Health Information Technology

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FCC Chairman Kevin Martin notes, "*In order to receive the benefits of telemedicine, electronic health care records, and other health care benefits, health providers must have access to underlying broadband infrastructure. Without this underlying infrastructure, efforts to implement these advances in health care cannot succeed.*"[1]

1 Introduction

Improving America's health care industry is essential in order to control the rising cost, face the increasing demand with improved life-saving care, and mitigate the negative effects of physician shortages. National Health Expenditures (NHE) already account for 17% of U.S Gross Domestic Product and by 2020 it is expected to top 20% [CITL, 2009]. The "rising costs would be less of a concern if there were results. But Americans are not healthy" [FCC, 2010a, See p. 1.]. For example, 68% of adults are overweight or obese leading to medical complications [Ogden and Carroll, 2010] and the nation has 670,000 new cases of congestive heart failure each year, many of them fatal [CDC, 2008]. To reign in these costs and meet the growth in demand, the health care industry needs to couple 21st century medicine with 21st century communication technology.

Broadband is not a panacea. Rather, implementing Information Technology in the health care industry, often called Health Information Technology (HIT), offers the potential to improve the quality of care while reducing costs and extending the reach of the limited pool of physicians [FCC, 2010a]. Furthermore, future innovations will certainly increase the applications of HIT systems. However, there exists several barriers to *wide-spread* adoption of HIT systems. It is essential that policy-makers remove these barriers in order to extract the potential benefits of HIT systems.

The focus of this study is to analyze current and future opportunities for HIT in the US health care industry. In particular, implementing these systems into Florida's health care industry to improve the states' quality of care and reduce the escalating health care costs. Section 2 focuses on the current and future benefits of *wide-spread* HIT adoption. However, the reluctance to adopt HIT systems suggests that there exists barriers to *wide-spread* implementation. Section 3 uncovers the characteristics that are barriers to or facilitators of adoption. This section reveals two main issues: (1) physicians lack the incentive to adopt HIT systems and (2) large investment costs of implementation and management HIT systems. In particular, this is a major barrier in rural regions facing weak broadband infrastructures. Then, section 4 focuses on the initiatives for *wide-spread* HIT systems in Florida. Establishing a statewide robust broadband infrastructure is essential in order to construct Florida's Health Information Network.

2 Benefits of HIT

In a recent study by RAND Health, they projected the productivity growth as a result of *wide-spread* implementation of HIT systems to be between 1.5% (low-end) and 4% (high-end).[2] The lower improvement implies an annual spending decrease of $346 billion, and an upper-end decrease of $813 billion [Hillestad et al., 2005]. In order to realize these productivity gains, *wide-spread* implementation is essential as a result of the interoperability of these systems.

"By connecting health care providers via broadband, we begin the process of laying the foundation for a digitally integrated health care system. Such an outcome would enable the implementation of a vision that ensures every health care facility, 911 call center, and emergency responder is connected both to each other and to a vast array of life-saving information and expertise" [JAC, 2008, See p. 60.]. *Wide-spread* adoption of HIT systems will lead to substantial innovations in preventive care, chronic disease management, care coordination, and medication management [Park and Basch, 2009]. This section provides a summary of several important applications and potential benefits of HIT systems.[3]

2.1 Preventive Care

Preventive care services are underperformed in the US by as much as 45% [McGlynn et al., 2003]. This deficiency is induced by the lack of a "reminder" system which keeps track of the services the patient needs. HIT systems can equip providers and patients with relevant clinical reminders displayed for the provider and patient via dashboards or reports to the provider and automated calls, texts messages, or emails to the patient. Implementation of HIT

[1] Statement of Chairman Kevin J. Martin, Re: In the Matter of Rural Health Care Support Mechanism, WC Docket No. 02-60.

[2] They predict the benefits to fall on the low-end due to the inherent complexities in the health care industry.

[3] Due to the plethora of HIT applications, we are unable to reflect all the applications of HIT in this survey. For a full analysis on all HIT applications see [FCC, 2010a], [Park and Basch, 2009], and [JAC, 2008].

systems in preventive care will generate substantial improvements in quality, patient health, and lead to cost reductions. For example, "about 54 percent of Americans get appropriate screenings for colorectal cancer, 69 percent for breast cancer, and 81 percent for cervical cancer. Bringing these rates closer to 100 percent would save up to 45,000 lives per year. Bringing influenza and pneumococcal vaccination closer to 100 percent would save up to an additional 39,000 lives per year" [Park and Basch, 2009].

The use of Electronic Medical (Health) Record [EMR] systems enables consistent delivery of up-to-date information to patients and providers. This system proactively reminds the provider and patient about any current gaps in the patients preventative care regimen. In order to implement such a system, both providers and patients require *wide-spread* broadband access [Hillestad et al., 2005]. It is essential that the patient's prior providers used EMR systems in order to have a complete view of the patients current needs. EMR systems will provide the physician with the life-saving information necessary in implementing the appropriate preventative care.

2.2 Chronic Disease Management

More than 75% of health care dollars are spent on chronic diseases such as diabetes, hypertension, heart disease, stroke, cancer, pulmonary conditions, and mental disorders [CDC, 2008]. "This is the area of the U.S. health care system that requires significant improvements more than any other" [Park and Basch, 2009, See p. 10.]. The use of EMR systems can improve chronic disease management through provider reminders of the patient's status. Such reminders can lead to improved care and a reduction in avertable complications. For instance, for chronic conditions such as asthma, congestive heart failure, chronic obstructive pulmonary disease, diabetes, hypertension, and coronary artery disease, as much as 40 cents on every dollar are spent on potentially avertable complications [Brantes, 2009]. A patient's EMR "dashboard" can track their status to determine the optimal course of action.[4] Also, such EMR systems can be equipped with performance feedback on how the providers are managing their patient's chronic disease providing them with a rank against their peers [Park and Basch, 2009]. This creates an incentive structure to improve chronic disease management leading to enhanced life-saving care.

This level of "data visibility" is not possible in an environment where each patient's data is in a paper chart.[5] *Wide-spread* HIT-powered chronic disease management will generate substantial improvements in patient care through increased information to providers and patients. A recent pilot program by Kaiser Permanente of Colorado used HIT-powered capabilities in cardiovascular care teams improving the number of patients achieving targeted cholesterol goals by 26% to 73% of patients. Also, in this pilot study, heart attacks fell by 73% [Permanente, 2009]. These preventions lead to significant cost savings through a reduction in emergency interventions. This transparency in patient care allows the patient to become more interactive in their chronic disease management and improves providers' care through EMR reminders and evaluation metrics.

2.3 Care Coordination

"The fragmentation of the U.S. health care delivery system is well documented" [Park and Basch, 2009, See p. 12]. Approximately 75% of Medicare spending is on beneficiaries with at least five chronic conditions who visit on average 14 different physicians per year [CBO, 2008]. Each provider acts on their own leading to inefficiencies through redundancy in care and sometimes providers make decisions that interact negatively with prior decisions made by a colleague. Thus, increasing coordination between providers can lead to improved care, cost reduction, and life-saving treatment decisions.

Modern broadband communication networks enable physicians to collaborate through EMR systems that include "specific decision-support and connectivity tools to enable consensus and coordinated action among care providers and patients" [Park and Basch, 2009, See p. 13]. Geisinger Health Systems in Pennsylvania uses EMR systems to standardize and automate care processes. Their cardiovascular surgeons developed a best-practice process. The result has increased the percent of patients discharged directly to home to 93% from 81% [Walker and Carayon, 2009] and reduced hospital readmission for bypass surgery 44% [Connoll, 2009].

Also, with sufficient broadband infrastructure, physicians can transfer bandwidth-intense information through video, pictures, and graphics fast and reliably. Such Telemedicine systems are particularly useful in rural regions that are often under-staffed with specialists.[6] Telemedicine offers the opportunity for remote diagnoses, monitoring, and treatment of rural patients. In particular, moving information through broadband networks reduces the need for physical transportation of patients to see specialists. The cost savings for reduction in patient transportation could be as much as $1.2 billion annually [Cusack et al., 2007]. By connecting rural patients and specialist, telemedicine can be used to close the current provider shortage and geography gaps. Thus, implementation of a *wide-spread* broadband network could prompt fast "real-time" collaboration between providers leading to more efficient care, life-saving diagnoses, and reduction in costs through a reduction in redundancy and patient transportation.

[4] Such "dashboards" can provide specific information dependent on the patient's needs. For example, if the patient has diabetes, the "dashboard" can summarize past test values, show patient blood pressure to alert if its too high, show if the patients body mass index is too high, etc. The annual savings for improved diabetes care has been estimated to be up to $6.1 billion [Clark, 2009].

[5] Approximately "90% of health care transactions are conducted by paper, fax, and phone calls - putting the medical system radically out of synch with the way business is conducted in every other sector of the economy " [JAC, 2008, See p. 13.].

[6] It is estimated that 37% of rural residents in the US do not have access to a primary care physician. "Telemedicine is a broad term within (HIT) that encompasses methods for electronically transmitting medical information to sustain and/or improve a patient's health status" [Hein, 2009, See p. 4.].

2.4 Medication Management

"Paper-based prescribing is at best an accurate reflection of the best thinking of the prescribing physician at that moment in time" [Park and Basch, 2009, See p. 14.]. Transition from paper-based methods to electronic methods that are connected to EMR systems will yield substantial improvements in care and prevention of Adverse Drug Events (ADEs) reducing unnecessary health care expenditures and saving lives [Schiff and Bates, 2010]. "ADEs are injuries "resulting from an intervention related to a drug" and can be classified as preventable or non-preventable" and are preventable if "errors can be identified in any part of the medication process - prescribing, transcribing, dispensing, consuming, or monitoring"[Johnston et al., 2002, See p. 6.]. The use of electronic prescribing (e-prescribing) system can optimize prescribing by providing: safety "checks" on drug-to-drug, drug-to-condition, drug-to-age, and drug-to-allergies; cost-effectiveness by switching from brand-name to generic and a reduction in admissions due to ADEs; and more appropriate drug utilization [Shores et al., 2010].

In a study by the Center for Information Technology Leadership (CITL), they estimate that the adoption of e-prescribing methods will reduce more than 2 million ADEs per year. This will, "avoid nearly 1.3 million visits, more than 190,000 admissions, and more than 130,000 life-threatening ADEs" per year. This reduction in ADEs will lead to annual savings of 44 billion (in 2002 dollars) [Johnston et al., 2002, See p. 6-7.]. However, their estimates are based upon "advanced" adoption of these systems. Implementation costs rapidly increase with system sophistication, advanced systems cost $\$29,000$ (per provider) over five times as much as basic systems $\$4,500$ (per provider) but produce 12 times greater financial returns [Johnston et al., 2002]. Thus, to realize the possible gains from electronic prescribing methods providers require significant investment, broadband access, and *wide-spread* adoption of EMR systems.

2.5 Emergency Medical (Health) Records

As discussed above, EMR systems play an integral role in the future of HIT systems. *Wide-spread* EMR adoption will establish an interconnected nation-wide network providing physicians with an efficient exchange of patient and treatment information. In a 2005 study by RAND, they estimate the cumulative potential benefits of *wide-spread* (90%) adoption of EMR systems. "Over fifteen years, the cumulative potential net efficiency and safety savings from hospital systems could be nearly $371 billion; potential cumulative savings from physician practice EMR systems could be $142 billion" [Hillestad et al., 2005, See p. 1114.]. While there has been a general consensus that EMR systems will yield dramatic benefits to the health care industry, there has been less agreement on the actual adoption rates of such systems. Dependent on the definition used to define an EMR system, basic and comprehensive EMR system adoption rates range from 7.6% to 13% and 1.5% to 4% respectively, [Jha et al., 2009] and [DesRoches et al., 2008]. These adoption rates are far from the *wide-spread* adoption necessary to observe the interoperability benefits of EMR systems. Also, many local/regional EMR systems are incompatible with neighboring EMR networks. Therefore, it is essential that there exists *wide-spread universal* EMR systems that will eliminate the current balkanized networks and allow providers to realize the interoperability benefits of EMR systems.

3 Broadband Requirements

The adoption of interoperable HIT systems has the potential to substantially improve the health care industry and reduce the escalating costs of care. However, these systems require significant access to broadband networks. The required broadband connectivity depends upon the size and services provided by the health care facility. For instance, the estimated "sufficient" broadband connectivity of a single physician practice is 4 Mbps, while an academic/large medical center requires at least 1,000 Mbps [FCC, 2010a], see Figure 1. These broadband needs are intensified by the increasing amount of data files that are collection and transfered via broadband, see Figure 2. "A single video consultation session can require a symmetric 2 Mbps connection with a good quality of service" [FCC, 2010a, See p. 209.]. Applications that integrate real-time images and live-video stimulates demand for more broadband. For example, real-time video from EMS vehicles to the emergency room can anticipate the patient's needs before arrival greatly improving their chances of survival [JAC, 2008]. Such IT innovations will improve the US health care system, but a robust broadband infrastructure is necessary to support such systems.

This section discusses the characteristics that encourage and impede HIT adoption. In particular, how insufficient broadband infrastructure and inadequate incentives hinder *wide-spread* adoption HIT systems. Broadband availability is particularly scarce in rural regions where infrastructure is inadequate and rural providers lack the financial capital and incentive to invest in broadband infrastructure. In order to persuade providers to invest in HIT systems, multiple funding programs have been implemented to remove the high capital costs of infrastructure investment.

3.1 Hospital Characteristics

As shown in section 2.5, the 10-17 percent EMR adoption is far from the *wide-spread* rates necessary to realize the interoperability benefits of such systems. These low levels of adoption suggests that policy-makers face substantial obstacles in achieving *wide-spread* HIT adoption. A recent study surveyed all acute care and surgical member hospitals analyzing the "hospital characteristics and factors that were reported to be barriers to or facilitators of adoption"[Jha et al., 2009, See p. 1628.]. The most commonly cited factors were:

- **Barriers of adoption**: inadequate capital for purchase (74%), concerns about maintenance costs (44%), resistance on the part of physicians (36%), unclear return on investment (32%), and inadequate expertise in information technology (30%).[7]

- **Contributing characteristics**: reimbursement for EMR use (82%), financial incentives (75%), availability of technical support(47%), and objective third-party evaluations of EMR products (35%). Also, those hospitals that were larger, major teaching hospitals, or located in urban areas were more likely to have EMR systems due to economies-of-scale and existence of robust broadband infrastructures.

This analysis provides policy-makers with evidence on the obstacles of implementing HIT systems and possible solutions. These factors can be segmented into two main issues: (1) designing an incentive structure that rewards physicians for adoption and use of HIT systems and (2) eliminating the high investment costs of implementing and maintaining such systems.

3.1.1 Value-Based Payment Systems

As noted in FCC's national broadband plan, "those who benefit most from use of these technologies are often not the same as those who shoulder the implementation costs"[FCC, 2010a, See p. 204.]. Providers, who pay for equipment and training, are likely to lose money through HIT investments, while payers/patients extract the benefits [Hillestad et al., 2005]. Currently, physicians are compensated by a volume-based system. The use of HIT systems will reduce admissions through electronic-prescribing, preventive care, non-visit-based care, and overall better management of patient conditions. Such a reduction in admissions will take away from visit-based care "that is the financial lifeblood of the practice" [Park and Basch, 2009, See p. 16.]. Such a payment system reduces the physician's incentive to adopt HIT systems.

Thus, providing rewards and financial incentives (top two "contributing characteristics") for adoption and use of HIT systems will reduce resistance by physicians and "clear-up" concerns over returns on investment (both significant "barriers to adoption"). However, "the fundamental solution to this dilemma is to change market incentives for health care providers to reward the delivery of higher-quality, more efficient care" [Park and Basch, 2009, See p. 2.] The establishment of a value-based payment system that ties "payments to proven, measurable expenditure reductions and health improvements" is essential [FCC, 2010a, See p. 203.]. However, the lack of large-scale HIT adoption cripples the ability to institute a value-based payment regime that would incentivize providers to adopt HIT systems. This is known as the *"vicious cycle"*. Therefore, providing reimbursements and financial rewards for HIT adoption is crucial in order to establish the framework for a robust HIT network. This foundation will support the construction of a value-based payment regime spurring further investment in HIT systems. This is known as the *"virtuous cycle"* [Park and Basch, 2009].[8]

As part of the American Recovery and Reinvestment Act of 2009, the HITECH act delegates \$19.2 billion to reward "meaningful use" of HIT systems with payments ranging from \$44,000-\$64,000 per physicians and up to \$11 million per hospital.[9] Such funding programs will help accelerate adoption of HIT systems in order to establish value-based payment systems and spur the *"virtuous cycle"* further accelerating HIT adoption. However, simply providing financial incentives is not enough to induce the required *wide-spread* adoption of HIT systems necessary in implementing a new payment regime. The large investment costs in providing the necessary broadband infrastructure creates a hindrance to *wide-spread* HIT adoption. This is particularly a problem in rural regions with weak broadband infrastructures.

3.1.2 Rural Broadband Access

The capital costs required to invest in HIT systems in addition to the cost of maintaining such systems is a major concern for rural providers. While urban physicians benefit from economies-of-scale, existing HIT hardware, and broadband infrastructures, rural providers generally do not have access to such networks.[10] Health providers in rural communities face additional challenges to HIT adoption due to a shortage in IT-trained employees, limited broadband connectivity, and insufficient access to financing [NAC, 2006]. Therefore, in order to induce small rural providers to adopt HIT systems, funding programs have been implemented to reduce the financial burden of constructing the necessary broadband infrastructure, implementing and maintaining HIT systems, and subsidizing the necessary employee training in IT systems.

In 1997, the FCC created the Rural Health Care Program, funded through the Universal Service Fund. This is the most extensive rural funding program. It is broken up into three types of subsidies to public and non-profit health care providers. First, the program subsidizes the rates paid by rural providers to eliminate the urban-rural rate inequalities.[11] Second, to "support advanced telecommunications and information services the program provides a 25% flat discount on monthly Internet access for rural health care providers and a 50% discount for

[7] Hospitals who adopted were less likely to cite four out of five of these as barriers (still cited physician resistance problems).

[8] "Research suggests that physicians react to market forces that affect earnings by changing the way they practice medicine" [HRSA, 2008, See p. 82.].

[9] Health Information Technology for Economic and Clinical Health (HITECH) Act; Federal Register Vol. 74 No. 79, April 2009, Rules and Regulations.

[10] It is estimated that 29% of Rural Health Clinics are without Mass-Market Broadband. Mass-Market Broadband are "small business" packages with at least 4 Mbps capacity. Bandwidth lower than 4Mbps constrains these providers "from achieving full adoption of video consultation, remote image diagnostic and Emergency Health (Medical) Record technology" [FCC, 2010a, See p. 211.].

[11] Rural providers face significant price inequalities compared to urban regions. Rural providers' broadband prices average three times the price of urban benchmarks [FCC, 2010a].

health care providers in states that are entirely rural" [FCC, 2010a, See p. 214.]. Lastly in 2006, the program adopted the Rural Pilot Program that provides up to 85% of the infrastructure costs and all recurring capital and operation costs over the first five years. In total, FCC's Rural Pilot Program offers $417 million funds to an eligible 62 projects nationwide serving 6,000 health care facilities [FCC, 2010b].

Each subsidy plays an integral role in decreasing the "barriers to adoption" for rural providers. However, "less than 25% of the approximately 11,000 eligible institutions are participating in the program, and many are not acquiring connections capable of meeting their needs" [FCC, 2010a, See p. 213.]. Those who dont participate claim that either the subsidy is too low or the application process is too complex. Large gaps in broadband access suggests that reforms to the current program are needed. In particular, restriction on funding to for-profit entites may limit the *wide-spread* implementation of broadband networks and HIT systems. "In rural areas alone, for-profit eligibility restrictions exclude more than 70% of the 38,000 health care providers; many face the same disadvantages in securing broadband as the eligible providers" [FCC, 2010a, See p. 214.].

The Rural Pilot Program, represents an important step in motivating rural broadband investment and extending HIT systems. This program connects rural communities and providers to "broadband backbone" networks by collaborating with existing urban networks and HIT systems offering costs savings through economies-of-scale in HIT infrastructure costs, telemedicine opportunities, existing EMR networks, and urban Regional Health Care Information Organizations (RHIOs).[12] In the past two years the pilot program has funded over 22 projects with funding support up to $191.2 million. The success of Rural Pilot Program exemplifies the importance of eliminating "barriers of adoption" in rural regions in order to establish *wide-spread* HIT adoption.

4 Florida Health IT

In May 2004 the Florida Legislature passed the Affordable Health Care for Floridians Act, which authorized Florida's Agency for Health Care Administration (AHCA) to develop a strategy to implement extensive Health Information Exchange (HIE) networks in Florida. The Florida Health Information Network (FHIN), as set out by AHCA, is a framework "to strengthen Florida's health care system through the timely, secure and authorized exchange of patient health information among health care stakeholders" [AHCA, 2010, See p. 39.]. The FHIN can be separated into two components: (1) establishment of Regional Health Information Organizations (RHIOs) and (2) construction of a statewide broadband infrastructure sufficient to support transfer of bandwidth-intense information connecting RHIOs [Gionfriddo, 2007].[13] In order to establish such a capital-intensive system, extensive state and federal funding programs have been implemented to support the construction of Florida's HIE network.

Over the past five years, FHIN grants and other state/federal funding programs worth $5.5 million have assisted in starting-up ten RHIOs. When funding ended, nearly half of the proposed RHIOs were engaged in some degree of HIE (Tallahassee, Jacksonville, Pensacola, Tampa, and Orlando), while several more RHIO efforts are currently underway (Ocala, Sarasota, Melbourne, Miami, and Brevard) [AHCA, 2010]. It has been estimated that 16 RHIOs are necessary to cover Florida's population of 18 million, each with a start-up cost of $3 million, with an estimated total cost of $51 million [Gionfriddo, 2007].[14] These RHIOs play a crucial role in implementing HIE networks and other HIT systems. RHIOs allow local providers to "access pertinent health information and share data with other providers treating the same patient. The RHIO will be responsible for merging the data from providers at the local level" [Gionfriddo, 2007, See p. 2.]. If the patient leaves their local area, the state's broadband infrastructure "kicks-in" by connecting local RHIOs, establishing interoperability statewide.[15] However, due to inadequate funding, most RHIOs are in their early stages. Future funding projects are required to establish robust RHIOs supporting a comprehensive Florida Health Information Network [AHCA, 2010].

In order to realize all the possible benefits of RHIOs and HIE systems, significant broadband infrastructure investments are necessary to establish statewide connectivity. Similar to other states, Florida encounters connectivity issues in rural regions. For example, only 68.4% of system-affiliated rural hospitals have access to local area networks compared to 89.7% of system-affiliated urban hospitals in Florida [Menachemi et al., 2005]. Therefore, substantial investments in rural broadband infrastructure is necessary to eliminate this connectivity gap. There are several rural funding programs established by state and federal organizations that set out to connect rural communities to RHIO networks and Florida's LambdaRail. In particular, in November 2007 the FCC awarded $9.6 million from the Rural Pilot Program to the Big Bend RHIO and Florida's AHCA to build a Health Information Network in the Florida Panhandle. This project set out to build a gigabit fiber optical network from the Florida Lambdarail interface points, connecting nine rural hospitals and establishing a broadband wireless network providing broadband access to non-profit clinics in rural communities, see Figure 3.[16] Once

[12] An (RHIO) is an organization "that brings together health care stakeholders within a defined geographic area and governs health information exchange (HIE) among them for the purpose of improving health and care in that community." With HIE being a subsystem within HIT systems and is "the electronic movement of health-related information among organizations according to nationally recognized standards." Source: National Alliance for Health Information Technology HIT definitions.

[13] FHIN is a virtual transportation system in which RHIOs create the "local roadway" system and statewide broadband infrastructure represent the "highways" connecting RHIOs who aggregate local information.

[14] However, RHIOs may exhibit economies-of-scale due to their large fixed (start-up) costs. Thus, fewer more geographically expansive RHIOs may be optimal.

[15] More broadly, AHCA requires Florida's RHIOs to adhere to National Health Information Network (NHIN) standards. This networks allows Florida to exchange data on a national level. This is especially beneficial in Florida due to the amount of tourism and temporary residents during the winter [AHCA, 2010].

[16] Recall, for-profit entites can not recieve funding from the Rural Pilot Program, but they are able to access this infrastructure for a fee dependent upon their usage.

the project is complete, the nine rural hospitals can connect to the Big Bend RHIO providing them access to the Tallahassee Private Medical Area Network (pMAN). Also, the broadband wireless network installed in each county provides connectivity to other health facilities and clinics in the region expanding broadband avaliability and connectivity to HIT systems.[17] Such rural funding programs will establish broadband infrastructure in rural regions to modernize health care technology and lead to overall economic growth.[18]

Establishing connections from rural regions to urban RHIOs, will allow Florida to construct a statewide Health Information Network. The FHIN will eliminate the balkanization of the health care industry in Florida and move towards a nationwide information network that supports the implementation of *wide-spread* HIT systems. Such systems provide Florida with a reduction in health care costs, improved life-saving care, and better emergency response capacity to events such as hurricanes and disease outbreaks. However, establishing operational RHIOs and sufficient broadband infrastructure involves high capital costs. Therefore, it is essential that Florida organizations and Federal authorities continue to fund such investments in order to establish an extensive Health Information Network.[19]

5 Conclusion

HIT has the capacity to greatly improve the health care industry. However, the barriers to *wide-spread* adoption must be eliminated to extract all of the possible gains. Hence, it is up to local, state, and federal funding programs to establish a robust broadband infrastructure, assist in training employees in IT systems, and introducing a new payment regime to incentivize providers to implement such systems.

The benefits from the resulting infrastructure and HIT investments are not limited to improved day-to-day health care services. Rather, robust broadband networks that support *wide-spread* HIT systems can play a crucial role in emergency situations. In particular, it is essential that the state of Florida establishes *wide-spread* HIT systems and broadband infrastructure in order to have the capacity to respond to an unexpected emergency event such as a hurricane. For instance, during Hurricane Katrina, "a fundamental communications disaster unfolded - knocking out the 9-1-1 network; cutting off hospital communications; highlighting an inability of emergency medical workers to communicate with each other" [JAC, 2008, See p. 6.]. Such an event highlighted the need for improved health communications. HIT systems reveal endless opportunities for health care improvements and innovations, but collaboration between government authorities is essential in order to eliminate the barriers to *wide-spread* adoption.

References

AHCA. *Prospecive Vendor: Florida Health Information Exchange (HIE) Infrastructure.* Agency for Health Care Administration, Solicitation Number: AHCA ITN 002-10/11, 2010.

Francois Brantes. *Prometheus Payment Initiative.* Interview, 2009.

CBO. *Budget Options, Volume I: Health Care.* Congressional Budget Office, 2008.

CDC. *Chronic Disease Overview.* U.S. Center for Disease Control and Prevention, 2008.

CITL. *National Health Expenditure Projections 2009-2019.* Center for Information Technology Leadership, 2009.

Don Clark. *Take Two Digital Pills and Call Me in the Morning.* Wall Street Journal, 2009.

Ceci Connoll. *For This Health System, Less Is More: Program That Guarantees Doing Things Right the First Time, for Flat Fee, Pays Off.* Washington Post, March 31, 2009.

Caitlin Cusack, Eric Pan, Julie Hook, Adam Vincent, David Kaelber, David Bates, and Blackford Middleton. *The Value of Provider to Provider Telehealth Technologies.* Center for Information Technology Leadership, 2007.

Catherine DesRoches, Eric Campbell, Sowmya Rao, Karen Donelan, Timothy Ferris, Ashish Jha, Rainu Kaushal, Douglas Levy, Sara Rosenbaum, Alexandra Shields, and David Blumenthal. Electronic Health Records in Ambulatory Care - A National Survey of Physicians. *The New England Journal of Medicine*, 359(1):50–57, 2008.

FCC. *Chapter 10: Health Care.* Federal Communications Commission: National Broadband Plan, 2010a.

FCC. *Rural Telemedicine Program Funds 16 More Broadband Telehealth Networks.* The Federal Communications Commissions Rural Health Care Pilot Program, 2010b.

[17] Connecting Florida's Rural Health Care Providers to a Broadband Information Network; Application for Rural Health Care Support Mechanism. WC Docket No. 02-60.

[18] In a recent study on analyzing the economic benefits of broadband network investment. Every dollar invested in broadband, the economic activity due to the additional connectivity generates three dollars. The county under study "experienced 128% growth over it peers since the municipal broadband network was built" [Ford and Koutsky, 2005].

[19] Florida's AHCA received up to $20.7 million in funding through the Cooperative Agreement Program as part of the American Recovery and Reinvestment Act of 2009. This funding is in the process of choosing a vendor to design and construct further Health Information Networks [AHCA, 2010].

George Ford and Thomas Koutsky. Broadband and Economic Development: A Municipal Case Study From Florida. *Review of Urban and Regional Development Studies*, 17(3):216–229, 2005.

Paul Gionfriddo. *Floridas Health Information Network: What Will it Cost to Develop?* Palm Beach County Community Health Alliance, Florida Health Policy Center, 2007.

Matthew Hein. *Telemedicine: An Important Force in the Transformation of Healthcare.* U.S. Department of Commerce International Trade Administration, 2009.

Richard Hillestad, James Bigelow, Anthony Bower, Federico Girosi, Robin Meili, Richard Scoville, and Roger Taylor. Can Electronic Medical Record Systems Transform Health Care? Potential Health Benefits, Savings, and Costs. *Health Affairs*, 24(5):1103–1117, 2005.

HRSA. *The Physician Workforce: Projections and Research into Current Issues Affecting Supply and Demand.* U.S. Department of Health and Human Services: Health Resources and Services Administration, Bureau of Health Professions, 2008.

JAC. *Communications Capabilities of Emergency Medical and Public Health Care Facilities.* Joint Advisory Committee, Report to Congress, 2008.

Ashish Jha, Catherine DesRoches, Eric Campbell, Karen Donelan, Sowmya Rao, Timothy Ferris, Alexandra Shields, Sara Rosenbaum, and David Blumenthal. Use of Electronic Health Records in U.S. Hospitals. *The New England Journal of Medicine*, 360(16):1628–1637, 2009.

Douglas Johnston, Eric Pan, Blackford Middleton, Janice Walker, and David Bates. *The Value of Computerized Provider Order Entry in Ambulatory Settings.* Center for Information Technology Leadership, Executive Preview, 2002.

Elizabeth McGlynn, Steven Asch, John Adams, Joan Keese, Jennifer Hicks, Alison DeCristofaro, and Eve Kerr. The Quality of Health Care Delivered to Adults in the United States. *The New England Journal of Medicine*, 348:2635–2645, 2003.

Nir Menachemi, Darrell Burke, Art Clawson, and Robert Brooks. Information Technologies in Florida's Rural Hospitals: Does System Affiliation Matter? *The Journal of Rural Health*, 21(3), 2005.

NAC. *The 2006 Report to the Secretary: Rural Health and Human Services Issue.* National Advisory Committee on Rural Health and Human Services, 2006.

Cynthia Ogden and Margaret Carroll. *Prevalence of Overweight, Obesity, and Extreme Obesity Among Adults: United States, Trends 19761980 Through 20072008.* Center for Disease Control (CDC): Division of Health and Nutrition Examination Surveys, 2010.

Todd Park and Peter Basch. *A Historic Opportunity: Wedding Health Information Technology to Care Delivery Innovation and Provider Payment Reform.* Center for America Progress, 2009.

Kaiser Permanente. Kaiser Pilot Results in Reduction of Heart Attack Deaths by 73 Percent. *Health IT News*, 2009.

Gordon Schiff and David Bates. Can Electronic Clinical Documentation Help Prevent Diagnostic Errors? *New England Journal of Medicine*, 362(12):1066–1069, 2010.

Todd Shores, Tony Obey, and Ryan Boal. *The Evolving E-prescribing Landscape.* Deloitte, 2010.

James Walker and Pascale Carayon. From Tasks To Processes: The Case For Changing Health Information Technology To Improve Health Care. *Health Affairs*, 2009.

Appendix:

Figure 1: Required Broadband Connectivity and Quality Metrics

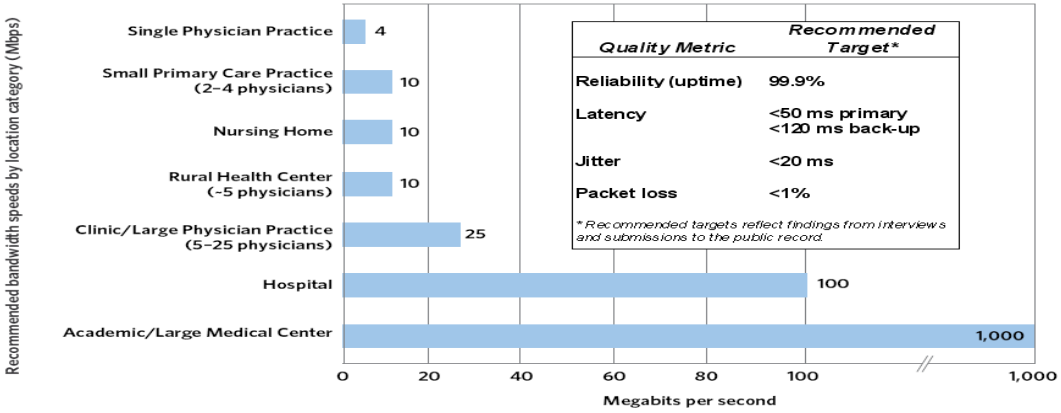
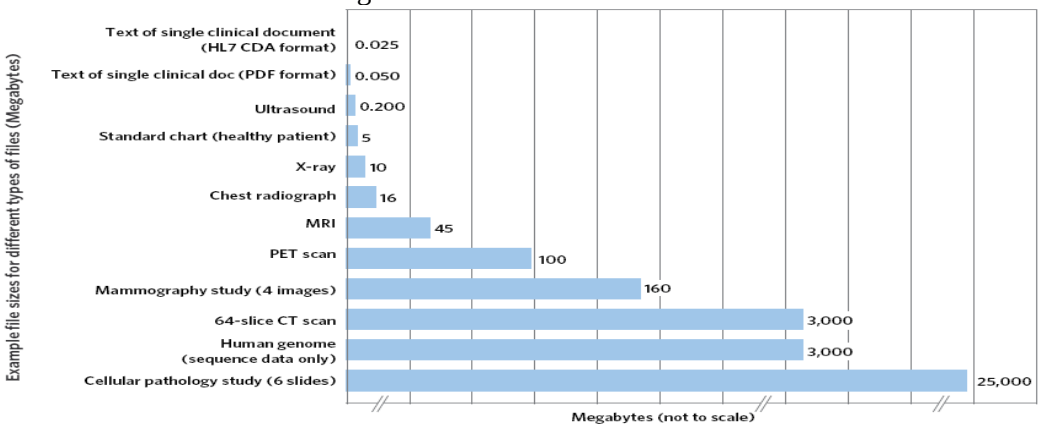


Figure 2: Health Data File Sizes



Source: [FCC, 2010]

Figure 3: Big Bend RHIO Rural Pilot Program Hospitals

Source: [AHCA, 2010]