider site and allowing the consumer to have direct access to specific information required for decision making:

- The patient's eligibility, health history, and payment information
- Patient records required by physicians and staff for making care decisions
- Prescriptions, which can be dispensed at the point of care
- Comparative information to facilitate provider, treatment, and product selection
- Physician secure messaging service and home monitoring

4.2.3 Providers

A smart card doubling as a health insurance card can provide physicians with a tool to access necessary medical information easily at the point of care. The card can also provide physicians with the motivation to use the card. For example, physicians could use the card to access a patient's drug history and plan formularies and then prescribe medications with the assurance that the prescription is appropriate and correct. As a further benefit, patients and physicians may then receive discounts and rebates for using the smart card to prescribe and fill prescriptions, simply because using a card in this manner reduces prescription fraud. By authenticating the prescription and the patient's identity at both ends of the process, with the physician writing the prescription and the pharmacy filling the prescription, the opportunity for error and fraud is almost eliminated. Both physicians and payers could also use a smart health insurance card to mine a secure database of clinical information—for example, to compare the clinic's top 10 diagnoses with the population of patients in the state.

Providers may also have a financial incentive to accept smart health insurance cards. Smart-card-based claims submissions and adjudications involve shorter cycle times, leading to a more immediate receipt of payment.

4.2.4 Employers

Employers benefit from the adoption of a smart card-based health insurance card. During enrollment and the subsequent yearly benefits review, the combination of a Web-based portal and a smart card eliminates the need to re-issue "paper cards," significantly reducing the cost of this process. After initial enrollment, the employer can have access to information about its employee population that can be used to re-negotiate its group health plan or other insurance with its providers. Because this information in a centralized database can be used to aggregate depersonalized information on employees, the employer can check for significant work-related health problems. If problems are found, workplace modification or employee training could be used to reduce the incidence of these problems. Health and wellness programs that have grown in popularity only benefit from the use of smart card technology because the programs can now be personalized without violating employees' right to privacy about their state of health. Secure messaging services can provide anonymous reminders to employees who fit a category that certain tests or annual physicals are due without the employers knowing who are getting these messages. The employee simply "subscribes" to services while using their smart card.

4.2.5 All Constituencies

All healthcare stakeholders can benefit from improved information flow and smart card aggregation in two ways.

First, patterns of consumer behavior can be studied. Correlating behavior and the content of clinical practice as captured through clinical charts and prescribing records can yield new insights into consumer health and wellness. Most of this data is currently locked in payer claims systems, and it is too daunting a task to correlate it with the clinical data reported by physicians or patients. These patterns can be used to develop measurable deliverables and goals for community-based systems. Combining outcome data with clinical information can make it possible to look at "quality of care" issues. For example, the duration of an individual patient's urinary tract infection could be analyzed to see how the treatment compared to a population of patients with the same problem. This information could provide a rich dataset for creating treatment protocols.

Second, needs and wants can be determined. Establishing smart card community connections can enable a range of data to be gathered from providers and consumers using direct surveys, and utilization management information describing the kinds of services accessed by subscribers can be monitored immediately.

5 Convergence of Healthcare Information as an Economic Driver for Adoption of Smart Cards

Smart card technology was in use in the U.S. healthcare system as early as the mid-1990s. The initial programs, however, operated in isolation. For example, a pilot program in Tennessee linked 29 pharmacies to reduce Medicaid fraud. The concept was simple and laid the groundwork for current RHIO efforts in Tennessee. Most other early smart card programs, however, focused on providing emergency data to enhance a patient's chances of survival, prescription information to reduce fraud, or identifying first responders in emergency situations rather than laying the foundation for a RHIO.

In today's environment of more consumer-driven healthcare, healthcare savings accounts, and employer-driven wellness programs, the push is toward convergence of information and collaboration with healthcare delivery players to reduce administrative costs and serve patients better. Until just recently, however, all stakeholders, including the consumer, have been slow to embrace smart card solutions. The advent of other technologies that allow system integration has led physicians and consumers to have rising expectations for decision-making information. Payers have also entered the fray, "pushing" information to their membership using newer Web technologies.

5.1 Consumer Expectations

As expectations for better and faster service in healthcare rise, opportunities exist to blend and change certain healthcare information sources. New projects that mix payer claims data with self-reported personal health information have experienced success. Payers such as Blue Cross of Northeastern Pennsylvania (BCNEPA) have used claims data to build a payer-based patient record and then provided access to that record to the patient for addition of personal health information. The updated record is then exposed to providers both in and out of the network.

A BCNEPA subscriber can use a particular Web site to sign up and complete a personal health record already populated with the subscriber's insurance identity and claims data. A smart card is issued to the subscriber with all of this aggregated health information securely encrypted on the new smart health insurance card. The first time the subscriber goes to an in-network provider, the provider has the benefit of a richer, more detailed record about the patient. The smart card is then updated with information from that visit, and the health information provided by all three stakeholders converges. Although it is too early to discuss the effect on ROI of using this approach, the results are extremely positive with respect to subscriber and provider acceptance and payer adherence to privacy rules.

5.2 Cost Sharing

The healthcare industry is unique in one respect: if a clinician makes a mistake because of incorrect or missing information, a patient can be at risk for serious injury or death. For this reason, all three stakeholders—payers, providers, and patients—have begun to purchase technology to make their experience in the U.S. healthcare system safer, faster, and less expensive. Healthcare IT spending is up on the provider side, with expenditures mainly focused on exploring, evaluating, purchasing, and implementing EMR systems of all types. The expenditures range from $30,000 per provider, including hardware and training for the solo practitioner, to in excess of $1 million for larger, community-based EMR systems. Not to be outdone, payers are implementing more and more complex managed care systems that provide additional features and functions to their employer groups and, ultimately, the subscriber. These systems can provide features that make enrollment painless for the subscriber and allow subscribers to look up personalized benefit information, wellness information, and disease management information. Patients are not far behind, taking advantage of the availability of online personal health records that range in cost from nothing at all to $99.00 per year and up.

These examples provide evidence of a convergence of information and a convergence of concern that information should be available where it is most needed, at the point of service. Correctly driven smart card implementation would take advantage of this concern. Each stakeholder would invest in their part of the interoperability effort (described as a RHIO), expending capital to participate.

All stakeholders would benefit from their investment. On the provider side, smart cards improve processes such as registration and insurance eligibility transactions, and the benefits are irrefutable. Payers benefit from providing more automated information, reducing both call center staff and the amount of erroneous information being provided by overworked and underpaid staff. Payers also can access real-time authenticated usage data. The patient reaps the benefits of both payers and providers, saving time and money. Patients who are employees also push some of their benefits to their employers. By addressing an employee's personalized needs and supporting the employee's use of the health system, employers can reduce their expenses through automated enrollment driven by actual usage data. Employers can also provide employees with targeted health and wellness programs, and in some cases, reduce their skyrocketing premiums by investing any savings in exercise facilities or gym memberships.

5.3 Focusing the Value of the Smart Card Implementation

Smart cards and their healthcare applications should be implemented just as any other healthcare IT effort would be implemented. The projects should be governed by the project management rules that apply to implementation of any hospital clinical or administrative system. The mechanics of implementation are not really the challenge. The challenge is starting a smart card project.

To substantiate the return on investment from a smart card project, it is best to start with a project that develops a standard data model. This model should represent the clinical health summary information and insurance and administrative information. To be successful, an initial smart card project should focus on developing a card that supports three basic concepts:

- Positive patient identification
- Insurance verification
- Secure and private access to dynamic health summary information gathered from all three stakeholders: patient, provider, and payer

The rest of the functionality will then follow, as smart card integrators compete for business and the market grows.

6 Identity Verification and Security in Healthcare Services

Creating and maintaining electronic medical data sets the stage for making critical information available on demand, for collaborative sharing of information among healthcare practitioners, and for leveraging the Internet to facilitate the exchange of healthcare data among multiple entities and across great distances. The information access and sharing are expected to improve patient care, reduce paperwork, and make systems more efficient. However, it also introduces the need to protect information from unauthorized users.

The highly personal and sensitive nature of EMRs means they must be protected by strict access controls. Electronic transactions depend on individual's proof of identity and right to access data, whether in person or remotely. To protect electronic healthcare systems, it is necessary both to verify the identity of anyone requesting access to sensitive medical data and to determine that person's access rights. We must know with certainty to whom we are entrusting our private information.

An increasing number of identity systems use smart cards as a key component. Smart cards provide a vital link in the chain of trust. They have a unique ability to verify cardholder identity accurately and to safeguard and offer the cardholder's credentials to a secure, trusted identity system. Smart cards support such security mechanisms as public key infrastructure (PKI) and biometric templates. The latter is an increasingly valuable tool for verifying identity, since biometrics is the only technology that can indisputably link a credential or an authentication event to a specific person. PKI and biometric security systems are increasingly applied to verify the identity of individuals in a variety of situations, including in the healthcare industry.

Multi-factor authentication methods provide secure physical and logical access to critical information systems. Smart cards can support all methods or authentication factors, from a physical token (something you have) to a PIN/password/private key (something you know) to a biometric template (something you are). Smart cards not only can verify identity using any of these authentication methods, these cards can also determine one's access privileges to that information and share it with the trusted system being accessed. That element is essential to maintaining an efficient, secure, and trustworthy electronic healthcare system.

Smart cards can also protect healthcare information as required by HIPAA. Smart cards are uniquely able to facilitate patient information access while enforcing the established security and privacy policies of a healthcare organization. Smart cards support user authentication and on-card encryption of data prior to, during, and after the transmission of data—a HIPAA requirement. Smart cards can serve as a secure, private, portable patient data repository that remains under the control of the patient. Moreover, smart cards provide a platform that healthcare organizations can use to improve access to medical care, make care more convenient, and deliver multi-application clinical and administrative benefits.

A plethora of medical data is gathered and shared today, such as the results of diagnostic tests, specimen analysis, and physician collaboration. The delivery system for that information must protect it from unauthorized disclosure within the healthcare organization as well as between organizations (e.g., for claims processing). Smart cards help healthcare organizations comply with HIPAA regulations for keeping patient records and sharing patient data. Smart cards support the HIPAA privacy rule by limiting who can access specific patient information. Smart cards support the HIPAA security rule by safeguarding the integrity and confidentiality of patient information.

Smart card technology has been selected by a number of healthcare organizations to meet the HIPAA mandates for data availability, data integrity, and data confidentiality. Smart cards can store multiple passwords/PINs and access credentials. Their use can enforce stronger security policies, employing a mixture of electronic credentials without forcing a change in the user environment. Finally, smart cards arguably protect privacy best of all the identification technologies, because they safeguard the personal information residing on the cards, provide authenticated information access, and authenticate the legitimacy of other entities during a transaction.

7 Opportunities to Support RHIO and NHIN Efforts

Regional health information organizations (RHIOs) have gained considerable momentum across the country. Current estimates are that over 250 RHIOs are in the planning or implementation stages. RHIOs are considered by many to be essential to the vision of a national health information network (NHIN) which is being promoted by the Federal government. However, there is considerable debate about how to finance such a network and how to bring together the diverse RHIOs that are currently being developed.

It is estimated that the NHIN will cost anywhere from $100–$300 billion,[19,20,21] and it is clear that the government is looking to the various stakeholders to form partnerships to move regional efforts forward. The RHIO movement, to date, has been largely funded by grants, and there are only a few that have been in existence for more than just a few years. A number of important challenges are ahead for these health information exchanges (HIE). A crucial test of these organizations will be their ability to develop sustainable business models. Two further challenges will be ensuring the privacy and security of personal health records and building consumer trust, since consumers will ultimately decide whether they want their medical information stored in these networks. Successful RHIO and HIE efforts will need to find ways to engage and empower their patients.

Smart cards may well be the answer to many difficult consumer issues concerning security, privacy, consent, and identity management. These issues may paralyze many of the health information exchanges as they mature. Smart cards provide a cost-effective and consumer-friendly solution that can more actively engage patients in managing and accessing their medical information.

[19] Kaushai, et. al, "The Costs of a National Health Information Network," Annals of Internal Medicine, August 2005.

[20] Walker, Jan, et. al., "The Value Of Health Care Information Exchange and Interoperability," Health Affairs, January 2005.

[21] The Center for Information Technology Leadership, in Wellesley, MA, puts the 10-year cost of the NHIN at $276 billion, while the Rand Corp., in Santa Monica, Calif., estimates $115 billion.

8 Conclusions

This paper identifies smart card technology as a critical enabling tool to help resolve some of the issues with which the healthcare community is grappling today. Smart cards can help reduce the inefficiencies prevalent in healthcare, diminish the number and effect of medical errors attributable to a lack of critical medical information, and empower patients to take a more active role in managing and maintaining their medical records.

There is a great disparity between the amount of money that is spent on U.S. healthcare—the most per capita of any nation—and the use of electronic healthcare records. What is needed in the United States is a healthcare system that offers providers an integrated view of a patient's health status and medical history. Many healthcare industry experts believe that such a system would significantly improve the chances that the healthcare community can attain its critical goals: to cut costs, improve the quality of care, reduce medical errors, and improve information access. Unfortunately, most healthcare providers cannot share data with other providers, and they are certainly not able to support an integrated view of the patient's medical history and current health.

To remedy this situation, some have looked to some sort of national healthcare information network (NHIN) to break through the information logjam. Attention has focused on regional health information organizations (RHIOs) with the expectation that they will be the precursors of an NHIN. However, not only have RHIOs not been able to demonstrate a sustainable business model, their focus has been on technical infrastructure, not on becoming organizations to improve information access for patients. To date, RHIOs have had little influence on the sharing of information among healthcare providers.

Already at record expenditure levels, the U.S. healthcare industry faces additional spending increases. Much has been made of the aging of the American population. Unfortunately, this increased longevity is accompanied by the prevalence of chronic health conditions, implying a requirement for additional care from a more diverse group of provider specialists. This requirement, in combination with the mobile nature of U.S. citizenry, implies a substantial increase in the demand for secure access to decentralized medical records. The current lack of complete and comprehensive medical records creates a challenging environment for the healthcare community. This lack also limits the community's ability to achieve its goals of improving the quality of patient healthcare and reducing inefficiencies and costs. Added to the provider burden of managing patient records are requirements for patient verification, security, and privacy, as well as patients' desires to control of their own medical records.

Smart cards are not a panacea for all these ills. However, a smart card carrying critical patient medical data does support patient empowerment. The patient's smart card protects privacy while ensuring information access and security. It supports the mobility of today's patients, providing a means by which the various specialists who treat the patient can share information. Smart card technology helps reduce the burden of record management, providing timely information sharing and serving as a mobile repository for diagnoses and treatments. A patient smart card supports identity verification, provides excellent security, and can speed up patient registration and check-in. Leveraging smart card technology to improve provider competitiveness and HIPAA compliance can improve efficiency and reduce costs. Smart cards can provide the U.S. healthcare community with a feasible and expeditious solution to the long-term problem of information access, and it is a solution that RHIOs and any future NHIN might consider for their own use.

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