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Health Information Technology-Electronic Health Records: A Primer

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I. INTRODUCTION

Health Information Technology-Electronic Health Records (HIT-EHR) is a broad term that refers to the generation, storage, and transmission of electronic health information. Information management is central to the healthcare system, and HIT-EHR is widely viewed as the necessary step to bring healthcare into the 21st century. It is argued that HIT-EHR will reduce overall health care costs, improve quality, and increase efficiency throughout the healthcare system. However many are still skeptical as to its real impact given the substantial investments required to implement it.

To put this in context, U.S. healthcare spending was $2.1 trillion in 2006, and at least $250 billion in California.[1] U.S. spending is projected to grow to $4 trillion by 2015.[2]

Direct administrative costs account for more than 7 percent of the total U.S. health spending. However, when the administrative costs of hospitals and doctors are added to those of insurers and government, U.S. administrative costs are estimated 31 percent of total health care spending.[3] These administrative costs are estimated to be 30 to 70 percent higher than in other countries that also have mixed public-private systems.[4]

The leading nations in adopting HIT-EHR, such as Britain and New Zealand, have achieved 98 percent participation by primary care physicians; by contrast, in the United States about 28 percent of primary care physicians use HIT-EHRs.[5] Other sectors of the U.S. economy (e.g. banking) have successfully digitalized their operations, but healthcare has been slow in making transition.

While the development and wide-scale use of HIT-EHR has experienced obstacles, it is gaining ground in both the public and private sectors. This report will highlight recent developments and explain various aspects of HIT-EHR, including definitions, current usage, how it can benefit healthcare quality and costs, barriers to its development, and current public and private efforts to implement and expand it.

Glossary of HIT-EHR Common Terminology[6]

- **Electronic Health Record** (EHR)
  Electronically stored and transmitted medical record that contains patient demographics, medical history, lab tests, X-rays, scans, prescription lists, and any other relevant information

- **Personal Health Record** (PHR)
  A patient-managed electronic medical record

- **Health Information Exchange** (HIE)
  Data transfer between separate healthcare entities in the same facility or across great distances

- **Telemedicine**
  The transfer of health information using telecommunications technology; it can be as simple as a general practitioner and specialist discussing a patient's case on a secure line or as complex as remote procedures and examinations through digital imaging; has great promise in rural geographies

- **Electronic Prescribing** (eRx)
  A tool that can electronically process and communicate the prescription of medication between providers and pharmacies; can be a stand-alone product or incorporated into an EHR system

- **Computerized Physician Order Entry** (CPOE)
  This tool, most frequently used in a hospital setting, allows for the electronic ordering of medications and tests; was originally a stand-alone closed-system product, but can also be incorporated into an EHR system

- **Regional Health Information Organization** (RHIO)
  A group of healthcare entities in the same geographic area, which agree upon a standardized electronic network in order to communicate health information

Source: Legislative Analyst's Office, *Promoting Health Information Technology in California*, Feb. 2007

II. OVERVIEW

<u>Snapshot: The State of Health Information Technology in California</u>

In January 2008, the California Health Care Foundation surveyed HIT-EHR adoption and use in California the first survey of its kind. California exhibits a slightly higher rate of HIT-EHR implementation compared to national rates. This data suggests financial resources are a major factor in decisions about HIT-EHR adoption, for example as is evident in the rate of adoption by practice size.

Findings from the California HealthCare Foundation Survey[7]

Use of Electronic Health Records (EHRs) at Hospitals	
Fully implemented	13%
Partially implemented	42%
Not implemented	45%

Use of EHRs at Community Clinics	
In place/in the process of implementing	9%
Actively planning purchase	30%
Not currently pursuing	61%

Physician Use of EHRs by Practice	
Kaiser	79%
Large Practice (10+)	57%
Small/Med Practice (2-9)	25%
Solo Practitioner	13%

Methods of Storing Records at Physician Practices	
Paper records	74%
EHRs	13%
Scanners/Other	13%

Extent of EHR Installation at Medical Groups of 6+ primary care physicians (PCPs)	
Fully installed	20%
Installation underway	8%
Plan to install within 1 year	21%
Unknown status	51%

Barriers to Use of EHRs Among Physicians (all that apply)	
Expense of purchase	59%
Difficulty/expense of implementation	42%
Unsure how to make selection	31%
Resistance to change in practice style	30%
Lack of internal technical expertise	25%
Retraining of staff	28%
No return on investment	22%
Fear of product failure	22%

Source: *Snapshot: The State of Health Information Technology in California* (California HealthCare Foundation, January 2008)

Examples of Perceived Benefits

- ***A more efficient processing system***

  Accelerated transfer of information and substantially decreased administrative activity

- ***Fewer medical tests***

  Redundant tests now often performed because of lost or inaccessible past records

- ***Less medical errors and increased overall quality***

  Sends alerts of adverse drug interactions and reminder for proper timing of tests, etc.

- ***Increased public health monitoring and disease management***

  Disease trends and other medical conditions can be easily aggregated and detected over a wide variety of patients, and individually tailored treatments can be established and monitored for complex patients

- ***Improved emergency care***

  Fast access to patient records can optimize treatments and procedures

- ***More accessible and better developed measures of transparency***

  Includes comparisons on outcomes, quality, costs, adherence to protocols, reimbursement rates

- ***Potential to dramatically accelerate clinical research***

  Makes possible the combination of clinical data from millions of patients, enables rapid learning of the value of new medical technology and disease treatments

- ***Potential for system-wide costs savings***

  As a result of improved efficiency and quality and decreases in error and redundancy

  Source: Legislative Analyst's Office, *Promoting Health Information Technology in California,* 2007.

III. POTENTIAL COSTS AND FINANCIAL BENEFITS

A number of studies have sought to estimate the overall costs and benefits of widespread HIT-EHR implementation. As total healthcare expenditures in the United States continue to rise, and is projected to reach $3 trillion nationally by 2012, HIT-EHR-centered investments are viewed by some as cost-savings tools that can have a significant impact on the system as a whole.

RAND researchers Richard Hillestad and colleagues used empirical evidence to estimate potential cost savings from implementation of HIT-EHR at a national level.[8] They found an immediate potential savings of $80 billion (following a hypothetical overnight 100 percent adoption rate), with an annual mean savings of $40 billion over the next fifteen years. In-patient care accounts for roughly three-quarters of the savings, mainly coming from reductions in length of stay and increased nurse and doctor productivity. However, the authors point out that realistic estimates will have to take into account a much slower rate of diffusion.

Rand researchers Federico Girosi et al. project a price tag of $17.2 billion for physicians and $98 billion for hospitals to achieve a 90 percent national implementation of HIT-EHR over a fifteen-year period.[9] Using similar extrapolation data, the study estimated that a full-scale hospital HIT-EHR system would cost between 1.8 percent and 3 percent of total yearly expenditures over a four-year implementation period. Nationally, this amounts to about $6.5 billion per year or $97.4 billion over the fifteen-year comparison timeframe. Costs in the ambulatory (outpatient) sector equate to about one-sixth of this total, resulting in a $22,000 HIT-EHR investment per physician.[I] Total expenditures for ambulatory care implementation would be about $17.2 billion over fifteen years (or $1.1 billion annually). Aggregating both sectors produces an annual savings of almost $42 billion at an annual cost of about $7.6 billion.

Hillestad, et al. estimate the healthcare savings through 2016, as a direct result of increased productivity as in comparable industries. Wide-scale HIT-EHR adoption resulting in a productivity improvement of 1.5 percent (similar to productivity gains from IT investments in retail/wholesale) would result in cumulative spending decreases in healthcare spending through 2016, of $346 billion. If implementation instead increased productivity by four percent (equal to half of the telecommunication industry increase), cumulative healthcare spending through 2016, would decrease by about $813 billion. The authors estimate that actual productivity increases would be somewhere between these bounds. The cumulative potential efficiency savings by 2016 would be almost $468 billion for hospital systems and $159 billion for physician practices.

Many others are skeptical of these estimates.
- Walker asserts that HIT-EHR systems are far too immature to make accurate predictions of savings given the complexity and unforeseen glitches involved in HIT-EHR implementation.[10] He argues that payors and providers will need real-world

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[I] The 2007 LAO Report states that a University of California at San Francisco case study estimated initial investment costs ranging from $37,000 to $64,000 per physician.

demonstrations of quality enhancing, cost-effective HIT-EHR systems in order to make serious investment commitments.

- Harvard Professors Himmelstein and Woolhandler[11] observe that the estimates of savings come from too few real data sources and assume 100 percent provider compliance with recommendations from the HIT-EHR computer system.

- Clifford Goodman, Vice President of the Lewin Group, hypothesizes that any potential savings will be reinvested back into the system (as improved quality or expanded public services) and widespread HIT-EHR adoption will not be a net cost saver.[12]

The following section describes two papers that provide real data from a federal Agency for Healthcare Research and Quality (AHRQ)-sponsored study, published a year after the RAND reports and reactions to them.

IV. POTENTIAL HEALTHCARE BENEFITS

The benefits of health information technology are clear in theory, but adoption rates lag in the United States, and real statistical results have been limited. The AHRQ funded a study to systematically review the benefits and costs of HIT-EHR in order to better provide payers and providers with an understanding of its effects. After an extensive literature search of over 4,000 articles, the study ultimately utilized 257 articles (some of which used high-quality randomized or controlled clinical trial designs) to determine a meta-analysis of the affects of HIT-EHR implementation. The papers by Chaundry, et al. [13] and the Southern California Evidence-Based Practice Center[14] highlight five major themes addressing improvements in both quality and efficiency.

Quality

- Increased delivery of patient care by physicians that adheres to evidence-based guidelines and protocols
  - Most often as a result of automated reminders and computerized decision supports
  - Improvements in care in conformity to guidelines and protocols ranging from absolute increases of 5 percent to 66 percent, with major clusters between
  - 12 percent and 20 percent.

- Enhanced capacity of providers and plans to perform surveillance and monitoring for disease conditions and care delivery
  - Findings show HIT-EHR systems can help to identify adverse drug events, examine their cause, and develop programs to decrease their frequency (decreasing liability and costs).
  - Several implementations also show marked decreases in identification time of county-based disease outbreaks (2.5 day decrease) as well as hospital acquired infections (65 percent decrease from 130 hrs to 46 hrs) with HIT-EHR systems.

- Reduction in medical errors
  - Benchmark hospitals showed various improvements with HIT-EHR implementation, including a decrease in the number of antibiotic-associated adverse drug reaction events (28 to four), a decrease in hospital lengths-of-stay for these patients (from thirteen to ten days) and a decrease in hospital costs per patient from $35,283 to $26,315.[15]
  - Improved medication dosing (prescribed dosing within recommended range, centered on antibiotics and anticoagulation drugs) ranging from 12 percent to 21 percent.

Efficiency

- Reduced utilization of unnecessary care

- Absolute decreases ranging from 8.5 percent to 24 percent, primarily in lab and radiology testing
- One large study found a 12.7 percent absolute decrease in costs per hospital admission ($6,964 to $6,077), the equivalent of a 0.9-day decrease in length of stay.[16]

- Mixed results in provider time utilization (productivity)
  - Suggestions that time requirements decreased as providers became accustomed to HIT-EHR, but formal long-term evaluations were not available.
  - One study found a decrease of 11 percent in time to deliver treatment using a CPOE (Computerized Physician Order Entry) to order tests and medications in hospital settings.[17]

Other Important Findings

More evidence is needed to make informed decisions about acquiring and implementing health information technology in small-size physician practices and community clinics

- Lack of evidence related to initial capital costs, effects on provider productivity, resources required for staff training, and workflow redesign

The effect of HIT-EHR implementation on cost and quality of care is not going to be consistent across all healthcare institutions (academic hospitals to community health centers).

Insufficient cost data is likely to delay strong governmental/health organization policies that give providers incentives to adopt HIT-EHR.

Estimated break-even points from investments in HIT-EHR systems range from as short as three years, to as long as 13 years. These estimates account for factors ranging from annual capital investments to the cost of organizational changes.

V. BARRIERS TO IMPLEMENTATION

Though physicians have no real objection to HIT-EHR, they often do not know where to start and perceive little direct benefit. The apparent lack of widespread HIT-EHR adoption is most often attributed to the absence of incentives for physicians and hospitals to implement such change.

John Halamka, CIO at Harvard Medical School/Beth Israel Deaconess Medical Center, and others note that whereas providers bear most of the costs (including the direct software and hardware purchases, expenses associated with implementation, training, maintenance, and productivity recovery), the insurers and ultimate payors (government, employers and individuals buying coverage) reap most of the financial benefits from HIT-EHR adoption.[18] Hackbarth and Milgate of MedPAC argue that increases in quality of care generally reduce utilization of services thus benefiting insurers – without an effective payment reward system to physicians and hospitals, reducing business for the provider.[19] It is unclear who will ultimately reap the cost savings benefits of HIT-EHR investments: the plan, the providers, or the ultimate payers (government, employers, and individuals buying coverage).

> ### Common Barriers to HIT-EHR Adoption
>
> - *High costs of implementation and maintenance*
>
> - *Uncertain beneficiaries of the return on HIT-EHR investment – i.e. providers incur the acquisition costs of equipment and training, while plans receive the financial benefits of reduced lab tests and lengths of stay*
>
> - *Transition to HIT-EHR system presents numerous challenges: time and cost of personnel training, uneven financial rewards, equipment costs, and lack of technical computer expertise*

Shortliffe points out that that HIT-EHR is poorly integrated into cost and reimbursement models for healthcare financing, which further weakens physician incentive to invest.[20] For example, should a doctor be reimbursed for answering an email from a patient like they normally would have been paid for an office visit? If so, how much? Measuring benefits and return on investments is also a challenging task, and so direct metrics are most commonly used. Indirect benefits (such as elimination of excess hospital capacity), which former National HIT-EHR Coordinator David Brailer defines as "second-order effects," are still unclear and provide little incentive for a physician or institution to fully invest. [21] Physicians will need to see some form of consistent fiscal incentive to invest in a product that they primarily expect to benefit health plans, ultimate payors, and patients.

Privacy and security also are constant liabilities in the development of digitalized personal health information. Shared data must be de-identified and encrypted in transit, then re-identified for proper use by the receiver. Although information available on a network or database can be secured, many still fear its vulnerability. Numerous federal and state organizations are working to develop standards and best practices. The Health Insurance Portability and Accountability Act (HIPAA) plays an important role. HIPAA Transaction and Code Sets (TCS) standards arguably

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have the potential to be the security cornerstone of HIT-EHR systems.[22] To assist in the application of HIPAA to HIT-EHR, the Center for Medicare and Medicaid Services (CMS) recently published the *HIPAA Security Guidance for Remote Use of and Access to Electronic Protected Health Information.*[23]

VI. HIT-EHR EFFORTS: FEDERAL LEVEL

There is much debate as to the role that the federal government should play in the promotion of HIT-EHR. Some argue that HIT-EHR development should be left completely to the private sector.[24] Middleton believes that the market has failed given the current state of HIT-EHR adoption, and government guidance and standardization is necessary to jumpstart widespread implementation.[25] Both Klienke and Taylor, et al., suggest that major government intervention is the only hope of success, in the form of subsidies, mandates, and substantial policy directives.[26,27]

The federal government is taking a role in the evolution of HIT-EHR. The following discussion outlines these efforts.

<u>The Office of the National Coordinator for Health Information Technology (ONC)</u>

In 2004, President George W. Bush issued an Executive Order establishing the position of the National Coordinator for Health Information Technology (hereinafter ONC).[28] The President's stated goal is for most Americans to have access to an interoperable electronic medical record by 2014. The Coordinator's responsibilities include: drafting HIT-EHR policy, establishing strategic action plans, and acting as a guiding force in nationwide development.

ONC's Federal HIT-EHR Strategic Plan: 2008-2012
This plan brings together all HIT-EHR federal efforts in a coordinated fashion, setting a number of goals, objectives, and strategies. The goals include privacy and security, interoperability, widespread adoption, and collaborative governance. The plan catalogs activities from many federal agencies that focus on HIT.[29] Some of those efforts are highlighted as follows.

The National Health Information Network (NHIN)
The ONC is advancing the NHIN as a "network of networks." By facilitating standards and specifications for privacy and interoperability, the NHIN hopes to provide communication across the nation by interconnecting the numerous HIEs (Health Insurance Exchanges) and RHIOs (Rural Health Information Organizations). Current efforts include several contracts for prototypes and trial implementations that will be tested at the end of the first contract year (September 2008). Some participating organizations include Cleveland Clinic, HealthBridge (Cincinnati area), Kaiser Permanente, and HealthLink RHIO (West-Central OH).[30]

<u>The American Health Information Community (AHIC)</u>

The AHIC is a federal advisory body created in 2005, to make recommendations to the Secretary of Health and Human Services Agency (HHS) on how to accelerate the development and adoption of HIT-EHR. Its areas of focus thus far include the application of HIT-EHRs to increase consumer empowerment in consumer-directed health plans, care management of

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chronic care, and biosurveillance.[II] Plans are now underway to establish a public-private partnership successor to the AHIC, based in the private sector, by Fall 2008, as an independent and sustainable body.[31]

Certification Commission for Healthcare Information Technology (CCHIT)

CCHIT is a collaboration among three industry associations that is developing federal certification criteria and an inspection process for HIT-EHR under a three-year contract awarded in 2005 from HHS.[32] Interoperability and security standards are central to certification. The Commission to date has certified over 100 ambulatory and inpatient systems as meeting federal guidelines.

Centers for Medicaid and Medicare Services (CMS)

As the largest purchaser of healthcare in the United States, there have been numerous calls for Medicare to invest in HIT-EHR.[33] CMS recently invested $150 million in HIT-EHR demonstration projects, and in June 2008 announced the selection of twelve community partners to assist in this effort. Over a five-year period, the project will give bonus payments to as many as 1,200 providers who use CCHIT certified HIT-EHR products. It will provide financial incentives for improved quality of care through their use of HIT-EHR. CMS encourages other private and public payers to offer similar financial incentives. Phase I recruitment for the demonstration will begin in Fall 2008.[34]

Agency for Healthcare Research and Quality (AHRQ)

AHRQ is a significant funding source for research and development across the HIT-EHR spectrum, with $166 million in grants and contracts specific to this effort. Funding is awarded to collect HIT-EHR data and to stimulate investment in HIT-EHR products, especially in rural and underserved areas.[35]

Veterans Health Information Systems and Technology Architecture (VistA)

VistA is the electronic record system used nationwide by the Veteran's Health Administration. It operates in 163 hospitals, 800 clinics, and 135 nursing homes. Supporting both ambulatory and inpatient care, VistA is one of the most widely used HIT-EHR systems in the world, supporting over four million veterans. In 2006, the system was awarded the Innovations in American Government Award. It is estimated that the VistA system improves efficiency by up to 6 percent.[36] The Department of Defense is currently integrating its HIT-EHR system with VistA. Under the Freedom of Information Act, VistA has become available as public domain software available for non-governmental entities. As a low cost HIT-EHR system, VistA has the potential to be a cost-effective alternative for providers and institutions. Numerous private organizations and international institutions have integrated VistA software in the provision healthcare.[37]

[II] Consumer Empowerment: HIT-EHR makes consumer-directed health plans more user friendly for patients; Chronic Care: HIT-EHR facilitates case-specific care and doctor/patient communications; Biosurveillance: HIT-EHR transfers secure data on disease outbreaks to Public Health Departments EHRs: will become standardized, secure, and widely available.

<u>Active Legislation</u>

Both Democratic and Republican legislators are pushing for faster federal action to expand HIT-EHR. Below are several bills that are currently moving through Congress.

Proposed Federal Legislation on HIT-EHR, 2008[38]

S. 1693 Wired for Health Care Quality Act 2008 (Sen. Edward Kennedy [D-MA])
This proposal would encourage the adoption of a nationwide interoperable health information technology system to improve quality and reduce the costs of healthcare in the United States.

*S. 2729 Ensuring the Future Physician Workforce Act of 2008 (Sen. John Cornyn [R-TX])*This bill would modify Medicare physician reimbursement policies. Specifics include payment and improved quality incentives through the use of HIT-EHR.

H. R. 6357 PRO(TECH)T Act of 2008 Rep. John Dingell [D-MI]
This bill would amend the Public Health Service Act to promote the adoption of health information technology, strengthen federal privacy regulations, offer financial support, and create advisory groups to facilitate implementation.

H. R. 6345 Patient-Controlled Health IT Act (Rep. Charles Boustany [R-LA])
This bill would establish a demonstration program and provide financial incentives to encourage individuals to adopt and use interactive personal health records (PHRs), and to encourage health information exchange networks to link their clinical data with these personal health records.

VII. HIT-EHR EFFORTS: STATE AND REGIONAL LEVEL

RHIOs (Regional Health Information Organizations) are entities in which local healthcare providers and plans agree to communicate health information over a standardized electronic network. It is estimated that there are between 100 and 200 RHIOs nationwide; the majority are still in early planning and development phase. They range in size from statewide structures to local city efforts and are mainly funded by federal funds, regional providers, and philanthropic grants. The eHealth Initiative, a nonprofit dedicated to the promotion of HIT-EHR development, is the best-known funding source for these regional efforts.[39] This section highlights several developments across the country and California-specific endeavors. A more comprehensive overview of these local efforts (and others) can be found in the footnoted reports. [40,41]

Indiana

The Indiana Health Information Exchange (IHIE) is the oldest RHIO in the United States. The pilot program was launched in 1994, and achieved full operation in 2004. It currently operates on an annual budget of $12 million, mainly funded through federal grants. The Exchange collaborates with the renowned heath care research foundation, The Regenstrief Institute, to offer the DOCS4DOCS message system, which aggregates clinical data to prevent duplicate testing, delivers information directly to the EHR system of any provider on the network, and provides reports to monitor patient care. To date, 25 hospitals and over 5,000 physicians use the system.

Washington State

Based in Spokane, Wash., the Northwest RHIO serves the Inland Northwest Regional Healthcare Network, which has patients in Washington, Idaho, Montana, Oregon, and Canada. All providers in the Network utilize a common HIT-EHR system that shares data for over 2.6 million patients.

Louisiana

The state has recently established the Louisiana Health Information Exchange (LaHIE), and is being funded by the federal government as a prototype for a NHIN (National Health Information Network). In the wake of the devastation from Hurricane Katrina, providers in the Gulf regions are looking to LaHIE to build an electronic information and communication infrastructure as part of the repair to their damaged healthcare system. Similar demonstration efforts are being implemented in Texas, Mississippi, and Alabama.

California

In July 2006, Governor Schwarzenegger issued *Executive Order S-06-07,* which establishes the goal of achieving full health information exchange in the state within ten years.[42] The Governor has designated some of the $240 million received from the United Health Group in order to obtain state regulatory approval for the merger of PacifiCare Health Systems in 2005, towards this goal. The funds are targeted to HIT-EHR improvements for the safety net and in underserved areas that have difficulty accruing capital for technology investments. The Executive Order calls

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for more public-private developments to accelerate HIT-EHR implementation and establishes the eHealth Action Forum to begin developing relevant state policy.

The California Regional Health Information Organization (CalRHIO) is a non profit statewide organization seeking to create a secure HIE network. It is currently in Phase I of implementation to establish a Statewide Online On Demand Information Service that offers: a master patient index, record locator service, e-Rx, and a query for medication history. The Service will include an Integration Hub that has the ability to translate data across different EHR systems and an EHR Gateway, which will provide physician EHR systems with national lab data. CalRHIO is collaborating with Hewlett Packard, Medicity, Perot Systems, EHR systems, and most recently Cisco Systems, in order to build the $300 million structure. CalRHIO anticipates enabling electronic access for providers and patients to 90 percent of Californians' health information by 2014.

The California HealthCare Foundation (CHCF) has developed ELINCS, an electronic exchange for patients' laboratory data, and is encouraging its statewide adoption.[43] CHCF also offers grants and technical assistance to providers interested in adopting the system.

On a local level, several communities around the state are attempting to develop HIEs for their providers. Specific efforts include the Securing Health Access and Record Exchange in Mendocino County and the Santa Cruz RHIO. The Santa Barbara County Care Data Exchange, one of the first and most widely known HIEs in the United States, recently lost funding from CHCF after eight years of development and was never fully implemented. A common pitfall of grant-funded systems like the Santa Barbara Exchange is the inability to become self sustainable within a restricted grant period; the program experienced significant implementation delays. Long Beach recently received an HHS award[44] for an HIE trial called the Long Beach Network for Health (LBNH). The initial goal of this program is to link the Emergency Departments of five Los Angeles metropolitan hospitals and to build a database of patients' electronic records. Easier access to these hospital records is expected to substantially reduce emergency room wait times and limit medical errors.

VIII. HIT-EHR EFFORTS: PRIVATE SECTOR

The private market plays important roles in the adoption of HIT-EHR. It includes HIT-EHR vendors, in-house, comprehensive systems that span a health plan or hospital network, hospital-physician systems and office-based physician systems.

Kaiser Permanente

Kaiser is actively adopting HIT-EHR, and has spent about $4 billion for its implementation. The system, KP HealthConnect, is the largest private sector deployment of HIT-EHR in the world and is expected to be fully operational for its 8.6 million subscribers by 2010.[45] HealthConnect already has reported marked increases in quality and efficiency due to error reductions and the enhanced availability of clinical information.[46] Kaiser recently partnered with Microsoft for a pilot project to link the health organization's patient data with the Microsoft personal health record service HealthVault. Kaiser sees value in Microsoft's technology for protecting the privacy and security of personal data.

Google and Microsoft

The Personal Health Record (PHR) is initiated and maintained by individual patients in a "bottom-up" approach, in contrast to the majority of HIT-EHR systems that operate in a provider or payer controlled "top-down" approach. Microsoft has developed a consumer-focused service called HealthVault, which combines a medical search engine and personal account to store medical information, either manually inputted or read from medical devices. [47] The patient(s) can share their data with practitioners or any other trusted individual.

The Google equivalent, Google Health, also allows users to create a customized record of health information. As the two entities are open source, opt-in services, all medical information is volunteered by the patient and thus HIPAA privacy laws do not apply. Both systems offer comprehensive privacy and security measures. The ONC recently announced that both PHR systems could be integrated into the NHIN to exchange electronic health information.[48]

Lumetra: Illumisys and ehrRoadMap.com

Lumetra is a nonprofit health consulting organization that provides a wide range of services for clients in the public and private sectors.[49] Illumisys, a subdivision of Lumetra, was launched in 2007, and provides consulting, education, and training in the selection and use of HIT-EHR systems. Its clients include management service organizations, public health departments, RHIOs, independent physicians, and other professional medical organizations. Their affiliate (ehrRoadMap) provides a complete online HIT-EHR planning resource.[50] This service could be a valuable tool to plan and facilitate HIT-EHR implementation in healthcare since a sizeable barrier to adoption is uncertainty as to where to start.

<u>Health Plan Activities</u>

Several large plans[51] are in the process of implementing HIT-EHR on some scale within their organization. WellPoint's PHRs have been available to members for two years and others such as Blue Shield and Cigna have PHR projects underway as well.

IX. CONCLUDING THOUGHTS

This report summarizes the status of Health Information Technology in the United States. Many stakeholders are involved in its development, and more importantly, it is an idea that is gaining support. Based on modern diffusion theory, HIT-EHR is entering into the 'early majority' phase of adoption. Diffusion theory describes the adoption process of new products entering society, starting with the innovators and early adopters, and moving through early/late majorities to the laggards. RAND estimates the penetration rate at roughly 30 percent for users with a 'signed contract' (an HIT-EHR system in use or in active development), with diffusion following a characteristic S-curve. If this trend holds, RAND projects reaching the 80 percent adoption threshold by 2016. However, RAND also suggests that complete adoption cannot be achieved without government assistance.[52] Small-sized office-based practitioners, rural and safety net providers and those providers with rudimentary electronic systems are expected to be the last to adopt. This would put these systems, their practitioners, and their patients at a competitive disadvantage to providers with full HIT-EHR implementation.

Internationally a number of countries have been able to achieve near universal HIT-EHR systems. Countries with virtually 100 percent HIT-EHR adoption such as Sweden, the Netherlands, and Denmark, attribute their success to a number of factors. Public policy and funding consistently play important roles, but other factors such as clinical leadership and non-financial support are equally if not more influential.[53] For example, in the Netherlands, EHRs were nationally decreed as 'good practice' and a subsequent form of peer pressure prompted widespread adoption. In Denmark, early adopters of EHRs would hold information sessions at their practices and explain to other physicians how the systems changed their work. Support systems like these (in addition to professional consultants) provided leadership and guidance.

The next few years are critical for HIT-EHR development. It will be important to coordinate national standards for interoperability and security, provide funding and leadership, and to recognize the need to reform outdated reimbursement and incentive structures.

California State Library, California Research Bureau

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