

ISSUE BRIEF

The Massachusetts Health Policy Forum



Massachusetts
Health Data
Consortium

Health Information Technology in Massachusetts: A Public/Private Partnership?

*What Should the State's Role be in Facilitating Health IT
Adoption?*

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Wednesday, December 5, 2007

8:30 am – 9:00 am Breakfast

9:00 am – 12:30 am Presentation and Discussion

12:30 pm Box Lunch “To Go”

**Omni Parker House Hotel
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Table of Contents

Executive Summary: The Story of Health Information Technology in Massachusetts.....	1
Introduction.....	4
The Goals and Promise of Health IT: A Health System Transformation?	7
The Massachusetts Health IT Landscape.....	10
Massachusetts' Virtual RHIO	11
Massachusetts Health Data Consortium (MHDC).....	11
New England Healthcare Electronic Data Interchange Network (NEHEN)	12
MA-SHARE.....	12
Massachusetts eHealth Collaborative	13
New England Healthcare Institute (NEHI)	14
Massachusetts Technology Collaborative.....	14
Masspro.....	15
E-Prescribing.....	15
Health Care Quality and Cost Council.....	16
Health Care Institutions	16
A Tradeoff Worth Making? Challenges to HIT Adoption.....	17
The Federal Role in Health IT Adoption	20
The State of the States: State-level HIT Initiatives and Policy Environment.....	23
The Massachusetts Health IT Policy Environment.....	27
Policy Issues.....	28
Conclusion	32
Appendix.....	33
California	33
Delaware	33
Indiana.....	34
Pennsylvania	35
Tennessee.....	36
A Three-State National HIE Prototype	37
References.....	38

Executive Summary: The Story of Health Information Technology in Massachusetts

The Commonwealth of Massachusetts is an epicenter of state-of-the-art health care, information technology, engineering, and research and development expertise. Groundbreaking innovation in health information technology (HIT) and health information exchange (HIE) is taking place in hospitals, health care systems, physician offices and in health plans throughout the state, for which Massachusetts is widely recognized as a leader among states. The Commonwealth is distinguished as the home of the Massachusetts eHealth Collaborative, a multi-stakeholder coalition working to demonstrate the feasibility of interconnected HIT through three community pilot projects, funded by a \$50 million commitment from Blue Cross Blue Shield of Massachusetts. Still, we are not close to reaching the potential of health information technology to improve health outcomes and the efficiency of the health care system. Continued success will require greater integration of systems and coordination among coalitions, privacy protections and an increased investment from the public and private sectors.

Collaboration has been the hallmark of the HIT and health information exchange landscape in the Commonwealth, beginning with the establishment of the Massachusetts Health Data Consortium (MHDC) in 1978. Today, several multi-stakeholder organizations in Massachusetts, including the Massachusetts eHealth Collaborative, the MHDC and others, and executive agencies of the Commonwealth, have been working on roadmaps and implementation of electronic health record systems and health information sharing among organizations. State agencies, health plans, provider institutions, physician groups and

consumer advocacy groups have joined coalitions and led efforts that have established Massachusetts' leadership position in HIT and HIE adoption.

While Massachusetts is ahead of many states in the regional sharing of health information, and our major health care institutions are among the most technologically advanced in the U.S. and have higher than average adoption rates of electronic health records, our statewide adoption rate is still low. Estimates of HIT adoption are 19 percent among hospitals,⁴ 45 percent of physicians and 23 percent of physician practices,⁵ and 44 percent among Community Health Centers.⁴

An investment in health information technology could pay substantial dividends. HIT can improve safety, effectiveness, timeliness, and equity of care, and can improve efficiency,⁶ resulting in billions of dollars in annual savings nationally.⁷ HIT can enhance safety by helping to prevent medical errors and adverse events,^{8,9} improving adherence to evidence-based practice,^{7,10} and by providing timely information to improve monitoring of patients for disease.^{7,10} Electronic health record systems can save costs through improved efficiency by replacing paper files, resulting in elimination of lost or incorrect information and repeated tests.^{7,10}

Because there are significant costs to providers to invest in and implement HIT, in capital, implementation, training, and productivity costs, the cost benefits of HIT may more readily accrue to payers¹¹ as efficiency gains may translate into bottom line savings for purchasers rather than providers of care. Some have found a compelling business case for national implementation of electronic medical records that can be accessed securely by authorized providers anywhere in the health care system.¹² Shared medical

records between freestanding and hospital-based outpatient clinics and external laboratories could result in an annual savings of \$31.8 billion if implemented nation-wide.¹² It is estimated that as much as 90 percent of the economic benefits would go to insurers and purchasers of care.¹³ Much of this savings is realizable by state governments.¹²

There is justification for a strong public role in the widespread adoption of electronic medical records and health information exchange. Advancements could directly improve the quality of care and reduce public expenditures for MassHealth recipients by reducing medical errors and increasing administrative and clinical efficiency, and through improved coordination of care for Medicaid enrollees.¹⁴ System-wide gains in quality and cost would yield major public welfare benefits. These benefits, however, depend on systems being able to talk to each other and an infrastructure that can only be built through coordination and investment by the public sector, in addition to private sector resources. In the absence of a strong federal role in promoting HIT, the state can fill the gap that the market is unlikely to completely fill because the cost of HIT investment is concentrated while the benefits are dispersed.

Realizing the potential benefits of health information technology will require increasing public funding, attention to privacy protections and standards to assure patient confidentiality and a comprehensive strategy to integrate existing but disparate advancements.

First, statewide adoption of interconnected HIT will require significant public and private investment. An early estimate of the cost of HIT implementation in Massachusetts to achieve 100 percent adoption is \$802 million for electronic

health records, \$304 million for Computerized Physician Order Entry (CPOE) and \$220 million for interoperability for the first year.¹⁵ The Commonwealth's premier interconnected electronic health record initiative, the Massachusetts eHealth Collaborative, was funded through an initial \$50 million private sector contribution, sustaining the project through July 2008. This investment is at risk without a source of sustaining funds. The Massachusetts eHealth Collaborative's refined estimate of modified statewide adoption of a version of its pilot project is \$500 million.¹⁶

Second, policy is needed to resolve the issue of patient consent to share medication and treatment information while providing consumers with stringent privacy and security protections.^{17, 18} Health data sharing in the Commonwealth has been occurring since 1978, and these data could be put to increased use for public health planning purposes. Health care disparities can be exacerbated by disparities in HIT adoption among providers, and members of vulnerable populations may not reap the benefits of interconnected health information exchange.

Third, paradoxically, although Massachusetts is distinguished by the number and breadth of its multi-stakeholder coalitions focused on health information exchange, much activity across Massachusetts is still occurring in silos.¹⁸ This fragmentation and resulting lack of coordination among projects has the potential to slow our progress. Public/private coalitions are key to continued success. Several existing multi-stakeholder coalitions in Massachusetts offer a potential coordination point for statewide public/private interconnected HIT governance, and could form the launch platform for the public/private

leadership body that is essential for future statewide progress.

On December 5, 2007 the Massachusetts Health Policy Forum and the Massachusetts Health Data Consortium will convene health leaders in the Commonwealth for a forum entitled, Health Information Technology in Massachusetts: A Public/Private Partnership? The overarching policy question to be addressed is: Will Massachusetts capitalize upon its collaborative history, its unique confluence of resources and talent, and its current investment in HIT, and form a public/private partnership to define and fund the next steps toward statewide adoption and national leadership in HIT?

This issue brief describes the HIT landscape of the Commonwealth and identifies the key characteristics that position Massachusetts as a leader in HIT and health information exchange. We present the progress of the Commonwealth along the HIT adoption curve, discuss enablers and barriers, and how we compare to other states.

Finally, we consider the potential for enhanced state leadership and the establishment of a state-led public/private partnership to address the policy issues required to propel us forward to create a Massachusetts HIT superhighway and maintain our leadership in HIT and health information exchange among states.

Introduction

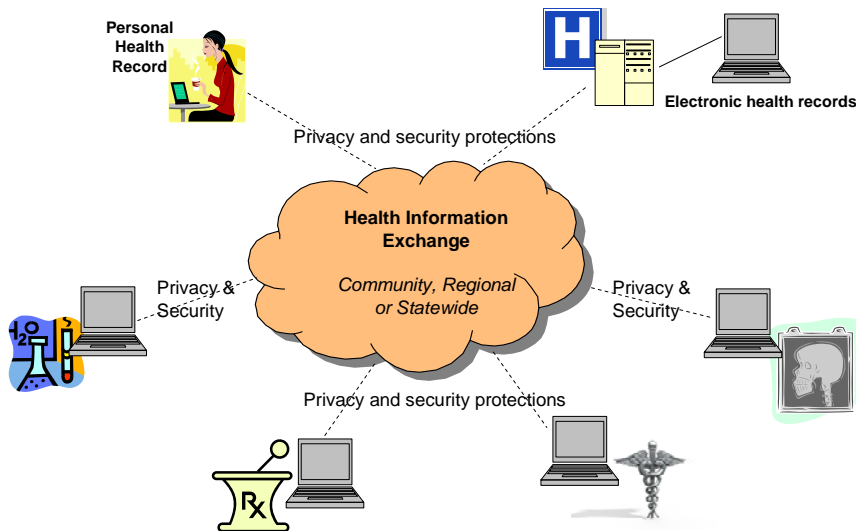
There is growing recognition within the private and public sectors that strengthening the interconnected HIT infrastructure is needed to address concerns about health care safety and quality, costs and information security.^{1, 6} The Institute of Medicine points to the critical role of HIT in improving health system quality, and recommends investment in HIT systems and connectivity as a necessary foundation to ensure that care is safe, effective, patient-centered, timely, efficient and equitable, leading to improved safety, quality and efficiency of the health care system.^{6, 19} Of the structural components of the health care system, information technology is the one most likely to improve the process of health care delivery.²⁰

In its idealized form, HIT is a range of

integrated technologies by which health information may be created, stored, transmitted and used by stakeholders of the health care system.²¹ HIT encompasses tools for clinicians and patients that automate and communicate information about the care that is delivered to patients. Although containing a myriad of capabilities within these broad categories, Blumenthal and Glaser suggest a three-tier, tools-based framework that is helpful for thinking about this range of interconnected technology,²¹ and that we will adopt for the purposes of policy discussion in the context of this policy forum and Issue Brief.

Three uses of HIT form the tiers of this framework: the electronic health record (EHR), health information exchange (HIE) and the personal health record (PHR).²¹ The relationship between EHR, HIE and PHR is portrayed in Figure 1.

Figure 1



Electronic Health Records (EHRs) provide the ability to collect, store and share patient data, and consist of four core functionalities according to the Institute of

Medicine (IOM): health information and data, results management, computerized provider order entry and support (CPOE), and clinical decision support.²² Health Information Exchange (HIE) provides the

ability to move and share clinical information between health information systems and organizations, to achieve interoperability of stand-alone EHRs. The goal of strategic interoperability through an HIE is an integrated continuum of care for the patient, regardless of site or time of care delivery, or who provides or pays for the care.²³ Personal health

records (PHRs), or patient portals, are relatively new systems that give consumers the ability to store and report their personal health information and, if interconnected to a provider-based EHR system, may provide patients the ability to access their electronic health record (EHR).²¹

Electronic Health Record (EHR): In 2003 the Institute of Medicine developed standards for the functionality of an EHR system, to include longitudinal collection of electronic health information (electronic medical record); access to person- and population-level health information by authorized users; decision support to enhance quality, safety and efficiency; and information to support process improvement.¹ EHR systems often include Computerized Physician Order Entry (CPOE) and patient self-management support capabilities.² E-prescribing is a tool that is often an evolutionary step in the full rollout of EHRs, offering integrated functions spanning three or more health system entities: Physicians can enter prescriptions electronically with the aid of decision support for drug-drug and drug-allergy interactions; then eligibility can be checked for benefit coverage and formulary compliance; medication history can be checked and tracked and prescriptions can be routed electronically to a retail or mail order pharmacy for fulfillment.³

Among these types of HIT, EHR and HIE are most mature in their development and are the focus of the health policy forum, “Health Information Technology in Massachusetts: A Public/Private Partnership?” This brief will also discuss the promise of PHR as the third layer of HIT capability, describing the implementation status of these tools, and the potential for gains they offer.^a

Despite potential cost savings and quality improvements, the adoption of HIT has been slow. Estimates of adoption rates vary because of inconsistent definitions and measurement of HIT functionality and stages of implementation, and selection

bias from self-selection of survey respondents that are more involved in IT implementation.^{2, 25} The U.S. is sixth out of seven industrialized countries in the use by primary care physicians of fully implemented HIT.²⁶ In the US, 19 percent of primary care physicians report use of advanced HIT, while New Zealand, the United Kingdom and Australia all report adoption rates greater than 70 percent, the Netherlands reports 59 percent, Germany reports 32 percent, and eight percent of primary care physicians in Canada report use of advanced HIT.²⁶

^a Telemedicine, in which clinical services are delivered by means of information and networking technologies, is not strictly a type of information technology but a clinical technology to deliver care, and may be deployed by means of HIT infrastructure.²⁴ Telemedicine will not be discussed in this issue brief.

Personal Health Records (PHR) have significant promise and could be one of the most important levers for improving quality and safety.⁸ PHRs allow people to electronically collect, view, manage or share copies of their health information privately and securely, putting health information under the control of the consumer.²⁷ Nearly 200 PHR products are now available, they are evolving quickly, and there is as yet no universal definition.^{27, 28} There are two forms of PHR. “Tethered” models are integrated with a provider, health plan or employer EHR or other information system.²⁷ Stand-alone PHRs are owned by the individual, are portable and may be shared with compatible systems that belong to providers, employers or insurers.²⁷ The national Framework for Strategic Action to deliver consumer-centric information-rich health care endorses the adoption of personal health records to personalize care and enhance informed consumer choice.²⁹ PHRs may enhance quality and help people to take better care of their health, and could shift the balance of power between clinicians and patients.²⁷ A survey found that 60 percent of Americans are in favor a secure online personal health record to allow them to check and refill their prescriptions, get test results over the internet, check for mistakes in their medical record, and conduct secure and private email communication with their doctors.³⁰ PHRs present new challenges of privacy, security, and questions about data integrity, ownership of the data, quality and costs are being studied in Massachusetts under grants from the Markle Foundation and AHRQ.^{8, 11} Microsoft’s October 2007 launch of HealthVault³¹ has attracted increased attention to the PHR evolution, offering an online health “vault” or data repository of electronic health information on the internet.³¹ Several dozen manufacturers, hospitals and charities have signed up and are expected to announce products and services using HealthVault soon.^{6, 19, 32} It remains to be seen whether consumers and health industry firms will trust Microsoft’s claim of hacker-proof health record storage.³²

Estimates are that nationally only about 20 to 25 percent of hospitals and 15 to 20 percent of physicians’ offices have implemented HIT.⁷ In one study, 28 percent of primary care doctors^b in the United States reported use of electronic medical records.²⁶ In Massachusetts, estimates of HIT adoption are 19 percent for hospitals, 45 percent of physicians and 23 percent of physician practices,⁵ and 44 percent among Community Health Centers.⁴ Studies show that larger, urban physician practices are more likely to adopt EHRs, as are “closed” systems such

^b Of primary care physicians, 12% share records electronically with clinicians outside their practice, 10% provide patients with access to EHRs, 22% routinely use electronic ordering of tests, 20% use e-prescribing, 48% have electronic access to patients’ test results, 28% use computerized decision support to alert on possible drug dose/interaction problems, and 32% routinely use electronic reminders sent to patients.²⁶

as those that integrate financing and delivery like the Veteran’s Health Administration (VHA) or staff-model HMOs such as Kaiser Permanente.² Leaders in EHR implementation are integrated systems such as Intermountain Health, Geisinger Health System, Mayo Clinic, Kaiser Permanente, the VHA,²⁵ and, in Massachusetts, Partners HealthCare System and CareGroup HealthCare System.

Some projections of the potential efficiency gains from the adoption of HIT may be very optimistic, and merit a cautious eye toward offsetting capital, maintenance and productivity costs: According to a RAND projection, widespread adoption of HIT by hospitals and physicians could result in savings of more than \$77 billion per year from cost reductions in inpatient and outpatient care.⁷ These savings are projected to

derive from increased safety, better scheduling and coordination, reduced nurses' administrative time, and more efficient drug utilization.⁷ Health benefits

are proposed to stem from using HIT to identify patient risk factors, leading to enhanced disease prevention and chronic disease management, and deaths avoided.⁷

Health Information Exchange (HIE) is the communication of HIT that occurs among patients and providers within a health care organization or health system; across health care organizations and systems within a community; and across the country.³³ HIE is a broad term that encompasses a variety of models currently emerging.³⁴ HIE provides the infrastructure that connects EHRs and clinical data residing in inpatient, outpatient, long-term care and home health settings, pharmacies and health plans. Regional and national health information exchange would allow patients' medical records to follow them when they travel or relocate, and would be available for public health, quality measurement and research.³³ HIE infrastructure is built upon a network of networks. Without an interoperable HIE infrastructure, there is the risk that local HIT networks will remain isolated and their full investment value never recovered. Some networks are regional, developed as Regional Health Information Networks (RHIOs) which are geographically defined, while others are built by groups that share information needs.³³ More than 100 communities across the country are developing HIEs - Santa Barbara, California, the Indianapolis region and the greater Boston area are prominent examples.³³ Community-level HIEs have been driven by local leaders and have relied on home-grown technical solutions, and there are no clear roadmaps for statewide expansion beyond these initial projects.³³

Adoption of HIT means different things to various health system stakeholders. To physicians and other clinicians, implementation of HIT may mean improved decision support, significant capital investment, the possibility of new ways of delivering care and managing the patient encounter, and the disruption of office workflow during the implementation and training period. To payers, HIT may bring processing efficiency, improved care management strategies, and opportunities for regional and statewide collaboration to manage costs and quality. To patients and consumers, HIT makes possible a new level and range of plan and provider quality and price information to support purchasing decisions, but raises concerns about privacy and security. To many, HIT may bring a vision of implementation and financing barriers that must be overcome, through which improvements in quality

and safety may, potentially, be purchased. Many stakeholders may be most concerned with regulatory and privacy issues surrounding HIT, such as how to safeguard the security of health information and ensure compatibility among disparate systems and data sources. These varying perspectives on the meaning of HIT suggest the many potential benefits, and the barriers that still remain, on the road to health system-wide HIT diffusion.

The Goals and Promise of Health IT: A Health System Transformation?

The integration of HIT and HIE is regarded as a force able to drive health system transformation, essential but not sufficient to achieve system-wide change.³⁵ Technology is not a panacea for the health care system's problems, it is a means toward the end of improved patient outcomes and system efficiency. The goal

of HIT is to offer a tool to enable health system redesign and change, to improve quality of care,¹¹ and to optimize quality of life for all within the constraints of the resources available in the system.³⁵

The multiple potential benefits of integrated, interoperable HIT, HIE and EHR systems span the care delivery process. Providers would have ready electronic access to patient care plan information, history, diagnostic and consult results, and prescribed medications, at any hour and from any internet-enabled location. Accurate case information can follow the patient from setting to setting. Decision support capabilities provide data on clinical trials,

evidence-based care and best practice guidelines to keep physicians up to date on medical knowledge, and may increase quality.² HIT is critical to quality measurement and improving systems of care: quality indicators can be tracked so that data can be used by providers, health systems, payers and researchers; safety is enhanced by preventing errors and adverse events;^{8,9} clinicians' adherence to guidelines and protocols is improved;^{7,10} and longitudinal monitoring of patients for disease is improved.^{7,10} These potential benefits will only accrue if EHR systems are integrated with HIE, and are interoperable with other HIT systems.

Regional Health Information Organizations (RHIOs) were the concept of David Brailer, MD, former National Health Information Technology Coordinator.³⁶ RHIOs are organizations that facilitate clinical data exchange by means of HIE.³⁷ The task of the RHIO is to provide a legal and technical infrastructure for health information sharing, serving requests for patient data from any inpatient or outpatient facility within its region.³⁸ There are many forms of RHIOs in the US that provide data sharing among hospitals and other providers and institutions, all implemented differently.³⁸ RHIOs proliferated beginning with the 2004 federal initiative to develop nationwide interoperability.³⁴ The ONC proposal positions RHIOs as the building blocks of the proposed National Health Information Network (NHIN),³⁶ a future national network of interconnected regional networks.

Electronic health record systems are proposed to save costs through improved efficiency by replacing paper files, resulting in elimination of lost or incorrect information; eliminate repeated tests^{7,10} by making results readily accessible from any location. It is estimated that \$4.5 billion per year is spent on inappropriate or unnecessary care, often because of duplication due to lack of patient information.³⁷ A RAND study found that HIT would save an estimated \$77 billion each year on increased efficiencies alone.⁷ In 2005, HIT was proposed by the Governors of Massachusetts, Indiana, Missouri, Michigan and Tennessee as a way to control states' expanding Medicaid

budgets.¹²

HIT can support the IOM's objective of delivering patient-centered care.^{6,39,34} HIT, with the addition of patient portals in the form of personal health records, supports patient self-management of chronic conditions, enabling a more actively participating consumer.^{11,35} Electronic health records that include CPOE and decision support have been shown to improve care transitions and coordination within provider offices, hospitals and health systems.^{2,40}

Electronic sharing of information through HIT can support organizational culture transformation by enabling communities of practice, online education programs,

quality reporting and outcomes transparency.³⁵ Information technology has been credited with enabling a culture of safety within health care organizations.⁹ An example of the gains that are possible with the implementation of HIT is offered by the Veterans Health System, which has undergone a transformational improvement in quality over the last 10 years.⁴¹⁻⁴³ Fully implemented EHR systems can enhance a health system's attractiveness as an employer and service provider. Kaiser, VHA and federally funded community health centers that have mature EHR implementations report that their HIT systems provide clear

competitive advantage in recruiting physicians and attracting consumers.¹¹

Widespread adoption of HIT networks may provide a cumulative advantage: The emerging National Health Information Network (NHIN) can result in increased gains from previous technology investments such as EHRs.³⁵ The burden of reporting for regulatory compliance may be reduced through automated data extraction and report generation.³⁵ Financial incentives and reimbursement models may be more effectively monitored through the use of information technology.³⁵

Dr. George Papanicolaou of Rowley, Massachusetts, a participant in the Massachusetts eHealth Collaborative demonstration project (see below) finds that the efficiency of his practice is improved and he may be able to make quicker diagnoses with the aid of EHRs and internet-based decision support.⁴⁴ With an EHR, he can create registries, follow up on recalls and improve chronic disease management.⁴⁴ Dr. Papanicolaou finds he can maintain better documentation of office visits, which leads to improved coding, more accurate billing, and potentially to increased revenue.⁴⁴

Seeking cost-benefit value in EHR adoption may be a red herring, taking us off track from the true value of implementation. There are significant costs to investing in and implementing HIT, in capital, training, and productivity costs, leading some to say there is no obvious business case for HIT investment by health care providers.⁴¹ Cost savings from EHR tend to accrue more to payers rather than providers.¹¹ Eliminating duplicative tests may actually cost individual or groups of providers, but yield improvements in efficiency and health at reduced costs overall.¹¹ Properly used, integrating HIT into daily practice can help providers re-design practice flow⁴⁵ and gain administrative efficiencies that promote quality, safety and savings. Therefore, at the provider level, analysis of the business case for HIT must balance

overall net returns in cost savings, efficiency gains, effects on the revenue cycle, long-term productivity and practice flow gains, and health outcome and patient satisfaction improvements. System redesign is required for the transformation that is often cited as a goal of HIT. Alternatively, if HIT is used to automate flawed clinical and business processes, breakthroughs in quality and cost improvement will not be realized.⁴¹

Some have found a compelling business case for national implementation of interoperable, standardized HIE.¹² A study of the value of national implementation of fully standardized information exchange between providers and laboratories, radiology centers, pharmacies, payers and public health departments projected significant annual cost savings, and important quality and

safety improvements.¹² Fully interoperable HIE between freestanding and hospital-based outpatient clinics and external laboratories would result in reduction of redundant tests, and reduce delays and costs associated with ordering and reporting of results, savings projected to result in an annual savings of \$31.8 billion if implemented nation-wide.¹²

For HIT to achieve its promise of system transformation, it must be combined with properly aligned incentives that reward patient outcomes and improvements in efficiency.³⁵ Some payers have begun to incentivize providers to adopt these technologies.³

With an aging population that is expected to be heavier utilizers of health services than previous generations, it makes sense to adopt and integrate HIT systems as soon as possible.³⁵

The Massachusetts Health IT Landscape

Massachusetts has been called a “super cluster” of life sciences, with its extraordinary landscape of the world’s leading health care delivery, biomedical research, education, medical device, biotechnology, pharmaceutical and information technology organizations and institutions.⁴⁶ The Commonwealth hosts HIT activities that range from initial EHR adoption projects at the provider level, mature institution-level EHR implementations, community-level CPOE and e-prescription networks, and regional HIE initiatives. Compared to other states, Massachusetts was an early adopter of community-wide HIT projects, has a history of data-sharing organizations and initiatives, and has more experience with RHIO activities than many other states.³⁷ Massachusetts is one of 37 states that have a mandate to collect health care systems data.⁴⁷ While the Commonwealth began sharing health data among hospitals in the

late 1970s, other states did not begin similar data sharing until the mid-1980s.⁴⁷ In 2006, the Commonwealth enacted state health reform legislation that includes a newly organized Health Care Quality and Cost Council with the charter to collect claims data from payers and report comparative quality data via a consumer health information website.^{48, 49} Massachusetts’ model of collaboration on HIT and HIE projects may offer an example to other states.³⁷

Although Massachusetts is located in a region that is at the forefront of EHR implementation and use,⁴⁴ adoption rates are still low, ranging from four percent to 44 percent among different provider groups, according to a 2005 study.⁴ Adoption estimates vary because of lack of consistency among surveys in the definition of what constitutes EHR adoption and because of selection bias among survey respondents. Of the state’s 115 acute care facilities and hospitals^c, 19 percent are estimated to use EHR, 15 percent use e-prescribing, and an estimated six to seven percent have adopted CPOE.⁴ Forty-four percent of Community Health Centers have implemented EHRs.⁴

A 2005 study of nearly 2000 physicians in the Commonwealth found that while 45 percent of physicians used EHRs, only 23 percent of practices had adopted these systems.⁵ Almost half of the state’s EHR users are concentrated in the four largest groups (Partners, Boston Medical Center, CareGroup and Harvard Vanguard).⁵ Hospital-based and teaching practices are more likely to have an EHR than other groups, and only 14 percent of solo practices have adopted EHRs.⁵

^c Includes all facilities in Massachusetts that provide some level of acute care, including rehabilitation hospitals and other related facilities.

The Massachusetts Provider Landscape

In 2006 there were 32,785 physicians in Massachusetts,⁵⁰ of whom 48 percent were self-employed.³ Of self-employed physicians, 51 percent are in solo practices, 35 percent are in small practices of two to eight physicians, and 14 percent practice in larger groups of more than eight.³ There are 114 hospitals, of which 79 are acute care and 35 are non-acute care facilities.⁵¹ There are 51 community health centers, 1,203 post acute/long term care facilities including home health agencies, 6,000 dental providers and 1,042 retail pharmacies.⁵¹

Overall adoption rates do not adequately reflect actual use of EHR functionality. In a survey of Massachusetts physicians in which 29 percent reported that their practice had adopted EHRs, more than 80 percent reported they had access to laboratory results (85 percent), and could document visits via EHRs (84 percent).⁵² However, computerized ordering of laboratory tests had been adopted by only 47 percent, and fewer still had the ability to e-prescribe (45 percent).⁵² Of all EHR functions available to physicians, they report using clinical decision support the least amount of the time.⁵²

Massachusetts' Virtual RHIO

The four major community-wide HIT organizations in the Commonwealth engaged in RHIO activities are the Massachusetts Health Data Consortium (MHDC), the New England Healthcare Electronic Data Interchange Network (NEHEN), MA-SHARE and the Massachusetts eHealth Collaborative (MAeHC).³⁷ Each of these organizations play a key role in the collaboration to facilitate regional HIT through promoting EHR and HIE implementation.³⁷ Massachusetts has organized four RHIO roles, conceptualized by Halamka, et al. as the “convener”, the “transactor”, the “grid” and the “last mile”.³⁷ Each of the four organizations performs one of these roles to create a “virtual RHIO”.³⁷ The “convener” brings together stakeholders to contribute to and benefit from RHIO activities; the “transactor” provides

community-wide exchange of healthcare administrative data; the “grid” contributes the clinical counterpart of the “transactor” role, providing community-wide exchange of clinical data; and the “last mile” role is that required to enable connection of services to provider offices through EHR capability.³⁷

Massachusetts Health Data Consortium (MHDC)

The Massachusetts Health Data Consortium is a co-sponsor of this health policy forum, and performs the role of “convener” in the Commonwealth’s virtual RHIO organization.³⁷ MHDC was formed in 1978 by the Office of State Health Planning, as a nonprofit independent coalition of public and private health care organizations.^{37, 47} The mission of the MHDC is to collect, analyze and disseminate health care information and to promote development of a comprehensive health data system to address the health information needs of the Commonwealth for the purpose of improving health care and health.²⁷ MHDC fulfills a broad, facilitative role as the convener, educational organization and business incubator.³⁷

The creation of the MHDC marked the first time that competing hospitals would share data with a third-party for analysis and redistribution, and required the implementation of standards for data sharing.³⁷ In the mid-1990s, data sharing activities led to creation of a CIO Forum

working group that meets bi-monthly to discuss the use of HIT to improve cost, quality and efficiency.³⁷ The CIO Forum also led to the development of privacy/security guidelines, standards, and HIPAA compliance collaboration, through its Privacy and Security Officers Forum and Technical Advisory Board.^{37, 47} In 2006, MHDC was designated by the Commonwealth as the Massachusetts leader of the HISPC project,⁵³ a national collaborative funded by the Agency for Healthcare Research and Quality (AHRQ) to address privacy and security policy issues affecting interoperable HIE.^{54, 55}

To foster the development of interconnected regional HIE in Massachusetts, in 1997 MHDC convened a conference which spawned the New England Healthcare Electronic Data Interchange Network (NEHEN), another player in the Commonwealth's virtual RHIO.^{37, 56}

New England Healthcare Electronic Data Interchange Network (NEHEN)

NEHEN is the "transactor" for the Commonwealth's virtual RHIO. NEHEN was created in 1997 by provider organizations Partners Healthcare, CareGroup, and Lifespan, and two payer organizations, Tufts Health Plan and Harvard Pilgrim Health Care.^{37, 56} NEHEN is a consortium of more than 30 regional payers and providers who have designed and implemented a secure electronic data interchange of HIPAA-compliant administrative transactions for the purpose of reducing costs.⁵⁷ NEHEN members include hospitals and health systems, community health centers, and the major health payers in the Commonwealth including Blue Cross Blue Shield of Massachusetts, Tufts Health Plan, Harvard Pilgrim Health Care, MassHealth, Neighborhood Health Plan, and Network Health.⁵⁶ NEHEN also has

connectivity to Medicare, and national Medicare Advantage payers such as Aetna and Cigna.^{56, 57} Each provider organization connects directly to each payer in the network, to transmit all HIPAA transactions including eligibility verification, referrals, pre-certifications, claim inquiries and submission, and electronic remittance.⁵⁶

The NEHEN collaboration has established a favorable business model based on cost avoidance through reduction in administrative transaction costs, and has fostered a relationship of trust among healthcare CIOs in its member network.³⁷ Average claims cost of \$5.00 per transaction were reduced to \$.25 per transaction with the implementation of the NEHEN network.³⁷

MA-SHARE

MA-SHARE, operated by the MHDC,⁵⁸ is the "grid" supporting the Commonwealth's virtual RHIO capabilities.³⁷ The MHDC launched MA-SHARE in 2003 as a regional collaborative, and since then has raised \$1.1 million for its projects, with financial support from Blue Cross and Blue Shield of Massachusetts, Partners Healthcare System, Harvard Pilgrim Health Care, Tufts Health Plan, Fallon Health Plan, Neighborhood Health Plan and the Massachusetts Medical Society.⁵⁸ MA-SHARE's mission is to promote inter-organizational HIT, standards and administrative simplification, to enable efficient, cost-effective and safe health information transfer.⁵⁸ Its RHIO operating goal is to operate a clinical "grid" providing services to support communities in clinical data exchange, the counterpart to NEHEN's support for administrative data exchange.³⁷ MA-SHARE initiatives have included working to develop a record locator service for identifying patient records and a clinical data exchange

project to exchange prescription and laboratory information in partnership with the Connecting for Health Initiative.³⁷

In 2004, MA-SHARE was successful in implementing one of the nation's first live clinical data initiatives, MedsInfo-ED to deliver prescription medication history to three pilot hospital emergency departments.⁵⁹ Currently, MA-SHARE is focusing on two projects: the implementation of a pilot using the continuity of care document to share discharge summaries and emergency department summaries among caregivers; and the Rx-Gateway and Education projects. Rx Gateway is a community utility that acts as traffic manager to electronically connect prescribers to patient information, retail pharmacies, and mail order programs to order and deliver prescriptions.^{37, 60} As of December 2006, more than 1,000 Beth Israel Deaconess Medical Center physicians are registered for e-prescribing and more than 100 of them are using the medical center's EHR for e-prescribing.⁶¹ Approximately 10,000 electronic prescriptions have been transmitted, and several of the early adopters have proven to be high-volume e-prescribers, with hundreds of electronic prescriptions created over the course of several weeks.⁶¹ The pilot is extending to Partners Healthcare/Brigham and Women's Hospital, work is in progress to integrate the Harvard Pilgrim Health Care formulary, and plans are progressing with several Massachusetts payers, hospitals, and EHR vendors to evaluate the community benefits of Rx Gateway integration.⁶¹ MA-SHARE solicits proposals from healthcare organizations interested in piloting clinical information technology projects.⁵⁸

Massachusetts eHealth Collaborative

The Massachusetts eHealth Collaborative forms the "last mile" of the

Commonwealth's virtual RHIO model, fulfilling the vision that community connectivity will be realized only when the "last mile" of the provider's office is wired.³⁷ On December 6, 2004, Governor Mitt Romney announced the launch of the Massachusetts eHealth Collaborative, funded by a \$50 million commitment to the state by Bill Van Fassen, President and CEO of Blue Cross Blue Shield of Massachusetts, and led by Chairman of the Board Dr. Allan Goroll, Governor of the Massachusetts Chapter of the American College of Physicians, and President and Chief Executive Officer Micky Tripathi, founding President and CEO of the Indiana Health Information Exchange.^{16, 62,}

⁶³ The Collaborative was conceived during a March 2004 summit of the Massachusetts chapter of the American College of Physicians (ACP) to meet its top strategic priority of quality improvement through patient safety.⁴⁴ Consultants Dr. Lucian Leape and Dr. David Bates, experts in patient safety, advised the ACP that the best way to improve quality and safety was by means of an electronic health record initiative.⁴⁴

The MAeHC is a multi-stakeholder working coalition established to demonstrate the gains and feasibility of implementing community-wide HIT through EHR and HIE, with the goal of universal statewide adoption of interconnected electronic health records.⁴⁴ The MAeHC is comprised of 34 member organizations representing providers, employers, advocacy, health plans, HIT and quality improvement groups, including hospital, physicians' and nurses' groups, Health Care for All, the Massachusetts Business Roundtable, Massachusetts Group Insurance Commission, The Massachusetts Health Data Consortium, Masspro, New England Healthcare Institute and others.⁶⁴

The initial \$50 million contribution is to fund the demonstration phase,¹⁶ consisting of pilot communities in Greater Brockton, Greater Newburyport and Northern Berkshire.⁶⁵ This 24 to 36 month pilot is the first demonstration project testing community-wide implementation of EHR in Massachusetts, one of the most advanced efforts in the country.⁶⁵ The goal of the pilot is to study and demonstrate the effectiveness and practicality of implementing electronic health records linked by HIE in community settings, to improve the quality, safety and cost-effectiveness of care, and to use lessons gained to engage payers, providers, patients, QIOs and employers to promote adoption statewide.^{37, 44, 65}

MAeHC invited 167 physician practices to participate in the pilot.⁴⁴ As of September 2007, 159 practices accepted the invitation, 141 have remained in the pilot, and 131 are now live on EHRs.⁴⁴ Of 561 individual physicians invited to participate, 98 percent accepted, 88 percent are still in the pilot, and 55 percent are now live on EHRs.⁴⁴

The MAeHC is constructing a program to share information, lessons learned and resources developed for the pilot projects with any community in the Commonwealth, and invites other communities seeking to implement EHRs to participate.⁶⁶ MAeHC is bringing together employer, health plan, provider and government stakeholders to build consensus about ongoing funding for the demonstration program, with the vision of universal adoption as the ultimate goal.⁴⁴ Mitch Adams projects that in 12 to 18 months, MAeHC will have data to show that EHRs are cost-saving in the pilot communities.⁴⁴

New England Healthcare Institute (NEHI)

The New England Healthcare Institute (NEHI) is an independent nonprofit health policy institution, formed in 2002 by health leaders representing all sectors of the national health care community including payers, purchasers, providers, researchers, and biotechnology, pharmaceutical and medical device firms.⁶⁷ Working in partnership with the Massachusetts Technology Collaborative (MTC), NEHI conducted research and produced a report, “Advanced Technologies to Lower Health Care Costs and Improve Quality”, that identified HIT applications that would most dramatically create quality and cost improvement in the Commonwealth.⁴⁶

As a result of this initial research, NEHI and MTC have moved forward with two major, multi-year initiatives: the Massachusetts Hospital Computerized Physician Order Entry (CPOE) project and the Massachusetts Tele-Intensive Care Unit Project (Tele-ICU). The goal of the CPOE project is to achieve implementation of CPOE in 100 percent of Massachusetts hospitals by 2011.⁶⁸ There are 19 pilot site hospitals enrolled in the initiative, \$1.5 million in funding from the state legislature, MTC, and NEHI for the overall initiative, and a coordinating council of payers, hospital executives and policymakers that are all working to create an incentive system for the adoption of CPOE. NEHI and MTC also collaborate with David Bates, MD and his team from the Brigham and Women’s Hospital to study rates of preventable adverse drug events and the accompanying financial burden in community hospitals in Massachusetts.

Massachusetts Technology Collaborative

Massachusetts Technology Collaborative (MTC) is a quasi-public agency that acts

as the state's development agency for renewable energy and the innovation economy, working to stimulate economic activity in communities throughout the Commonwealth.⁶⁹ MTC brings together leaders from industry, academia, and government to advance technology-based solutions that lead to economic growth in Massachusetts.⁶⁹ MTC works closely with the Governor and the State Legislature to promote technology-driven innovation that fuels the state's economy,⁶⁹ and partners with NEHI to advance HIT to improve health care quality and cost.⁴⁴ MTC and NEHI have formalized an approach for identifying key technologies as those that have a high impact on quality and cost, and are under-adopted with barriers that could be eliminated.⁴⁶ MTC collaborates with NEHI on the CPOE Initiative.

Masspro

Masspro, founded more than 20 years ago by the Massachusetts Medical Society, is the federally designated healthcare Quality Improvement Organization (QIO) for Massachusetts.⁷⁰ In addition to providing quality measurement and improvement consultation to health care providers in all settings, Masspro assists physician practices throughout the Commonwealth to implement EHRs. Masspro represents Massachusetts as a pilot state in the Centers for Medicare & Medicaid Services (CMS) Doctor's Office Quality Information Technology (DOQ-IT) initiative, and has recruited over 2,000 Massachusetts physicians in small-to-medium sized practices to adopt EHRs.⁷⁰ The QIO also works with hospitals across Massachusetts in planning for the implementation for CPOE. Masspro partners with Bridges to Excellence, a multi-state, employer, physician and researcher coalition, to incentivize physician practices to improve quality through adoption of information technology, working with more than 1,200

practices in Massachusetts.^{70, 71} Masspro is also working with the CMS to implement the Medicare Care Management Performance (MCMP) Pay-for-Performance demonstration project, which rewards physician practices for EHR adoption, use and improvement impact on continuity of care, health outcomes, quality of care, patient satisfaction, physician satisfaction, and Medicare expenditures.⁷⁰

E-Prescribing

There are several e-prescribing programs in the Commonwealth. In Massachusetts, 83.3 million prescriptions are written every year, and there are 1,064 pharmacies.³ The premier e-prescribing effort in the state is the eRX Collaborative, formed in 2003 by Blue Cross Blue Shield of Massachusetts and Tufts Health Plan, later joined by Neighborhood Health Plan.⁷² The Collaborative is guided by the MA eRX Forum, facilitated by the Massachusetts Health Data Consortium. The eRX Collaborative had an early lead in the industry, with the highest adoption and utilization rates in the US compared to other e-prescribing initiatives. In the first six months of 2007, 2.6 million prescriptions were transmitted, a 21 percent increase from the same period in 2006. More than 50,000 prescriptions were changed as a result of drug-drug or drug-allergy alerts, approximately 8300 per month.⁷² In 2006, America's Health Insurance Plans awarded Blue Cross Blue Shield of Massachusetts their Innovation and Excellence Award for Health Information Technology, in which the success of the eRX Collaborative was a critical component. In 2006 and 2007, the project was awarded the SafeRX Award for enhancing patient safety through secure and accurate prescribing.⁷²

Health Care Quality and Cost Council

In 2006, Chapter 58, the Massachusetts health reform legislation, established the Health Care Quality and Cost Council, chaired by Dr. JudyAnn Bigby, Secretary of Health and Human Services. The Council has a mission to promote high-quality, safe, effective, timely, efficient, equitable and patient-centered health care and establish quality and cost benchmarks.⁴⁸ The goal of the Council is to incorporate health data collection and internet reporting goals, lowering or containing growth in health care costs while improving the quality of care, and the Council is authorized to design and implement health care quality improvement interventions with providers.⁷³ The Council will establish and maintain a consumer health information website to compare the cost and quality of health care services to enable consumers to make informed health care choices, and has the authority to collect claims and quality data from insurers and health care providers and to assess penalties on insurers or providers do not submit data.⁴⁸ Through regulation, in September 2007 the Council established standards for the uniform transmission of claims data sets for reporting to the Council.⁷⁴ To meet its goals, one of the Council's initiatives is to establish an all-payer database of claims submitted by public and private payers throughout the Commonwealth. In October 2007, the Council contracted with the Maine Health Information Center to act as its Claims Data Manager for data reporting by health plans, with the Massachusetts Health Data Consortium and Masspro serving as sub-contractors.⁴⁹ The goal of this collaboration is to build an all-payer health information database for Massachusetts.⁴⁹

Health Care Institutions

All of Massachusetts' major health care

institutions have HIT initiatives. These organizations are a key part of the solution to "complete the last mile" in community connectivity of interoperable EHRs;³⁷ it is possible to mention only a few of these initiatives here. For example, Partners HealthCare System has an award-winning EHR implementation that has roots going back more than 20 years to an in-house developed integrated computing system.⁷⁵ Partners is one of two organizations in the US awarded a five year AHRQ contract to develop methods to advance the effectiveness of clinical decision support in EHR, and has been recognized for nine years in a row as one of the 100 "Most Wired" hospitals and health systems in the country by Hospitals and Health Networks Magazine.⁷⁶ According to Tom Lee, CEO of Partners Community HealthCare, the physician network affiliated with Partners, all physicians in the Partners network must adopt or agree to adopt EHRs by January 1, 2008 or else they will be removed from the network.⁷⁷ The policy will affect about 5000 physicians in the network who will be required to implement one of two EHR systems by January 1, 2009. Partners' web-based EHR, Longitudinal Medial Record has been certified by the Certification Commission for Healthcare Information and Technology for meeting all 2006 criteria for functionality, interoperability, security reliability and professional standards.^{78,79} Today, More than 78 percent of Partners primary care physicians and 62 percent of specialists use EHRs.⁷⁹

Boston Medical Center (BMC), a not for profit, 581 bed urban academic medical center, is the largest safety net hospital in New England.⁸⁰ BMC has an extensive EHR implementation, with 8,000 users at 69 clinics, with almost 100 percent clinician participation.⁴⁴ According to Meg Aranow, Vice President and Chief Information Officer of BMC, the institution was an early adopter of EHRs

despite skepticism that a safety-net provider could implement successfully. BMC successfully implemented fully-functioning EHR in neighborhood health centers among a financially challenged patient population, in as little as four to six weeks in some clinics.⁴⁴ BMC has extended their EHR product offerings to private physicians in the community who refer to BMC.⁴⁴

CareGroup HealthCare System, consisting of Beth Israel Deaconess Medical Center, community hospitals including Mount Auburn Hospital, New England Baptist Hospital, Deaconess-Glover Hospital, Deaconess-Nashoba Hospital, and 72 ambulatory care practices, is considered one of the most technologically advanced hospital systems in the U.S. and has been an early adopter of EHRs.⁸¹ In 2001, Beth Israel Deaconess deployed a CPOE system throughout all departments of the academic medical center, eliminating handwritten orders, reducing medication dosing errors by 90 percent, overall errors by at least 50 percent, eliminating redundant data entry and improving work flow.⁸² All of CareGroup's hospitals and its network of ambulatory care providers are linked via a web-based home-grown EHR system, and medical records are available to qualified referring physicians on a view-only basis.^{81, 83} As a result of the rollout to referring physicians, CareGroup will be able to offer more than 1,000 physicians in Massachusetts the choice to purchase a hospital-based EHR for a low initial investment.^{82, 83} The system includes a web-based ambulatory CPOE component that is expected to handle approximately two million outpatient encounters annually.⁸³ Hospitals and practices in the CareGroup system are connected for interoperable clinical data exchange and communitywide RHIO activities.⁸²

In central Massachusetts, Fallon Community Health Plan, a not-for-profit insurer, Fallon Clinic, a 240-physician multi-specialty group, St. Vincent's Hospital and UMass Memorial Health Care, an integrated delivery system with a tertiary-care hospital and other facilities, have partnered to implement the SAFE Health Info program, under a grant from the National Institutes of Health and AHRQ.^{84, 85} The three-year \$1.4 million grant is funding the development of a community-led EHR and HIE project to exchange health information among the three organizations.⁸⁵ The project is funded in large part by Fallon Community Health Plan, and is planned to evolve into a long-term partnership to develop a RHIO called the Central Massachusetts Health Information Organization.⁸⁶

A Tradeoff Worth Making? Challenges to HIT Adoption

Despite these leading efforts, Massachusetts has yet to realize the full potential of HIT and HIE. Financial barriers to HIT implementation include lack of investment funding, and training and maintenance costs, both at start-up and ongoing. Implementation and maintenance requires a technologically skilled staff and/or vendor support to design and install EHR systems.² Ongoing costs include training of new staff, and hardware and software upgrades to maintain the system. Other ongoing costs may be associated with the use of technology: Decision support, in spite of its quality benefits, may lead to higher utilization and spending because it may create bias toward providing more care rather than less.¹¹ Nationally, it is estimated that wiring the health care system could cost as much as \$156 billion of public and private money over five years.^{41, 87} There is no national strategy to fund capital investment in HIT or provide reimbursement incentives for its use,

which creates a dependence on private sector funding that could lead to variation in capabilities and present issues in achieving interoperability. Less well-financed providers are at a disadvantage on the HIT adoption curve. The quantification of the benefits of HIT investment to care providers is unclear, making funding more difficult to secure. Health and care disparities may be exacerbated by disparities in HIT adoption because larger, financially stronger providers are better able to make the necessary investments.

Although financial factors are the most frequently cited obstacles to adoption of EHR by physicians, there are others.⁵ Barriers include lack of computer skills, lack of technical support, lack of uniform standards and technical limitations of systems.⁵ More than half of physicians surveyed in Massachusetts pointed to concerns about patient privacy and security that must be resolved.⁵

Loss of physician productivity during implementation and training is often pointed to as a barrier, and HIT has been found to have both positive and negative impacts on physician productivity.¹⁰ Lack of physician leadership, involvement and ownership can be a deterrent to adoption.¹¹ Physician resistance can also be a barrier in some facilities, although this seems to be less than has been generally perceived and addressable^{8,88} as systems proliferate and demonstrate stability and value. According to VHA and Kaiser Permanente staff involved with IT implementation, physician receptivity to HIT may be related to age: younger and older physicians may be more accepting, while those in mid-career, at peak productivity, may resist the potential time drain of IT implementation and training.¹¹ These health systems reported that some physicians required six months to integrate their training and experience with HIT and

appear to embrace the technology.¹¹

HIT is easier to use for specialists compared to generalists, because of the relatively smaller number of procedures performed and medical issues encountered, can more easily create a smaller number of standardized templates for care plan, office flow, decision support and documentation.⁴⁴ The Massachusetts eHealth Collaborative found that the main barriers cited by physicians to participating in the pilot project of electronic health record (EHR) implementation were the inconvenience of the conversion process and the belief that EHRs were not applicable to their particular specialty.⁴⁴ According to Meg Aranow, Vice President and Chief Information Officer of Boston Medical Center, one of the greatest implementation challenges is to strike the right balance between the standardization required by automation, and the customization required for good patient-centered care.⁴⁴

Health Information Exchange (HIE) may be even more challenging to implement than EHRs, because exchange between organizations introduces additional barriers of technical compatibility among systems housed in different, and disparate, organizations, and additional concerns about data privacy and security. Barriers to RHIO formation have included concerns about privacy, security, organizational trust, patient consent, and agreement on standards adoption.³⁷ To share information accurately, safely and with trust among organizations, data formats must be understood by all networked systems, information must be kept secure from intentional or unintentional corruption, and must be kept private from unauthorized use or access. HIEs rely on standards for communication, require compatibility in the codes that are used to store data, and in the technical facilities that are used to

transmit data among settings and users. Standards must take into consideration the large degree of variation among existing HIT systems and networks, from the simplest to the most advanced.³³

The current federal and state policy environment concerning consumer privacy and information security protections is based upon a health system in which records are stored on paper. Updates are needed to accommodate the electronic transmission of health information. Protections for data security and privacy lead to significant technical and policy issues that must be addressed in promoting EHR and HIE diffusion. Beyond HIPAA requirements, there are no national or intrastate uniform agreements about security or privacy of health information across a network.³³ These issues were encountered and in part addressed by the MedsInfo-ED project, a successful proof-of-concept patient safety initiative in Massachusetts that prototyped and tested a community clinical data exchange model to automate the communication of medication history to emergency department clinicians.⁸⁹ MedsInfo-ED was managed by MA-SHARE and sponsored by the Alliance for Health Care Improvement, a collaborative of six Massachusetts-based health plans including Blue Cross Blue Shield of Massachusetts, Harvard Pilgrim Health Care, Tufts Health Plan, Neighborhood Health Plan, MassHealth (Massachusetts Medicaid) and the Massachusetts Group Insurance Commission (purchaser of health insurance for Commonwealth of Massachusetts employees and retirees).⁸⁹ These plans in combination cover more than 80 percent of the population and more than 86 percent of covered lives in Massachusetts.^{89, 90}

Several privacy-related barriers were identified and addressed by MedsInfo-ED. HIPAA interpretations challenged the

project's ability to test and validate the software developed; the project's legal team clarified what was allowable under HIPAA's health care operation exemption.⁹¹ Patient consent in order for providers and plans to access health information electronically is an important policy issue, as the Massachusetts Fair Information Practices Act (FIPA) state law is stricter than HIPAA in regard to consent.^{91, 92} MedsInfo-ED implemented procedures to meet the Massachusetts Attorney General's position that under FIPA, providers must obtain and document oral consent to share patient's records electronically.⁸⁹ Massachusetts has stringent regulations related to the release of data concerning certain sensitive medications and conditions, as do most states, although there is interstate variation.^{89, 91} Massachusetts insurance regulations require specific advanced written consent prior to release of any HIV-related health information including treatment and medications.⁹³ Two state laws prevent Blue Cross Blue Shield of Massachusetts and commercial indemnity plans from releasing mental health treatment and medication information without prior written consent of the patient.^{94, 95} Federally funded substance abuse programs are subject to 42 CFR Section 2 which protects the confidentiality of drug and alcohol abuse patient records.⁹⁶ These protections were addressed and preserved by MedsInfo-ED through a prescription medication filter program that blocked the transmission of medications indicative of sensitive categories of treatment from view by clinicians.⁸⁹ This solution, while maintaining important consumer privacy protections, limited the usefulness of MedsInfo-ED for treatment of up to five percent of the commercial population of patients, and possibly even more of the Medicaid and Medicare population.⁸⁹ HIPAA's "minimum necessary" provision

limits display of multiple patient records to choose from in locating a patient's information; MedsInfo-ED found that this limitation might reduce the likelihood of finding a patient's medication history.⁸⁹ A significant roadblock to MedsInfo-ED's development was encountered concerning HIPAA's electronic data standards used to confirm eligibility, which raised concerns about the potential to return false positives and mis-identify the patient and present the wrong medication history.⁸⁹ MedsInfo-Ed implemented a workaround that allowed for clinicians to validate that the correct patient was located.⁸⁹

In 2006, MHDC was designated by the Commonwealth as the leader of the federally funded Massachusetts Health Information Security and Privacy Collaborative (MA-HISPC) project.⁵³ Massachusetts is one of 34 states participating in this nationwide AHRQ-funded public/private collaboration to address privacy and security policy issues, regulations and business practices affecting interoperable HIE.^{54, 55} HISPC is managed by RTI in cooperation with the National Governors Association, AHRQ, and the Office of the National Coordinator for Health IT at HHS, and aims to identify variation among states in privacy and security practices and laws, to propose solutions to address challenges, and to increase expertise about health information privacy and security protection.⁵⁵ Phase I of the project resulted in the identification of four key public policy concerns: patient consent to the use of HIE networks, use and disclosure of sensitive medical information, implementation of access controls, and application of community standards.^{17, 97} Among these, MA-HISPC identified patient consent, and use and disclosure of sensitive medical information, as priority areas to be addressed through legal, technical, policy and educational solutions, and developed

an implementation plan to develop these solutions.¹⁷ The April 2007 implementation plan addresses consent management and related HIPAA and state law education, and includes the goal for MA-SHARE to build a Consent Manager application with testing in a regional HIE, and identifies a number of specific policy issues that must be resolved.¹⁸ During a six-month Phase II of MA-HISPC, which began in summer 2007, first steps to development of a consent management application have resulted in the administrative specifications for the consent information workflow. The complete project will take 24 months.^{18, 98} Major policy issues salient to this implementation that were identified by MA-HISPC are listed in the conclusion of this report.

The Federal Role in Health IT Adoption

There is justification for a strong federal role in HIT adoption for several reasons. The benefits of HIT are likely to have health-system wide impact on quality and cost improvement, and realizing the full value of those benefits will require interoperability which depends on coordinated, collective activity to build a national infrastructure.⁴¹ Another reason is the nature of the returns on HIT investment, where benefits accrue mostly to the payer of health services through improved efficiency, lower premiums and enhanced worker productivity rather than to the physicians and hospitals who are the purchasers of HIT.⁴¹ It is estimated that 90 percent of the economic benefits would go to insurers and purchasers of care, including the federal government,¹³ which paid at least 50 percent of the Commonwealth's Medicaid cost of about \$6.3 billion in 2005,⁹⁹ and 100 percent of the Medicare cost of \$7.9 billion in 2004.¹⁰⁰ The cost of HIT investment is concentrated while the benefits are

dispersed. Under these circumstances the market is unlikely to provide HIT at levels that optimize value to the public.

Health information technology has received escalating attention at the federal level over the past decade. National commissions have reported the strong need for federal action and the potential benefits of HIT adoption and nationwide interoperability,¹⁰¹ but despite ambitious goals, there has been limited federal investment and leadership to further the diffusion of these technologies at the state, community and provider level.

In April 2004, President George W. Bush issued an Executive Order calling for EHRs for most Americans by 2014. The President called for medical information to be available to all providers that will follow consumers regardless of site of care, enabling providers to access medical history, CPOE, electronic reminders, and to use quality to empower consumer choice through performance measurement and transparency.^{102, 103}

Following on the President's Executive Order, the President's Information Technology Advisory Committee in 2004 defined a strong federal role to provide coordinated national leadership to promote HIT diffusion and reap its potential cost and quality benefits across the health system.¹⁰⁴ The federal role prescribed by the Committee proposes a coordination of federal departments and agencies with the private sector, focused to overcome the technological barriers to adoption, by addressing issues of computer infrastructure and standards, privacy and security.¹⁰⁴ The Committee calls for funding of economic incentives for HIT investment by provider organizations, support for community and regional HIE demonstrations, identification and resolution of legal impediments to sharing of EHR systems among providers such as antifraud and anti-kickback statutes, and

development of a single set of EHR and HIE standards for transmission, privacy and security.¹⁰⁴

The President's Executive Order established the Office of the National Coordinator for Health Information Technology (ONC) as a sub-cabinet position reporting directly to the Secretary of HHS. The duties of this position are to help the President accomplish the ten-year goal of interoperable EHR, and lead the nation in the strategic planning for nationwide interoperable HIT.¹⁰²

President Bush called for federal agencies to lead the way toward national adoption of HIT.¹⁰⁵ The Office of Personnel Management (OPM), the Department of Defense (DoD), and the Department of Veterans Affairs (VA) must submit reports to ONC on their experiences implementing HIT and will collaborate with ONC to gather lessons learned and encourage the widespread adoption of HIT throughout the health care system.¹⁰⁶ The ONC is charged to create a National Health Information Network (NHIN), coordinate federal HIT outlays, and encourage creation of regional health information organizations (RHIOs) that would facilitate community-wide and regional clinical data exchange.³⁷ In addition to ONC, HHS supports other HIT initiatives including:

- The **American Health Information Community (AHIC)** was created in 2005 as a federal advisory committee of health care stakeholders from the public and private sectors, that makes recommendations to the Secretary of HHS on the promotion of HIE.¹⁰⁷
- The **Nationwide Health Information Network (NHIN) Architecture Prototypes** project is an HHS initiative that awarded four contracts totaling \$18.6 million, to health care and HIT consortia to develop NHIN prototypes.¹⁰⁸ Projects in several

states are participating in these consortia, including MA-SHARE in the Commonwealth of Massachusetts.¹⁰⁹ The consortia will share information across the four prototypes to create one interconnected NHIN prototype infrastructure.¹¹⁰

- The **Health Information Technology Standards Panel (HITSP)** is convened by the American National Standards Panel under a \$3.3 million contract from HHS and chaired by John Halamka, MD, charged to outline HIT standards and develop a synchronization process to allow dissemination of those standards to enable interoperable HIE.^{109, 111}
- The **Certification Commission for Health Information Technology (CCHIT)** was awarded a \$2.7 million contract by HHS to develop standards certification guidelines and evaluation criteria for HIT products including EHRs and NHIN architectures.^{108, 109, 111}
- The **Health IT Adoption Initiative** was created by a contract awarded to George Washington University and Massachusetts General Hospital by HHS.^{109, 112} The initiative aims to develop consistent measures of EHR adoption rates to compare progress across the country and to accelerate the adoption of EHRs.^{109, 113} The initiative tracks the adoption of EHRs for the Department of Health and Human Services, and issues an annual report of survey results, to be used to measure progress toward the President's 10-year goal for widespread adoption of interoperable EHRs.¹¹³
- Under contract with HHS, **State RHIOs** are studied by the Foundation of Research and Education (FORE) and the American Health Information Management Association (AHIMA) to identify best practices for state-level

RHIO development.¹¹⁴ Massachusetts was among the nine states selected for study.^{34, 114}

President Bush issued another executive order in August 2006, requiring that federal agencies that purchase and deliver health care use interoperability standards as defined by HHS.¹⁰⁷

In addition to HHS and ONC, AHRQ, the Centers for Medicare & Medicaid Services (CMS), and Health Resources and Services Administration (HRSA) are also actively engaged in promoting the adoption of HIT nationally. Since 2004, AHRQ has awarded HIT-related grants totaling more than \$166 million in 38 states.^{115, 116} Funded projects include \$96 million in grants to promote access to HIT;¹¹⁷ Statewide and Regional Demonstrations of HIE awards of \$5 million each to five states in 2004 and 2005;¹¹⁸ an \$18.5 million contract to the National Organization for Research at the University of Chicago to encourage adoption of HIT by sharing knowledge;¹¹⁷ health IT implementation grants totaling \$22.3 million to 16 grantees in 15 states;¹¹⁹ and e-prescribing pilot projects jointly awarded with CMS to sites including Brigham and Women's Hospital in Boston.¹²⁰

HRSA's Office of Health Information Technology was created in 2005 to focus specifically on the HIT-related needs of the uninsured, underinsured, safety-net providers, and special-needs population. In 2007, HRSA awarded \$31.4 million in grants to Community Health Centers to expand HIT and implement EHRs.¹²¹

In the 109th Congress (January 2005 to January 2007), 41 bills relating to HIT were filed.¹²² The United States Senate is currently considering legislation introduced by Senator Edward M. Kennedy with bi-partisan support, the Wired for Health Care Quality Act of

2007, to enhance the adoption of a nationwide interoperable health information technology system and to improve the quality and reduce the cost of health care in the United States. The bill formalizes the role of private entities in the standards-setting process by establishing the public/private Partnership for Health Care Improvement, and authorizes three grant programs to facilitate the widespread adoption of interoperable HIT. The legislation also authorizes competitive grants to carry out demonstration projects to develop academic curricula integrating HIT systems in clinical education of health professionals, and establishes a Health Information Technology Resource Center within the Agency for Health Care Research and Quality to provide technical assistance and accelerate efforts to adopt interoperable HIT.¹²³ S. 1693 would authorize the appropriation of \$150 million in 2008 and an additional \$150 million in 2009 for grants to facilitate adoption of HIT.¹²⁴

The State of the States: State-level HIT Initiatives and Policy Environment

The federal role of infrastructure development and adoption incentives, and standard-setting for interoperability, data exchange, privacy and security,¹⁰⁴ can be complemented by leadership at the state level to provide the strategic vision and operational roadmap needed for state progress. The State Alliance for eHealth of the National Governor's Association (NGA) was formed in January 2007 under contract from the Office of the National Coordinator for Health Information Technology, to give guidance to states to address state-level HIT issues and barriers to promote HIT adoption.¹²⁵ The Alliance for e-Health is co-chaired by Tennessee Governor Phil Bredesen and Vermont Governor Jim Douglas.¹²⁶ Voting members include Massachusetts Senator

Richard Moore and former New Hampshire Governor Jeanne Shaheen, Director of the Institute of Politics at Harvard University.¹²⁶ From a state-specific perspective, the Alliance will address barriers to HIE adoption and interoperability, privacy and security; address barriers and build consensus among states on regulations, laws and standards for interoperability and medical practice related to HIT, including licensure and liability; and spur partnerships among states and between the private and public sectors.¹²⁵ The Alliance is aimed at creating synergies between national and state-level HIE efforts, and to serve as a nexus point for the coordination of individual state roadmaps to HIT adoption.¹²⁷

In October 2007, a taskforce of the Alliance published a set of initial findings from a commissioned study by the UMass Medical School Center for Health Policy and Research in which interviews were conducted with 10 Medicaid agencies around the country, to analyze the opportunities and challenges for publicly funded healthcare programs to participate in and facilitate the use of HIE to improve healthcare quality, efficiency and effectiveness.¹²⁸ This study identified success factors for Medicaid participation in HIT and HIE initiatives.¹²⁹ These success factors include: the Governor has provided visible leadership of HIE and HIT efforts in Medicaid and SCHIP; multi-stakeholder collaborations between state agencies, payers (including Medicaid/SCHIP), providers and consumers are essential to foster trust among public and private stakeholders, build consensus, align priorities, develop recommendations for states' HIE and HIT initiatives, and advance interoperability standards and governance; flexible funding models like Medicaid Transformation Grants have been integral to expanding HIE and HIT initiatives in

Medicaid/SCHIP agencies: traditional funding mechanisms do not address the scope of HIT projects.^{128, 129} State roadmaps have been viewed as a successful tool to set statewide priorities involving HIT and HIE integration into publicly funded health programs.¹²⁹ The following is a summary of the detailed recommendations developed by the Alliance taskforce, based in part on the UMass Medical School Center for Health Policy and Research study:^{14, 129}

- The NGA should provide guidance to states on development of executive orders and legislation related to HIT and HIE adoption including procedures for designing a state HIE roadmap, requiring that all state agencies adopt and utilize interoperable HIT, and ensuring consumer protections of appropriate access to health data;
 - Each state should develop or adopt a vision for state HIE that leverages existing and planned public and private HIE efforts and outline a state HIE by the end of 2008 for implementation by 2014. State roadmaps should describe how the state plans to implement HIE in the state, engage diverse stakeholders including consumers, providers and payers, develop and test HIE architectures based on approved standards, build financial, political support and legislative authority for HIE development; ensure consumer protections are in place, train and sustain an HIE-capable workforce, enable intrastate collaboration and data exchange. In close coordination with the Office of the National Coordinator and other federal agencies, NGA should play a leadership role on behalf of all governors to facilitate the coordination of individual state roadmaps to create a national interstate HIE strategy.
- Governors should designate a single authority for the state to coordinate state government based HIE implementation and work in collaboration with public/private HIE efforts;
 - Governors and state legislatures should align to establish flexible mechanisms to develop and sustain HIE;
 - States should fund greater development of technical assistance resources for state Medicaid/SCHIP and state IT agencies to build workforce competency on HIT, aligned with the Health Resources and Services Administration technical assistance toolbox modules;
 - State Medicaid agencies implementing EHR systems should require use of certified, standards-based EHR and HIE capabilities, and should implement portable, private and secure access to personal health records for Medicaid enrollees. State Medicaid agencies should develop the cultural and linguistic competency to engage diverse Medicaid/SCHIP enrollees to access their personal health records;
 - State Medicaid agencies should implement incentives and reimbursement policies such as pay for participation, rate adjustment, case management and pay for performance, that encourage provider adoption and

use of HIT and participation in HIE.¹⁴

Several states have developed roadmaps or statewide strategic plans for IT adoption.¹⁵ The contents of these plans include many of the elements found in the NGA recommendations and other goals and initiatives such as:^{15, 34, 130, 131}

- Establish the state's vision for information technology that adopts a strategy of EHR adoption and HIE connectivity to promote improvements in safety, quality and population health. The state can not afford to focus only on regional HIE connectivity: EHR and HIE adoption must be pursued in parallel because a grid of statewide HIE connectivity is only useful if providers can connect to the network infrastructure with their own EHR systems.³⁷
- Establish a single state-level public/private entity that has sufficient authority over state-level HIE governance.³⁴ Establish a formal public/private stakeholder partnership to promote adoption of EHRs by providers;
- Designate a formal point of leadership and coordination within state government to facilitate HIE participation, investments, and strategies across executive departments and agencies.³⁴ Evaluate the opportunity for the state to use its various roles to actively participate in efforts to promote adoption and interoperability of HIT and EHRs, and engage state HIT systems to participate in appropriate regional and statewide collaboratives;⁵¹ Coordinate all

public HIT initiatives and programs;

- Consistently evaluate the financial and non-financial return on investment of public HIT initiatives;⁵¹ Conduct use and readiness assessment of the provider population for HIT adoption; Identify and address barriers to adoption including state laws and regulations; Define incentives for adoption and use of EHR and HIE;
- Leverage a range of technologies with the potential to dramatically lower health care costs and improve quality, including electronic communication between patients and physicians, e-prescribing, EHR that includes CPOE, HIE, telemedicine and disease management;⁴⁶
- Develop principles for financing of HIT investment; Develop plans for investment and sustainability of HIT projects;⁵¹
- Develop and disseminate quality measurement standards for HIT;⁵¹ Develop and establish requirements for use of HIT to promote safety, quality, and transparency;
- Study and develop ways to use HIT to reduce health and access disparities in the state;
- Define steps to develop statewide HIE infrastructure connecting providers, plans, public agencies, pharmacies, etc.; Identify and communicate standards for interoperability, privacy and security to HIT stakeholders statewide;^{33, 132} develop a statewide process for adopting and promoting standards; Define

data for interoperable information sharing among providers, plans, public entities and consumers; Address privacy and security concerns, and establish policies to ensure protection of confidentiality and security; Establish a governance structure for public and private data exchange;

- Develop and communicate principles for consumer rights and protections; Educate and inform consumers and other stakeholders about opportunities and benefits of statewide HIT;
- Integrate HIT infrastructure to promote and improve population/public health; Expand use of population health data to develop state HIT and public health policy and planning;
- Collaborate with other states to share knowledge and ensure secure interoperable exchange of information across state lines;¹¹
- Promote the state's representation on national health information and standards boards;
- Research and evaluate non-health care initiatives that may enhance infrastructure or other resources required for HIT adoption;⁵¹

More than 150 HIE projects have been initiated in almost three quarters of the states as collaborations among public, private and nonprofit organizations to promote HIT development and facilitate a shift from competitive to collaborative use of shared data.³⁴ These initiatives are typically grass-roots, local capacity-building collaboratives, tailored to the preferences of state populations and governments, that aim to serve statewide quality and cost goals.³⁴

The eHealth Initiative,¹³³ a non-profit independent organization that provides guidance to states making strides in HIT, found that only six percent of states are at the level of statewide HIE implementation, eight percent have plans to go statewide, 29 percent are working to develop a statewide plan, and 25 percent are working to establish state-level leadership of HIT efforts.¹³⁴ Seventeen percent of states are involved in regional HIT implementations and 15 percent are just developing public awareness of the need for HIE.¹³⁴

Many states are considering or have enacted legislation to promote HIT and address barriers to its implementation. Legislation ranges from establishing an HIT entity, defining standards, meeting federally defined standards, issuing security and privacy regulations, integration of HIT activities among public programs including public health, Medicaid and other state agencies, guidelines for quality and transparency, and funding.¹¹⁶ Some states have more strict requirements for protection of privacy and security of health data than federal guidelines, and supersede those required by HIPAA legislation.¹³⁵ Ten states^d have issued executive orders supporting the use of HIT and HIE.¹³⁴

Overall, at least 29 states have some level of legislative activity including executive orders, proposed budget appropriations, introduced legislation, or commissioned planning for HIEs.¹¹⁰ Between 2005 and 2006, 38 state legislatures file 121 bills specifically relating to HIT, and 36 bills were passed and signed into law in 24 states.¹³⁴ As of April 2007, 41 states had over 150 HIT bills pending in their legislature and 27 states had EHR bills up

^d States with executive orders include: Arizona, 2005; California, 2006; Florida, 2004; Illinois, 2006; Kansas, 2004; Missouri, 2006; North Carolina, 1994; Tennessee, 2006; Virginia, 2006; and Wisconsin, 2005.

for consideration.¹¹⁶

Several states' initiatives offer models that add to the momentum to expand nationwide HIE capability,³⁴ and projects continue to proliferate. Projects vary in scope from small, local initiatives to collaboratives working toward statewide implementation. Many projects are seeded by local grant funding, but are struggling to find the means for sustainability.

Several states have larger projects that receive more significant funding from federal sources, and are moving toward statewide implementation and, ultimately, interoperability with the future Nationwide Health Information Network (NHIN).

Five of these states are highlighted in the appendix. They include California, with HIE efforts in more than half of the states' 58 counties; Delaware, the first state to implement statewide HIE; Indiana, which hosts one of the most established and studied HIE projects in the country; and Pennsylvania, whose Governor Edward Rendell aims to reform health care in the state through, in part, merging the issues of quality and HIT expansion. We also discuss a three-state HIE prototype for a Nationwide Health Information Network that includes California, Indianapolis and Boston.

The Massachusetts Health IT Policy Environment

Compared to some other states, the Commonwealth of Massachusetts has contributed less in financial support, incentives and directives aimed at driving health IT adoption, however there are some achievements worth noting.

Governor Deval Patrick proposed an investment in HIT in the Commonwealth via \$9.3 million in FY08 to fund a new internet-based reporting and billing service to reduce the state's health care costs by an estimated \$11 million annually.¹³⁶ This investment will complete a new billing

and invoice management system for HHS, leveraging an additional \$5.1 million in federal funds.¹³⁷ A \$6.25 million investment is proposed for a new Medicaid Management Information System, to leverage an additional \$47.7 million in federal funds.¹³⁷

In the last two legislative sessions, three pieces of legislation have been signed that have an impact on HIT.^{138, 139} In 2006, as part of the Massachusetts health reform legislation (Chapter 58), \$5 million in funding was transferred to the Massachusetts Technology Collaborative to support initial implementation of its CPOE initiative and other activities.⁴⁸ As part of the appropriations act of 2007, the office of Medicaid is authorized to submit a proposal to CMS for a grant to fund a MassHealth e-Prescribing pilot project to Medicaid providers integrated into the Rx Gateway already under development by MA-SHARE.¹⁴⁰ On October 10, 2007, Chapter 130 was enacted, to establish an Electronic Health Records Task Force within the Executive Office of Health and Human Services (EOHHS) to make recommendations on an EHR implementation for enrollees in MassHealth, SCHIP, Commonwealth Care or safety net care programs.¹⁴¹ The task force is coordinated by the Chief Information Officer of the EOHHS and consists of representatives of VHA facilities in the Commonwealth, UMass Medical School, the e-Rx Collaborative, MA-SHARE, the Massachusetts Health Data Consortium, the Massachusetts eHealth Collaborative and Masspro.¹⁴¹

Compared to some other states, few legislation-based HIT initiatives have been enacted in the Commonwealth, but much has been proposed, with Senator Richard Moore taking a primary leadership role. Legislative proposals include grant and loan funding for HIT projects, investment in HIT to stimulate quality and economic

opportunity, promote HIT in underserved areas, accelerate adoption of EHRs and CPOE, invest in quality and safety through the use of HIT, provide incentive payments to providers to utilize CPOE, reimburse providers for electronic consultations, establish guidelines for the use of the internet in medical practice, privacy and security protections, and other proposals.

In spite of a relative lack of enabling legislation, much HIT and HIE development has taken place in the Commonwealth. Following the example of Chapter 58's establishment of the Healthcare Quality and Cost Council, and its stimulus of initiatives such as the all-payer database, stronger legislative and executive support may be needed to propel the state to the next level in building HIT and HIE infrastructure.

Policy Issues

An overarching question facing public and private HIT stakeholders in the Commonwealth is: should Massachusetts empower a formalized, state-led multi-stakeholder public/private partnership and develop a *Massachusetts Statewide Plan for Health Information Technology* that documents the partnership's consensus on the steps toward enhancing HIT adoption? A number of policy issues and questions face the Commonwealth of Massachusetts on the road to HIT adoption, and might be addressed by a *Massachusetts Statewide Plan for Health Information Technology*. Several issues are suggested by the NGA guidance outlined in the above section, "The State of the States: State-level HIT Initiatives and Policy Environment."

There is justification for a strong public role in HIT and HIE adoption. HIT and HIE may reduce Medicaid and SCHIP costs by reducing medical errors and increasing administrative and clinical efficiency.¹⁴ There is an opportunity to

enhance Medicaid and SCHIP through widespread adoption and use of HIT to share information, coordinate care and improve quality.¹⁴ The projected gains in quality and cost improvement have the potential for health-system wide impact that benefits the public welfare. These benefits, however, depend on an interoperable infrastructure that requires coordination and investment by the public sector, and that can not be accomplished by the private sector alone. In the absence of a strong federal role in promoting HIT, the state can help fill the gap that the market is unlikely to fill because the cost of HIT investment is concentrated while the benefits are dispersed. Under these circumstances the market is unlikely to provide HIT at levels that optimize value to the public.

The public sector has an important role to play in HIT diffusion, because some of the enablers and barriers may be best addressed at the state level. Financial barriers to private investment by physician offices in HIT implementation include lack of investment funding, and training and maintenance costs, both at start-up and ongoing, and the lack of a clear business case at the provider level, especially for smaller physician practices. Creative state-driven funding mechanisms can help providers and community coalitions to secure the needed start-up and sustaining funding. Cohesive and coordinated standards and policies are needed to ensure privacy, consumer protections, quality, information security, and technical compatibility among interconnected systems housed in different organizations. The federal role of nationwide infrastructure development and adoption incentives, and standard-setting for interoperability, data exchange, privacy and security,¹⁰⁴ can be complemented by leadership at the state level to provide the strategic vision and operational roadmap needed for state progress. Only the state

can address many of the state-specific policy issues arising from important privacy and security concerns that protect the public interest.

For HIT to achieve its promise of health system transformation, it must be combined with properly aligned incentives that reward patient outcomes, improvements in efficiency,³⁵ adoption and use of technology. The state has important purchasing and incentive power to wield to encourage quality, efficiency, and diffusion of technology.

Many advances in HIT and HIE adoption in Massachusetts have been made because of the culture of innovation, entrepreneurship, and collaboration that distinguishes our state. Still, unlike some states, the Commonwealth has no broadly vetted formal plan that defines statewide goals and milestones for integrated and coordinated public and private HIT and HIE adoption. While the Commonwealth and various coalitions have HIE and HIT roadmaps and plans, these are not necessarily aligned and coordinated to ensure that statewide milestones and goals are defined and achieved. In the last two years, many states have increased their level of Executive commitment, legislative support and funding of statewide HIT expansion. The Commonwealth of Massachusetts is active as a key stakeholder to the various HIT coalitions that dot the Massachusetts landscape and stands to gain much from a stepped-up investment in the form of primary leadership of public/private development and governance of HIT and HIE diffusion. Leadership at the state level is necessary to develop a public/private strategy to fund and operate a statewide fully integrated health information capability.

Several states have developed roadmaps or statewide strategic plans for HIT adoption,¹⁵ which are viewed as successful tools to set statewide priorities involving

HIT and HIE integration into publicly funded health programs.¹²⁹ The State eHealth Alliance of the National Governor's Association, under contract from the Office of the National Coordinator for Health Information Technology, guides states on development of statewide plans, executive orders and legislation to promote HIT and HIE adoption.¹²⁵ The Alliance recommends that states adopt a statewide strategic plan for HIE that leverages existing and planned public and private HIE efforts by the end of 2008 for implementation statewide by 2014.^{14, 129} Further, the NGA recommends that Governors and state legislatures designate a single state authority to coordinate state government-based HIE implementation and to work in collaboration with public/private HIE efforts.^{14, 129} Governors and legislatures are recommended to establish flexible funding mechanisms to develop and sustain HIE and state Medicaid agencies can play a role through incentives and reimbursement policies that encourage provider adoption and use of HIT and participation in statewide HIE.¹²⁹

Massachusetts HIE initiatives have learned that the state cannot afford to focus only on regional HIE connectivity: EHR and HIE adoption must be pursued in parallel because a technology grid of statewide HIE connectivity is only useful if providers can connect to the network infrastructure with their own EHR systems.³⁷ A single state-level public/private entity with sufficient authority is necessary to this goal.^{34, 51} Because differences in the availability of investment funding among providers can cause HIT to exacerbate health disparities, an important public role is to study and develop ways to use HIT to reduce health and access disparities in the state.⁵¹

Policy Issues. The Commonwealth faces policy issues in five key areas concerning

the statewide advancement of HIT and HIE: funding; privacy, security and standards; public health; racial and ethnic disparities, and serving of vulnerable populations; and coordination and governance.

Funding. The number of health information exchange initiatives in Massachusetts is impressive and growing, but they are fragmented and underfunded.¹⁸ There is no existing model to develop the resources to pay for statewide adoption of interconnected EHRs.⁴⁴ MA-HISPC has not yet identified sufficient private and public funding to sustain its 24 month HIE privacy and security project to address the key issue of gaining patient consent to share medical information.¹⁸ The Commonwealth's premier interconnected EHR initiative, the Massachusetts eHealth Collaborative, was funded through an initial \$50 million private sector contribution. Current operations are sustainable through July 2008, but sustainability beyond that date is at risk without the commitment of further funding. Will this \$50 million investment be leveraged to return its full financial and non-financial value through the ultimate achievement of statewide HIE? Further, there is as yet no formal consensus that the Massachusetts eHealth Collaborative is the Commonwealth's model for community-wide HIT adoption.

An early estimate of the cost of HIT implementation in Massachusetts to achieve 100 percent adoption is \$802 million for EHR, \$304 million for Computerized Physician Order Entry (CPOE) and \$220 million for interoperability.¹⁵ This estimate bases its projection on a 5-year cost of ambulatory EHR implementation at around \$60,000 per provider.¹⁵ The 5-year net benefits are estimated at \$832 million for ambulatory EHR and acute inpatient CPOE.¹⁵ Based on its pilot, the Massachusetts eHealth

Collaborative has developed a more refined estimate of the cost of modified statewide adoption of its model, projecting the costs to be approximately \$500 million.¹⁶ This estimate is refined based on the pilot's experience with actual investment, installation, training and support costs. Economies were gained from centralized purchasing and technical support services. In addition, this cost projection used revised assumptions of the number of physicians in the state who would draw on this investment funding to adopt EHRs.

A creative combination of public and private funding streams, possibly accompanied by appropriate tax and reimbursement incentives, may offer a solution to the funding problem. MassHealth, Commonwealth Care and Commonwealth Choice, with the potential to capture enhanced federal matching funds to fuel part of the investment, and the power of reimbursement policies as incentives, could be used as leverage to promote HIT adoption.

Privacy, Security and Standards. Policy is needed to articulate and resolve the patient consent issues surrounding the use, disclosure and sharing of patient medical information while providing consumers with stringent privacy and security protections^{33, 132} through legal, technical, policy and educational means, and the MA-HISPC implementation plan proposes a solution.^{17, 18} Consumer and patient education must be addressed to encourage public support for HIE initiatives.¹⁸ Statewide advocacy can be depended upon to develop and communicate principles for consumer rights and protections and to educate and inform consumers and other stakeholders about opportunities and benefits of statewide HIT, but coordinated technical solutions and the necessary legislative and regulatory guidance and protections must be put into place.

Public health. The role of current and future statewide HIT and HIE infrastructure in the promotion and improvement of public health has yet to be defined in the Commonwealth. The infrastructure to enable data collection and sharing is available, and the use of this data can be expanded and applied to public health policy and planning.

Racial and ethnic disparities, and serving of vulnerable populations. As interconnected HIT and HIE diffuses statewide, the potential exists to exclude several critical and vulnerable populations.⁸⁹ Excluded populations may include some Medicare patients, people who are uninsured who pay out of pocket, or people who have switched health plans. Rural populations could be excluded if there are regional variations in the availability of HIT and HIE that disadvantage rural providers. Health and care disparities may be exacerbated by disparities in HIT adoption because larger, financially stronger providers are better able to make the necessary investments. Plans for statewide HIT and HIE goals must address this possibility, and include goals for HIT use and adoption that are inclusive and that reduce racial and ethnic health and care disparities.

Coordination and Governance. Coordination of policies and business practices is necessary to achieve interconnected HIT among organizations, but this continues to be a challenge.¹⁸ Much HIE activity across Massachusetts is still occurring in silos,¹⁸ which could be spanned with the establishment of a single, coordinating public/private partnership.

A Public/Private Partnership? Public/private coalitions are key to the successful diffusion of HIT and HIE. Several existing coalitions in Massachusetts, appropriately empowered, offer a potential coordination point for a statewide public/private HIT/HIE

governance body. Chapter 58 established an important and promising new mechanism for cost and quality improvement through the Health Care Quality and Cost Council chaired by Dr. JudyAnn Bigby, Secretary of Health and Human Services. The Council has a mission to promote quality, safety and cost improvement, using HIT to establish a consumer health information website, and has the authority to establish standards and collect claims and quality data from insurers and health care providers.⁴⁸ In October 2007, the Council created a coalition by contract with the Maine Health Information Center and subcontractors MHDC and Masspro to build an all-payer health information database for Massachusetts.⁴⁹ Another coalition was recently formed, the Electronic Health Records Task Force within the Executive Office of Health and Human Services (EOHHS) to make recommendations on an EHR implementation for enrollees in MassHealth, SCHIP, Commonwealth Care or safety net programs.¹⁴¹ The task force is coordinated by the Chief Information Officer of EOHHS and consists of representatives of VHA facilities in the Commonwealth, UMass Medical School, the e-Rx Collaborative, MA-SHARE, MHDC, the Massachusetts eHealth Collaborative and Masspro.¹⁴¹ A third potential point of coordination is the MA-HISPC MA-Implementation Planning Work Group (MA-IPWG), a public/private multi-stakeholder coalition comprised of Commonwealth of Massachusetts, MHDC, consumer advocacy, health plan, provider, and private legal representatives. One, or a combination, of the existing coalitions could form the launch platform for the public/private leadership body that future statewide progress depends upon.

Conclusion

There is much evidence to support the premise that quality and efficiency gains are possible from statewide interoperable HIT and HIE. Massachusetts HIE projects are technologically and operationally advanced, but they are still just initial steps toward full, statewide interoperable HIE.¹⁸ Future progress is dependent on strong public/private partnerships.¹⁰¹ The Commonwealth has an important leadership role to play in this partnership, especially significant in the absence of a strong federal role in encouraging HIT adoption, and because of the potential for HIT to benefit the public welfare. This benefit depends on an infrastructure and policy solutions that require increased public sector investment in funding, and executive and legislative guidance, in addition to private sector resources.

Massachusetts is unique in the breadth and depth of organizations and expertise brought to bear on expanding HIT interoperability,¹⁴² and a thirty year history of collaboration. The provider community, and the private and public health care sectors, are committed to making gains through collaboration.⁴⁴ The Commonwealth's virtual RHIO consisting of four organizations is a premier example of the state's culture of collaboration. Although the membership and missions of these organizations appear to overlap, they have established complementary roles to promote HIE and EHR activity.³⁷ The Massachusetts eHealth Collaborative offers another illustration of the success of private sector partnerships that have moved the state to prominence in the national HIT landscape.

Massachusetts needs to build upon its important successes and strong technological base to address key policy issues to enhance the Commonwealth's

HIT capability. Increased public funding is needed to supplement the private sector's investment. Privacy and security protections must be further developed to build the public trust necessary to share medical information. A comprehensive strategy is needed to integrate existing innovations. A public/private coalition that provides strategic guidance, statewide planning and governance is essential for future progress.

On December 5, 2007 the Massachusetts Health Policy Forum and the Massachusetts Health Data Consortium will convene health leaders in the Commonwealth for a forum entitled, Health Information Technology in Massachusetts: A Public/Private Partnership? The overarching policy question to be addressed is this: Will Massachusetts capitalize upon this collaborative history, its unique confluence of resources and talent, and its current investment in HIT capability, and form a public/private partnership to define the next steps toward statewide adoption and national leadership in health information technology? And, further, what should the state's role be in facilitating HIT adoption?

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Appendix

California

California, the most populous state in the country with a very diverse 36.5 million residents in 2006,¹⁴³ has met significant milestones toward its huge goal of interconnection of its health system and patients. As of May 2006, there were 16 HIE efforts within the state, in 24 out of 58 counties.^{144, 145} Governor Arnold Schwarzenegger issued an Executive Order on July 25, 2006 to commit California to attaining 100 percent electronic health data exchange between payers, providers, consumers, researchers and government agencies within 10 years.¹⁴⁶ The Governor's order created the California eHealth Action Forum, to develop a statewide HIT implementation plan that would be capable of interconnecting to the future NHIN, due to the Governor by July 1, 2007.¹⁴⁶ An Executive Order issued on March 14, 2007 added to this plan by committing additional state resources to provide leadership, and increase support and incentives to promote adoption of HIT, support standards and achieve a 100 percent interoperable statewide HIE; to increase transparency through reporting of quality and pricing; and to promote quality and efficiency in health service delivery.¹⁴⁷

The California Regional Health Information Organization (CalRHIO) was established in January 2006 as partnership of business, health care and policy leaders including the California Department of Health and Human Services and the Director of CMS, Region 9, to develop innovation and funding opportunities for a statewide secure HIE.¹⁴⁸ CalRHIO works to integrate California's goal with national benchmarks and standards, and has a primary focus to ensure the participation

of safety net providers and underserved populations in HIE.^{148, 149} CalRHIO operates a HIE utility which helps facilitate interoperability and improves data access control, the integration of data from multiple health system sources, and the management of privacy and security of patient identity.¹⁴⁴ Funding is provided by the HealthTech Center, the California HealthCare Foundation, hospital and delivery systems and the Blue Shield Foundation, and a \$350,000 federal grant.¹⁵⁰ Overall funding for CalRHIO total more than \$4.6 million and comes from a variety of sources including Sutter Health, Blue Cross of California Foundation, Kaiser Permanente, Blue Shield of California, and California HealthCare Foundation.¹⁴⁵ Private seed money will be sought for the start-up expenses of the HIE utility, estimated at \$300 million.¹⁵¹ In addition to statewide HIE implementation, CalRHIO is working on 2 or 3 pilot projects to implement HIT availability in hospital emergency department, and to test the standards required for HIE interoperability, projects which are funded from diversified sources.¹⁴⁵

Delaware

Delaware is the first state to implement statewide HIE.¹⁵² Delaware's primary HIT project, the Delaware Health Information Network (DHIN),¹⁵³ was created in 1997 by HB276.¹⁵⁴ The Delaware Health Care Commission operates DHIN as a public/private partnership to provide the infrastructure for statewide clinical information exchange. DHIN's mission is to improve quality and efficiency of health care in Delaware by facilitating statewide HIT.¹⁵³ DHIN is a public/private partnership of physicians, insurers, hospitals, commercial laboratories, community organizations, policymakers, employers and patients including the Delaware Health Care

Commission, Delaware HealthCare Association, Delaware State Chamber of Commerce, Delaware Department of Health and Social Services, Delaware Department of Insurance, Delaware State Budget Office, blue Cross Blue Shield of Delaware, and the Medical Society of Delaware.¹⁵⁵

In October 2005, DHIN received federal support for its HIE implementation, becoming one of six states to receive a five-year \$4.7 million State and Regional Demonstration Project Contract from AHRQ for the development of statewide HIE.¹⁵⁵ Delaware's HIE will deliver lab test results, radiology reports, and hospital admission and discharge reports to three hospital systems, five doctors' practices with 30 offices and 70 physicians, and LabCorp. More users will be added in the next phase. About 30 percent of Delaware physicians have electronic medical records and physicians' offices need only a PC running Microsoft Windows and a high-speed Internet connection to use DHIN services.¹⁵² DHIN is being built by the technology supplier Medicity of Salt Lake City, partnered with Perot Systems, the team that recently won a contract to build the statewide HIE for California.¹⁵² Funding sources, in addition to the \$4.7 million AHRQ grant, include \$2 million from the state government and \$2 million from the three hospital systems, LabCorp and Blue Cross Blue Shield of Delaware.¹⁵² The network is not charging fees for its services and is expecting more funding from the state and the participating health care companies.¹⁵² In the next phase more users will be added, and developers plan to offer a patient portal, insurance claims submission services, public health reporting of contagious diseases, clinical decision support and chronic disease management services.¹⁵² In July 2007, the state of Delaware appropriated an additional \$3

million to sustain DHIN for fiscal year 2008.¹⁵⁶

Indiana

Indiana is similar in population size to Massachusetts¹⁵⁷ and is also considered a leader in HIT. The Indiana Health Information Exchange (IHIE) is one of the most established and studied HIE efforts in the US.¹¹⁰ Governor Daniels issued an Executive Order in March 2007 to reaffirm the state's progress in secure interoperable HIE, and to commit the state to continue to support HIE expansion and to meet interoperability standards approved by the Secretary of HHS.¹⁵⁸

The Indiana Network for Patient Care is city-wide electronic data exchange launched by the Regenstrief Institute in the 1990s in Indianapolis, that offers hospital registration records, inpatient lab information and emergency department data.¹⁵⁹ When a patient is seen in any of the 11 emergency rooms operated by the five consortium hospital systems, with consent all their medical information can be viewed electronically.¹⁶⁰ One of the oldest HIEs in the country, the Indiana Network for Patient Care began sharing information for health service delivery, research and public health purposes in 1997.

In 2004, the Indiana Health Information Exchange was organized to expand on the Indiana Network for Patient Care.¹¹⁰ The mission of this group is to improve quality, safety and efficiency of health care throughout Indiana by sharing data through an interoperable, standardized, and secure HIE.¹⁶¹ The Indiana Health Information Exchange has expanded HIE capability to include local and state public health departments, Indiana Medicaid, medication management companies, large physician practices, and health systems.¹¹⁰ Its application Docs4Docs delivers clinical information between physician offices,

laboratories, radiology departments via a web-based system, then transfers clinical data directly into individual EHRs.¹⁶² The implementation is being expanded to other parts of the state; to date 25 hospitals and over 5000 physicians are connected.¹⁶³

Key partners in Indiana's HIE efforts include employers, the City of Indianapolis, health systems, Community Health Network, Indiana State Department of Health, Indiana State Medical Association, Indiana University School of Medicine, Indianapolis Medical Society and Regenstrief Institute. Funding comes from an AHRQ State and Regional Demonstrations grant totaling \$5 million over five years, the Foundation for eHealth Initiative, the State of Indiana, and the private sector.^{164, 165} Federally funded HIT projects include: a partnership with eHealth Initiative to share best practices on the sustainability of HIE; a pilot project to measure and report on physician practices funded by CMS and AHRQ; and the Connecting for Health Consortium, a working group to develop a prototype National Health Information Network.¹⁶⁵

Pennsylvania

On January 17, 2007 Governor Edward G. Rendell released a "Prescription for Pennsylvania", aiming to reform health care in the state, that includes the goal of merging the issues of quality and HIT expansion.¹⁶⁶ The prescription includes a proposal to update hospital regulations to include a requirement for state of the art patient safety and EHRs.¹⁶⁶ The Governor's initiative calls for phasing in the implementation of interoperable EHRs, e-Prescribing, CPOE, and medication bar coding. Additionally, a High Technology Commission will be established to develop standards for interoperability of personal health records and EHRs, and to create a plan for financial incentives to encourage providers to adopt these systems. By 2008

all acute care facilities must meet the guidelines established by the Health Technology Commission and by 2009 they must have EHRs implemented that meet the Commission's criteria.¹⁶⁷

The Pennsylvania eHealth Initiative was created in 2005 as a public/private partnership to develop a statewide plan for HIT and HIE.¹⁶⁸ The Initiative is working to accelerate the adoption and use of EHRs, HIE and personal health records in the Commonwealth, issuing a report in April 2007 that made specific recommendations on how the state can combine smaller HIE initiatives and effect broad collaboration toward a statewide interoperable HIE.^{168, 169}

Pennsylvania has about a dozen RHIO and health information projects underway, regional and local HIT projects in Pennsylvania.¹⁷⁰ Central Pennsylvania Health Information Collaborative connects hospitals, physicians other health providers in a 31-county region via a regional health information exchange.¹⁷¹ Geisinger clinic in Danville, Pennsylvania is funded through two AHRQ grants totaling \$1.7 million to provide planning (1-year, \$200,000) and implementation (3-year, \$1.5 million).¹⁷² Highmark eHealth Collaborative in northeastern Pennsylvania provides grants of up to \$7,000 per physician to implement e-prescribing and EHRs, requiring the practice to pay at least 25 percent of the cost.¹⁷²

Philadelphia Health Information Exchange is funded by a \$1.7 million grant from the National Institutes of Health to facilitate interoperability and portability of EHRs to create an HIE to support sharing of medical records.¹⁷² The West Central Pennsylvania Health Care Network connects 5 hospitals in 3 counties with EHRs to share data across health care facilities in rural Pennsylvania.¹⁷² West Central received a \$1.5 million grant from AHRQ, other grant and foundation

funding, and is following an aggressive EHR implementation schedule.¹⁷³

In a significant setback, the Northeastern Pennsylvania RHIO established in July 2006 to provide HIE for 24 healthcare institutions including 22 hospitals and 6000 providers across 13 counties, closed after less than one year.^{170, 172} The initiative disbanded because of lack of community support and funding, including some financial support that was promised but was not delivered.¹⁷⁴ Initial estimates projected that \$11 million in start-up costs would be needed, and that another \$2 million a year would be required to sustain the effort.¹⁷⁰ The board indicated that there was doubt that any of the group's work from the past year could be salvaged.¹⁷⁴

The Pittsburgh Regional Health Information Network offers another cautionary tale. The Initiative operated from 2001 to 2003 as an HIT collaborative of the Pittsburgh Regional Health Initiative (PRHI) Chronic Care Model Action Group, to build a chronic care information system to improve the coordination of care for people with diabetes, depression and other chronic illnesses.¹⁷⁵ PRHI says the effort was an idea ahead of its time, and was terminated in 2005.¹⁷⁵ This initiative failed in part due to the uncertainty of national HIT policy environment that provided little guidance or standards for data sharing across competing institutions for community benefit.¹⁷⁶

Tennessee

On April 6, 2006, Governor Phil Bredesen issued an executive order to create a 16-member Governor's eHealth Advisory Council that includes all stakeholders to Tennessee's HIT efforts, with the purpose of guiding the governor and the legislature on development of statewide HIE, and to offer guidance in overcoming barriers to

adoption.¹⁷⁷ Four local HIE projects are underway in Tennessee: Mid-south eHealth Alliance (2004), CareSpark (2005), IVHIN Knoxville (2003) and Nashville (2006). A description of two of the larger initiatives follows.

Mid-south eHealth Alliance, begun in 2004, operates a RHIO providing medical information for approximately one million people in 3 Memphis-area counties.¹⁷⁸ The goal of the project is to evaluate the impact and facilitate the use of HIE focusing on emergency department EHRs, and to improve collection of public health information.¹⁷⁹ Collaborators include patients, payers, providers, public health organizations, and state and local government.¹⁸⁰ Mid-South received a State and Regional Demonstration grant from AHRQ in 2004 for \$4.8 million over 5 years, to establish statewide HIE.¹⁸¹ The State of Tennessee appropriated an additional \$7.2 million over the same five year period.¹⁸¹ Vanderbilt University has contributed significant in-kind resources through donation of staff time and technology and is responsible for managing the AHRQ contract.¹⁸¹

CareSpark was launched in 2005 by the Community Health Improvement Partnership as a collaborative project among 17 counties in Northeastern Tennessee and Southwestern Virginia.¹¹⁰ A stakeholder coalition including hospitals, physician practices, employers, pharmacies, a medical school, public health department and insurers participates in the project.¹¹⁰ In 2005, CareSpark received federal support to perform testing of a prototype of the National Health Information Network, under a contract awarded by the Department of Health and Human Services to a network consortium working under the direction of Accenture.¹⁸² In Massachusetts, MA-SHARE is involved in a similar effort under a parallel contract.¹⁸²

A Three-State National HIE Prototype

Connecting for Health conducted a three-state prototype of electronic health information exchange based on its Common Framework beginning in late 2004. The communities of Mendocino County, CA, Indianapolis and Boston were connected in an HIE, and successfully shared electronic health information within and among the three communities.¹³² The prototype was designed as a test of the Common Framework, using its detailed technical specifications and policies for information use, access, privacy and security.¹⁸³ The three communities are quite different in terms of health care institutions and population served: Mendocino Health Records Exchange (HRE) in Mendocino County, a rural northern California community made up of safety net clinics, rural hospitals, public health and small practices; Indianapolis hospitals networked by the Indiana Health Information Exchange and Regenstrief Institute; and links between institutions facilitated by Massachusetts SHARE involving payers, providers, patients and employees in Massachusetts.¹⁸³ A successful test of the three-state prototype was conducted in early 2006, achieving a milestone toward the secure, private exchange of health information. The prototype effort is managed by the Markle Foundation and funded by Markle and the Robert Wood Johnson Foundation.¹⁸⁴

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