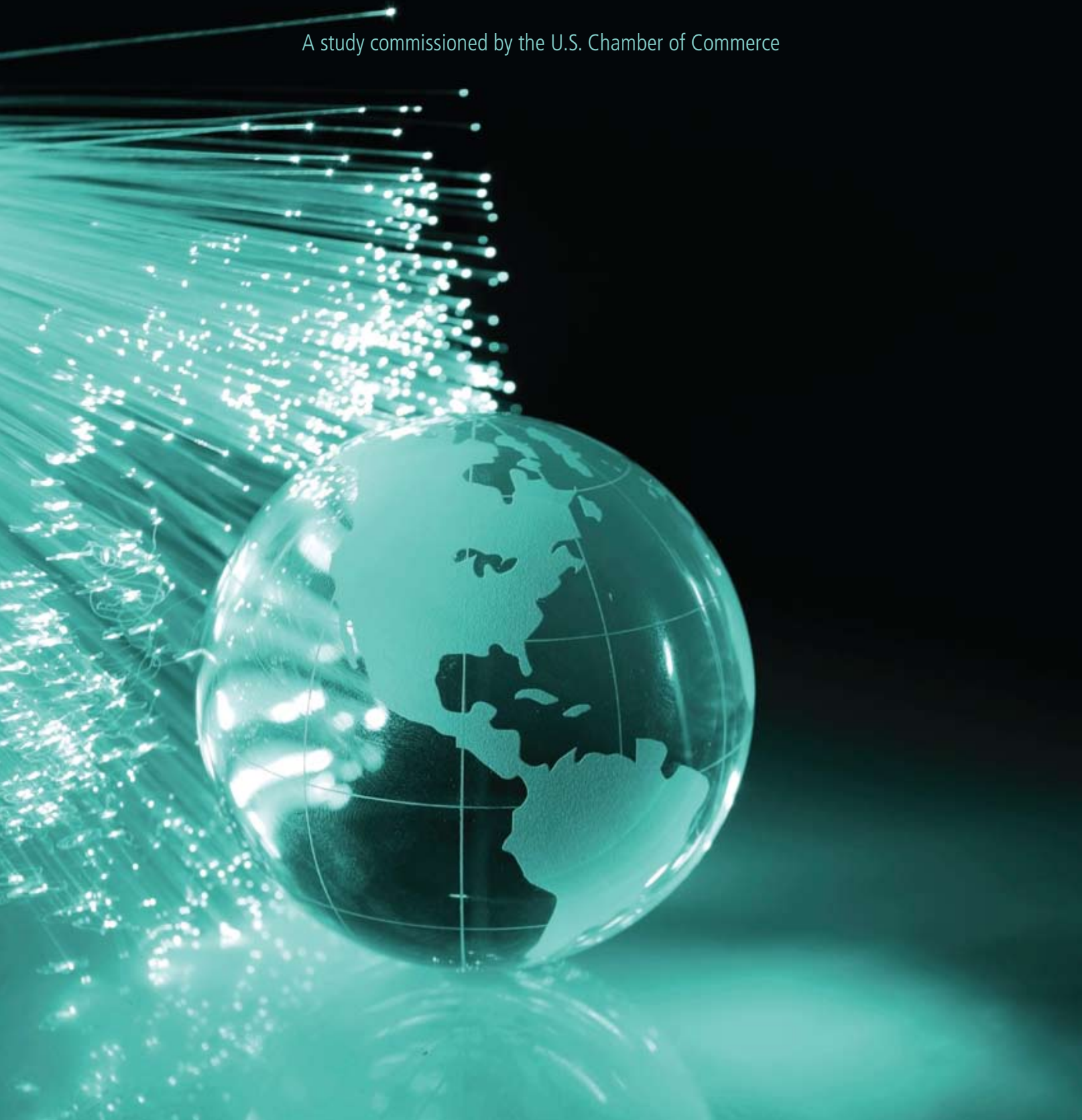
The Impact of Broadband on Telemedicine

A study commissioned by the U.S. Chamber of Commerce



THE IMPACT OF BROADBAND ON TELEMEDICINE

A Study Commissioned by the U.S. Chamber of Commerce

APRIL 2009

A REPORT TO THE U.S. CHAMBER OF COMMERCE

THE IMPACT OF BROADBAND ON TELEMEDICINE

Charles M. Davidson
Michael J. Santorelli

Advanced Communications Law & Policy Institute
at New York Law School

The Advanced Communications Law & Policy Institute ("ACLP") at New York Law School thanks the U.S. Chamber of Commerce for commissioning this report. The ACLP also thanks Lesley O'Neill and Ann Turner for their invaluable research assistance.

Throughout the preparation of this report, the ACLP consulted with a wide variety of experts and practitioners in the field of telemedicine, many of whom are referenced in the paper. The ACLP thanks them for their input and the resources they provided. Their comments provided unique insight into the role that broadband is playing in the development and deployment of current- and next-generation broadband-enabled telemedicine tools and the impact that these tools are having on patients across the country.

The views expressed herein are those of the authors and do not represent those of New York Law School.

ABOUT THE U.S. CHAMBER OF COMMERCE

The U.S. Chamber of Commerce is the world's largest business federation representing more than 3 million businesses of all sizes, sectors, and regions. It includes hundreds of associations, thousands of local chambers, and 106 American Chambers of Commerce in 94 countries. Its members include businesses of all sizes and sectors—from large Fortune 500 companies to home-based, one-person operations. In fact, 96% of its membership encompasses businesses with fewer than 100 employees.

For more information, please contact:

U.S. Chamber of Commerce
1615 H Street, NW
Washington, DC 20062-2000
Main Number: 202-659-6000
Customer Service: 1-800-638-6582
www.uschamber.com

ABOUT THE ACLP AT NEW YORK LAW SCHOOL

The Advanced Communications Law & Policy Institute ("ACLP") at New York Law School is a public policy program that focuses on identifying and analyzing key legal, policy, and regulatory issues facing the advanced communications sector. ACLP's mission is to promote robust and solution-focused dialogues amongst state and federal policymakers, industry, academe, the financial community, and consumers concerning changes to the state and federal regulatory regimes governing wireline, wireless, broadband, and IP platforms.

For more information, please contact:

Charles M. Davidson, Director
Michael J. Santorelli, Associate Director
41 Worth Street, Room 116
New York, NY 10013
212-431-2163 (o)
212-431-0297 (f)
www.nyls.edu/aclp
aclp@nyls.edu

TABLE OF CONTENTS

CASE STUDIES & SNAPSHOTS

1. EXECUTIVE SUMMARY

Healthcare in the United States is at a critical crossroads and faces a number of challenges:

- *Costs continue to increase*. In 2007, healthcare costs represented 16 percent of U.S. Gross Domestic Product ("GDP"), or approximately $2.1 trillion, and are expected to rise to nearly 20 percent of GDP by 2017.[1]
- *Government-funded healthcare coverage continues to expand*. The number of people covered by government health programs (e.g., Medicare and Medicaid) increased from 80.3 million in 2006 to 83 million in 2007.[2]
- *The number of uninsured remains high.* In 2007, the number of uninsured stood at over 45.7 million, down slightly from 47 million in 2006.[3]
- *Improvement in the quality of healthcare has slowed*. By at least one measure, the quality of healthcare in the United States, though improving, has slowed substantially over the last several years.[4] One of the reasons cited for this stagnation is the disparate levels of healthcare available to patients across the United States.[5]
- *Demographic trends presage further strain.* The number of senior citizens in the United States is expected to double by 2050,[6] putting further strain on the healthcare system. Moreover, young adults comprise the largest and fastest growing segment of the uninsured population.[7]
- *The current health insurance framework is inefficient.* Antiquated reimbursement mechanisms fail to provide proper incentives for adopting new healthcare techniques.

Recent proposals for reforming healthcare have centered on enhancing efficiencies in its administration while increasing coverage and decreasing costs.[8] Many of these plans center on the integration and use of a variety of technologies to accomplish these goals. Indeed, a diverse array of telemedicine, telehealth, and health information technology ("HIT") tools has already been successful in leveraging the telecommunications infrastructure to deliver medical and health services to remote, under-served parts of the country. These tools have expanded the scope of healthcare by enabling the delivery of expert care to remote clinics and hospitals and, increasingly, patients' homes. The emergence of broadband as a viable and complementary platform for the delivery of these services has bolstered the quality, range, and effectiveness of these tools and holds the potential to further transform healthcare in the United States.

To date, broadband has helped to further broaden the scope of healthcare and has led to dramatic cost savings by facilitating the fast and reliable transmission of critical health information, multimedia medical applications, and lifesaving services to many parts of the country. *Most critically, the wider use of broadband-enabled telemedicine tools is helping to shift the healthcare paradigm towards more individualized care.* Indeed, these tools have the potential to empower patients with ready access to personal medical information and to facilitate more convenient and comfortable care by allowing for in-home treatment and remote monitoring. In short, the wide availability of robust broadband connections is driving innovation and increasing the adoption and use of telemedicine, telehealth, and HIT tools.

However, obstacles remain to integrating these technologies into everyday healthcare. As this paper makes clear, there is no shortage of technological innovation in the telemedicine and telehealth sectors, as the wide availability of broadband and its relative affordability have fostered an environment of experimentation in the development and use of these tools. *However, ancillary issues like antiquated insurance laws, inadequate reimbursement schemes, and restrictive physician licensure systems threaten to chill these efforts and impede further adoption.*

This paper discusses telemedicine and telehealth generally (Section 2), evaluates the roles and impacts of broadband on these services (Section 3), highlights current efforts to deploy broadband-enabled telemedicine solutions across the country (Sections 4 & 5), and provides recommendations for modernizing those laws and regulations that are holding back further utilization of these increasingly critical tools (Section 6).

1.1 Defining Telemedicine

Innovation in the administration and provision of remote healthcare generally revolves around three interrelated classes of technologies—telemedicine, telehealth, and health IT. Delineating the scope of each of these technologies highlights many areas of overlap and potential collaboration:

- Telemedicine refers to "the use of electronic communications and HIT to provide clinical services" for remote patients.[9] Examples include teleconsultations and telesurgery.
- Telehealth encompasses a "broader application…of electronic communications and information technologies" that is used to "support healthcare services."[10] Examples include videoconferencing, transmission of images, and remote monitoring of a patient's vital signs.[11]
- Health IT facilitates the timely transfer of health information among doctors, hospitals, clinics, nurses, patients, and other stakeholders.[12]

Perhaps the most widely known HIT application is the electronic health record ("EHR"), which stores an individual patient's medical history—test results, doctor recommendations, medications, etc.—in a digital form.

The speed, reach, and efficacy of telemedicine are enhanced by the use of telehealth applications and the implementation of a variety of HIT tools like EHRs.[13] As such, references to "telemedicine" in this paper, unless stated otherwise, will encompass telemedicine, telehealth, and other types of technologies that use telecommunications networks to deliver interactive healthcare solutions to remote patients. Health IT tools will be discussed separately where appropriate.

1.2 Telemedicine & Broadband: An Overview

Broadband is facilitating the development of a number of cutting-edge approaches to healthcare, many of which are expected to lead to vast individual and national cost savings and to an increase in the availability of quality health solutions. Moreover, broadband-enabled telemedicine services are shifting the healthcare paradigm by, among other things, enabling in-home care and real-time patient monitoring and focusing on disease prevention by enhancing personal wellbeing.[14] In addition, these services and applications have the potential to:

- Level the playing field between urban and rural medical capabilities, ensuring more uniform and enhanced healthcare for all Americans.
- Drastically reduce healthcare costs by enabling the widespread use of EHRs, which could lead to annual cost savings of approximately $80 billion.[15]
- Reduce costly medical errors by implementing solutions like e-prescribing, which can enhance physician accuracy.[16]
- Facilitate more timely and precise diagnoses and treatments of chronic diseases.
- Leverage the global nature of the Internet to find efficiencies in the practice of medicine (e.g., outsourcing medical test data for analysis and diagnosis; streamlining administrative tasks; etc.).
- Increase employment in the healthcare sector. One recent study, for example, estimates that an investment of $10 billion in HIT in one year would create or retain 212,000 U.S. jobs for a year.[17]
- Empower individuals to more carefully and effectively manage personal and family health decisions.

These and other advancements, however, are ultimately dependent on two key factors.

First, telemedicine service providers and consumers must have access to robust broadband connections. Policymakers should continue to craft policies that encourage further investment, innovation, and deployment of next-generation broadband network infrastructure.

Second, policymakers must also modernize a variety of laws and regulations that impact the telemedicine sector (e.g., insurance laws, physician licensure, etc.). Without amendment, these laws could stall innovation and chill adoption.

1.3 Overview of the Paper

Section 2 provides an introduction to telemedicine and discusses why these tools and services are important to healthcare generally and patients specifically. This section then analyzes how telemedicine has been transformed by the emergence of digital technologies. The rise of the Internet and the increased use of IT tools provided the sector with certain lower-cost alternatives for expanding care and decreasing the costs of administering healthcare.

Section 3 assesses the impacts of broadband on telemedicine. Broadband enables a range of innovative telemedicine tools and services that are currently revolutionizing healthcare in the United States. This section highlights how:

- Broadband has increased the range of healthcare across the United States;
- Broadband-enabled telemedicine facilitates in-home care;
- Broadband-enabled telemedicine further decreases the costs of healthcare; and
- Broadband-enabled telemedicine enhances the care available to children, senior citizens, and people with disabilities, among many others.

Section 4 analyzes how broadband is currently being utilized by telemedicine developers and providers across the country. In particular, this section provides a survey of public and private sector efforts that use broadband for the delivery of telemedicine services, including an examination of:

- Federal telemedicine grant programs;
- State-level telemedicine programs that rely upon statewide broadband networks;

- Public-private and hybrid approaches that combine public resources with private sector innovation; and
- Private-sector entities that are developing and deploying broadband-enabled telemedicine services in a variety of contexts in order to gauge their viability.

These and similar efforts have produced a myriad of services that are of increasing value to doctors, patients, hospitals, caregivers, and other stakeholders in the healthcare sector. However, even though innovation in the telemedicine arena is thriving, it is still a nascent industry with relatively limited availability. Adoption and use of more advanced telemedicine services often depends on the availability of broadband or one's proximity to a local telemedicine provider. This section details a number of efforts that are using various types of broadband connections in the provision of telemedicine to even the most remote parts of the country.

Section 5 discusses the impact that greater broadband availability and technological advances will have on telemedicine. The full potential of telemedicine cannot be realized without the continued deployment and adoption of advanced broadband networks, further innovation of telemedicine devices and applications, and the development of network protocols to efficiently and securely transmit these time-sensitive services.

In the near term, public and private sector stakeholders will continue to deploy more widespread telemedicine pilot programs and broadband-enabled prototypes to examine the usefulness and effectiveness of these tools. Over the next several years, as devices and services become more widely available, telemedicine will further shift the national healthcare paradigm by equipping individuals and caregivers with the information and tools necessary to enhance personal wellbeing.

Successes in the near term will enable even more robust innovation in the long term, much of which will likely revolve around broadband. Indeed, increased utilization of broadband and broadband-enabled services by all consumers over the coming decades will further transform the healthcare paradigm by pushing healthcare further into the home, enabling more individualized treatments, promoting a culture of personal wellness and healthcare management, and ultimately producing enormous cost savings.

Section 6 articulates a series of recommendations for use by local, state, and federal government when crafting policies that seek to encourage continued innovation in the telemedicine sector and spur the use and adoption of these services by more consumers. The telemedicine sector currently faces a number of hurdles that could potentially slow or impede further growth and innovation, including antiquated insurance, tort, and

physician licensure laws that do not fully support, recognize, or reimburse for the use of cutting-edge telemedicine services.

There are a number of areas, however, where government can and should play a constructive role in enabling further experimentation and adoption of broadband-enabled telemedicine tools. For example, policymakers should continue to adopt laws that promote investment in and deployment of cutting-edge broadband infrastructure, as these networks will be the primary means for transmitting next-generation telemedicine services, tools, and applications.

1.4 Foundational Principles

As discussed throughout this paper, a number of ***foundational principles*** should drive public policy vis-à-vis telemedicine:

- Broadband enables telemedicine and the delivery of critical healthcare services to remote and home-bound patients, facilitates enormous cost savings, and empowers individuals by providing them with access to critical medical information.
- Broadband is facilitating the development of a new generation of telemedicine tools, services, and devices, which have bolstered healthcare in this country and resulted in measurable and significant cost savings to providers and patients.
- Broadband-enabled telemedicine is shifting the healthcare paradigm towards more individualized and convenient care by, among other things, allowing for more robust in-home health monitoring and treatment.
- An array of public and private sector initiatives is spurring innovation, deployment, and use of broadband-enabled telemedicine services across the healthcare industry. Government programs that strategically subsidize private efforts, like the FCC's Rural Healthcare Pilot, have been particularly effective and represent a viable approach for bringing telemedicine services and broadband to every part of the country.
- Opportunities exist for local, state, and federal government to implement forward-looking policies that encourage continued innovation and use of telemedicine services. These include updating antiquated laws related to insurance reimbursement, reining in overly expansive tort laws, and modernizing privacy standards.

- Substantial investment in next-generation networks is essential in order to realize the full range of broadband-enabled telemedicine tools and services.

2. AN INTRODUCTION TO TELEMEDICINE: WHY IT MATTERS & THE ROLE OF DIGITAL TECHNOLOGIES IN ITS EVOLUTION

In many respects, the telemedicine industry is evolving parallel to the telecommunications industry—advances in network infrastructure and technological innovation in the latter have transformed the former into a robust, national (and increasingly international) sector. The wide availability of broadband is spurring investment and innovation across the sector and has positioned broadband-enabled telemedicine as a critical component of U.S. healthcare reform. Yet telemedicine, in its most basic form, has proven to be an invaluable cog in the modern machine of healthcare.

This section focuses on two core elements of modern telemedicine. First, it discusses why telemedicine is important. In addition to providing critical medical services to rural and remote patients, telemedicine, over many decades, has slowly shifted the healthcare paradigm in the United States toward more individualized care. Telemedicine originally brought expert healthcare to remote hospitals and clinics; now it is pushing further into patients' homes.

Second, this section examines the evolution of telemedicine and assesses the impacts of digital technologies like the Internet and HIT on it. The advent of digital technologies has dramatically reduced many of the costs associated with telemedicine services, which in turn has spurred adoption and raised the profile of telemedicine among patients, doctors, and policymakers.

2.1 Why Telemedicine is Important

Telemedicine first emerged in the United States about fifty years ago,[18] although experiments using radio and telephone equipment were recorded as early as the dawn of the twentieth century.[19] The first telemedicine program in the United States was housed at the University of Nebraska, where neurological examinations were broadcast across campus.[20] By 1964, the University had established a telepsychiatry program with a mental institution over 100 miles away.[21]

Today, telemedicine enables an increasingly wide range of services over much longer distances, including:

- Real-time patient consultations;
- Remote monitoring of patients' vital signs and conditions;
- The storing and forwarding of critical health information for analysis and diagnosis (e.g., MRI results) [22];
- The provision of specialized services over long distances (e.g., teledentistry, telepharmacy, and telepsychiatry); and
- The wide availability of health information to patients and care givers.

Originally, many of these services were transmitted either over the existing telephone infrastructure or via satellite. While both were effective in enhancing the scope of healthcare, the former quickly became unable to accommodate large amounts of data while the latter remained expensive and unreliable.[23] However, telemedicine in its most basic form—medicine over long distances via telecommunications[24]—makes available a variety of healthcare solutions that would otherwise be unavailable to many rural and homebound patients.

Real-world examples regarding the human impact of telemedicine are illustrative when assessing the range of care these services can provide. Telemedicine allows pregnant women living in remote areas to receive timely prenatal care[25] and to deliver babies safely. For example, a telemedicine network in Alaska has linked doctors with patients about to give birth upwards of 200 miles away in very remote parts of the state.[26] Telemedicine is also being used to monitor senior citizens in order to track their health, assess cognitive abilities, enable emergency medical responses should a senior fall or fail to get out of bed, and provide remote family members with peace of mind that their loved ones are receiving proper care.[27] Other real-world examples of the impacts of telemedicine services are discussed throughout this paper (see Case Study 2).

Telemedicine has thus become a key component of modern healthcare. It has helped to equalize access to expert medical services and continues to reshape the paradigm for patient care in the United States. Over the last decade, the reach and power of telemedicine has been further augmented by the rise of a number of digital technologies, including the Internet, HIT, and broadband. Each has had a distinct and measurable impact on telemedicine specifically and healthcare generally.

CASE STUDY 1

The Case of Grandma Helen, as told by her Grandson

My grandmother, Helen, is 94 and lives in Connecticut. Her closest relatives live at least two hours away. I am her primary caregiver and live three hours away. As her health has begun to fail, she has become increasingly isolated. In November, while on the way to visit the eye doctor, she fell and broke her shoulder. I made several trips to visit with her and was involved in her discharge planning, an experience that turned out to be an eye-opener regarding the current healthcare system.

Until her surgery, Grandma Helen lived a very independent life. Thus, one of my family's challenges was figuring out how she would be able to stay in her house and live as independently as possible for as long as possible. Like many other seniors, the longer she stays active at home, the less dependent she is on expensive nursing homes or in-patient hospital services. The discharge planning helped me realize how overly complicated and antiquated the healthcare system is. As someone who works in the tech industry, I know that many of these decisions could be made much simpler and care made much more effective through the use of new technologies and services.

Having observed a telemedicine trial using dial-up Internet service approximately ten years ago, I am aware of many solutions that could make my grandmother's life, and my life as her caretaker, infinitely easier. During that trial we connected a camera and diagnostic equipment like a stethoscope to a laptop to study the efficacy of doing remote home nurse visits for patients with congestive heart failure. We concluded that the equipment provided reliable results and observed that many elderly patients took rather easily to the technology.

In light of these experiences, I began to sort through my grandmother's discharge planning and assumed that, after ten years, the healthcare industry had evolved to include the use of cutting-edge technologies that would make caring for Grandma Helen and coordinating her healthcare easier. Indeed, with broadband readily available, great progress must have been made in making advanced care solutions widely accessible. Unfortunately, my experience proved me wrong. Even though our country has undergone a technological revolution, a number of legal and policy obstacles and still exist, preventing many people, like my grandmother, from fully realizing the benefits of these cutting-edge services.

Indeed, my grandmother could benefit from a number of broadband-enabled telemedicine solutions. For example, **electronic health records** would allow my grandmother's five doctors to coordinate care. **Telemedicine visits** would allow Grandma Helen to participate in routine doctor visits from the comfort of her home, rather than having to navigate the unreliable and physically taxing public transportation system. **Wireless sensors** installed on the doors to my grandmother's refrigerator and medicine cabinet would allow caregivers to assess whether she was eating and taking her medications. Sensors installed on her walker could measure pressure and movement, allowing her physician to know if she begins to favor one side of her body. **Digital locks**, which can be unlocked using a cell phone, would allow me to remotely monitor access to my grandmother's house.

These and other solutions, many of which are enabled by broadband, are increasingly available and, in my grandmother's case, could enhance care and decrease costs.

2.2 *The Emergence of Digital Technologies & Their Impacts on Telemedicine*

Digital technologies have had three primary impacts on telemedicine. First, unlike their analog predecessors, digital technologies have allowed for the efficient and fast transmission of large amounts of data over long distances, thus enhancing the speed and scope of telemedicine. Second, digitizing information greatly enhances sending, receiving, managing, and storing data. Third, the widespread adoption and implementation of these technologies have led to dramatic cost savings.

This section discusses the impacts on telemedicine of two core digital technologies—the Internet and HIT.

2.2.1 *The Internet: Facilitating Digital Transfers of Health Information & the Delivery of Health Services*

The Internet has enhanced the effectiveness and range of telemedicine services because of the way in which it transmits data. Information is sent over the Internet using a technique called "packet switching," which operates by breaking data down into small bits, sending them out across the Web via a number of different routes, and reassembling them on the other end. This method of transmission, along with a variety of digital compression techniques, has greatly enhanced the scope of telemedicine by allowing for the faster transmission of large data files at relatively lower costs. In particular, the Internet has had two key impacts on the telemedicine sector.

First, as the Internet exploded in popularity, increasing amounts of information began to migrate online. Consumers quickly became better informed about health issues and more attuned to the universe of healthcare options. Indeed, by 2000, more than half of all Internet users had used the Web to obtain medical or health information.[28] That number rose to 75 percent by the end of 2007.[29]

Second, consumers eventually began to demand more of their Internet connections—faster upload and download speeds, more reliability, and cheaper prices—which spurred innovation at the network level. Even though commercial Internet offerings were initially limited to slower dial-up connections, dedicated point-to-point digital data lines were available to businesses throughout the 1980s and 1990s. These types of lines, which included T1 lines, however, were very expensive and often only used by large hospitals or other well-funded entities. Yet, more often than not, these land-based networks were more affordable than the satellite technology that was initially used to provide telemedicine services over long distances.

2.2.2 *Health Information Technology: Streamlining the Administration of Healthcare*

Concomitant with the evolution of the Internet, hospitals and medical practitioners began to upgrade their internal data management systems with more efficient health information technologies. The first generation of HIT streamlined data management, enhanced back-office functions like billing, and allowed for a more comprehensive approach to medical data. Next-generation HIT services, like electronic health records (discussed in more detail below), leverage broadband networks to further enhance efficiency, extending the initial HIT model beyond caregivers and providing patients with easy access to personal health information. Many current HIT systems also facilitate better communication among healthcare providers, which in turn allows doctors to provide their patients with more comprehensive care.[30]

The adoption of HIT protocols and practices also cut administrative costs and promoted a culture of technological adoption in hospitals. In 2003, the GAO studied the impact of HIT adoption in 10 healthcare sites across the country. In its report to Congress, the GAO concluded that cost savings associated with HIT adoption were significant and had an impact on 13 different areas of a hospital's operation, from creating efficiencies in data management to savings realized in the transition from paper to electronic data.[31] Adoption of HIT was robust in the 1990s and early 2000s, and in 2005 the American Health Information Community, a federal advisory body, was chartered to make recommendations to the Secretary of the U.S. Department of Health and Human Services ("HHS") on how to further accelerate the adoption of HIT.[32] By 2006, 46 percent of community hospitals reported moderate or high use of HIT, compared to 37 percent in 2005.[33]

Anecdotal evidence supports the view held among a growing number of practitioners that these types of systems have a real, measurable, and substantial impact on patients.[34]

2.3 *Conclusions*

Whereas early telemedicine developers and providers relied primarily on basic transmission techniques like ISDN (see Case Study 2), the transition to digital networks and the use of digital tools like IT and the Internet enhanced existing service offerings (e.g., remote two-way video consultations) and spurred further innovation (e.g., the ability to transfer high-resolution photos and test results at much greater speeds). Moreover, as telemedicine services became more complex and effective, hospitals and other healthcare providers augmented these gains by adopting new IT technologies to reduce costs and streamline data management. HIT adoption and spending continues to

increase as next generation services like EHRs become more popular among practitioners[35] and politicians.[36]

CASE STUDY 2
The University of Virginia's Office of Telemedicine

Established in 1993, the University of Virginia's ("UVA") Office of Telemedicine (www.healthsystem.virginia.edu/internet/telemedicine/home.cfm) has consistently been at the forefront of telemedicine. Eugene Sullivan, the Office's Director, explains that the program was initially launched to demonstrate the general viability of telemedicine. The first demonstration was the establishment of a fiber-optic telemedicine link between UVA, Walter Reade Medical Center, and an Army base in Georgia. The success of this demo led to the launch of UVA's "civilian" telemedicine program in 1996. However, at that time in Virginia, fiber-optic networks were scarce, Sullivan recalls, which meant that most telemedicine links were established via ISDN technology. ISDN uses the telephone network to transmit data at speeds comparable to that of a dial-up modem. The advent of broadband had an enormous impact on the UVA program.

The arrival of broadband enhanced existing applications like teleconsultations and spurred critical new innovations like UVA's telestroke program—the Virginia Acute Stroke Telehealth network. This service allows for remote and rapid diagnoses of strokes, which enables quicker and more effective treatment. Thanks to broadband, telemedicine has "turned the corner," according to Sullivan. Demand for telemedicine continues to increase as programs like UVA's continue to provide innovative and lifesaving services to patients in every corner of the state.

3. KEY IMPACTS OF BROADBAND ON TELEMEDICINE

In 1999, the FCC observed that broadband access to the Internet was poised to "meaningfully improve [the Nation's]…healthcare services."[37] Moreover, the FCC found that demand for broadband was significant and that service providers were responding to increased demand by investing billions of dollars in their networks to provide more robust service.[38] As a result, during the late 1990s and early 2000s, first-generation broadband technologies like DSL and cable modem service were deployed across large parts of the United States. By the end of 2007, there were over 121 million broadband subscribers in the United States,[39] up from just 6.7 million at the end of 2000.[40]

High-speed data networks have played a key role in the innovation and mainstream adoption of more robust telemedicine applications. Recently, the HHS recognized how

important broadband will be to the continued growth of telemedicine and to the implementation of more robust HIT systems.[41] In particular, HHS observed that *broadband-enabled telemedicine programs "improve patient access to care over great distances, which can reduce costs from unnecessary travel, enhance chronic illness management, and improve health outcomes by facilitating regular and preventive care."*[42] Moreover, the deployment of even faster next-generation broadband networks will enable, among many other things, the faster transmission of very large image files and additional bandwidth-intensive applications like telesurgery[43] and make available a wide variety of health services and treatments in the home (see Section 5.1).

As a result of competition among broadband providers, wide availability, and robust network architecture, broadband is an affordable and critical tool for patients, care givers, and innovators in the telemedicine sector. While Section 4 will discuss a number of individual approaches to using broadband in telemedicine and highlight the successes of telemedicine programs from across the country, this section discusses how broadband has influenced the development and use of telemedicine services and impacted the U.S. healthcare sector (see Snapshot 1 for an overview).

SNAPSHOT 1
An Overview of Broadband's Impacts on Telemedicine

Increases the Range of Telemedicine	*Facilitates In-Home Care*	*Decreases Costs*	*Enhances Care for Children, Seniors & People w/ Disabilities*
▪ Broadband-enabled telemedicine tools extend the range of healthcare to rural and unserved parts of the country. ▪ Telemedicine tools assist in leveling the playing field vis-à-vis quality of care across all demographics and geographies.	▪ The wide availability and increasing affordability of broadband enables the use of effective in-home diagnostic, monitoring, and treatment services. ▪ Seniors in particular will benefit from these tools by having the ability to receive more care at home.	▪ Broadband enhances the use of EHRs, which can lead to annual savings of $80 billion. ▪ Early disease detection via these tools can save billions of dollars. ▪ Telemedicine reduces costly medical errors and decreases unnecessary patient travel.	▪ Broadband-enabled telemedicine provides effective and affordable care to rural and low-income children. ▪ Tools and services have been crafted for use by senior citizens and people with disabilities, leading to vast savings.

3.1 Broadband Increases the Range of and Access to Telemedicine

The availability of robust broadband technology has increased the speed of healthcare and expanded the geographic availability of telemedicine applications like

teleconsultations, teleradiology, and remote monitoring.[44] Further deployment of broadband networks will continue to extend the range of many telemedicine services. Examples of how broadband impacts the range of telemedicine include:

- *Telemedicine allows patients who live in remote parts of the country or who are physically unable to travel long distances to receive quality healthcare, often via real-time broadband-enabled services* like videoconferencing. Whereas in the past these types of patients would have to either delay treatment or risk traveling long distance to consult with a specialist, broadband-enabled telemedicine services provide fast, reliable, effective, and convenient healthcare to patients regardless of geographic location.
- *Broadband also allows telemedicine providers to leverage the global nature of the Internet and outsource critical medical data to specialists for diagnoses*. For example, teleradiology is increasingly popular in rural areas like Alaska, where local healthcare providers send x-rays via email to colleagues in other states or other countries. Indeed, over the past few years increasing amounts of radiological data have been outsourced to doctors in India for review and diagnosis.[45] While this and other types of "outsourced" medicine have been somewhat controversial,[46] these efforts produce synergies that maximize the readily available talents of those who live in distant places by using broadband connections and decrease costs for patients and doctors in the United States.

In particular, rural patients, who generally have more limited access to quality healthcare, advanced medical equipment, and specialists than non-rural patients, have benefited greatly from broadband-enabled telemedicine. Telemedicine was initially developed to link rural patients with larger hospitals and clinics in order to narrow this gap; broadband has further enhanced the scope and quality of services available to rural patients in their immediate geographic area. In particular, broadband helps to:

- *Reduce the number of physicians needed in rural areas by setting up facilities where patients can be seen by their doctors remotely or consult with a specialist based in an urban center.* Broadband helps to make up for a dearth of physicians who practice in rural areas. Indeed, a 2005 study found that only three percent of medical students expressed a desire to work in rural areas.[47]
- *Provide physicians with the opportunity to continue their medical education via chat groups, videoconferencing, and Internet-based continuing education programs based in urban healthcare facilities.* For example, the Telemedicine Program at Texas Tech University offers a number of distance learning opportunities for healthcare providers throughout

the state of Texas. One class, Telemedicine 101, introduces patients and doctors to the concept of remote healthcare and encourages healthcare providers to assess whether they need to implement such services in their towns.[48] These types of programs allow rural doctors and patients to stay abreast of new developments in the field of medicine and telemedicine.

- *Level the playing field between urban and rural medical capabilities.* Broadband-enabled telemedicine helps to ensure more uniform and enhanced healthcare for all Americans.[49] High-capacity broadband not only reduces the cost of healthcare, it also improves the quality of care and the quality of life of those not located near advanced facilities.

3.2 *Broadband Facilitates In-Home Care*

The wide availability and increasing affordability of broadband enables the use of effective in-home diagnostic, monitoring, and treatment services. Current in-home techniques are being used by small groups of patients, many of whom are seniors. However, in the long-term such in-home services will likely become commonplace (see Section 5.3). In the interim, these services, in combination with other approaches outlined below, will further shift the healthcare paradigm towards more individualized care and disease prevention.

Examples of broadband-enabled in-home services include:

- *Remote Monitoring Generally*. This technique encompasses a wide range of tools and services, including the use of sensors to record movements (see section 4.3.2) and the use of wireless devices to monitor vital signs and symptoms (e.g., glucose levels[50]). A recent study estimated that "a full embrace of remote monitoring alone could reduce healthcare expenditures by a net of $197 billion (in constant 2008 dollars) over the next 25 years with the adoption of policies that reduce barriers and accelerate the use of remote monitoring technologies."[51]
- *Remote Monitoring for Senior Citizens*. Remote monitoring systems hold much immediate promise for senior citizens. Indeed, one study projects the market for monitoring services will become a $2 billion per year industry by 2010.[52] The same study estimated that 3.4 million seniors will be using networked sensor applications to monitor and improve their health by 2012.[53]
- *In-Home Chronic Disease Management.* In 2002, the Veterans Association found that in-home chronic disease management tools (e.g., teleconsultations, remote diabetes monitoring) resulted in 40 percent

fewer emergency room visits and a 63 percent reduction in hospital admissions.[54]

- *In-Home Telecardiology.* A recent trial involving patients with various heart-related ailments found that in-home monitoring devices were effective and popular among both care providers and patients. In particular, one study estimated that broadband-enabled real-time video consultations could replace upwards of 45 percent of in-person visits regarding heart-related matters.[55]
- *Telenursing to Augment In-Home Care.* A number of organizations are leveraging the ubiquity of low-cost telemedicine tools to enhance their offerings and to meet greater demand. For example, in 2007 the Visiting Nurse Service of New York launched a program to equip those patients at risk of being re-hospitalized with in-home equipment to monitor vital signs in the hope of decreasing the number of unplanned or unnecessary hospitalizations.[56]

3.3 *Broadband-Enabled Telemedicine Further Decreases Healthcare Costs*

Broadband-enabled telemedicine and other advanced health technologies (e.g., EHRs) have produced measurable healthcare cost savings and increased efficiency through more effective treatment of chronic diseases and streamlined internal processes.[57] Examples include:

- *Telemedicine produces cost savings by decreasing the amount of travel required by a patient or a doctor.* If a patient requires medical services that are not being provided locally, telemedicine services like real-time remote consultations via broadband allow the patient to save time and money otherwise spent in the car or on gasoline.[58] Cost savings flow from money saved on not having to travel long distances and on the time saved from not having to take time off from work.[59] For example, one study estimates that telemedicine "could save the U.S. healthcare system $4.28 billion [annually] just from reducing transfers of patients from one location, such as a nursing home for medical exams at hospitals, physicians' offices, or other caregiver locations."[60]
- *Telemedicine increases accessibility to specialists, which allows for more efficient diagnosis and treatment.*[61] Leveraging the expertise and experience of a specialist often leads to more successful and effective treatments.[62]
- *Early disease detection is more prevalent via telemedicine.* For example, a number of in-home monitoring systems are being tested to detect the

early onset of cognitive diseases like Alzheimer's.[63] Treating these types of diseases "costs the United States more than $148 billion annually in Medicaid and Medicare services and in indirect costs to businesses that employ [Alzheimer's] and dementia caregivers."[64] Yet it is estimated that the early "interventions that could delay the onset of Alzheimer's disease by as little as one year would reduce prevalence of the disease by 12 million fewer cases in 2050," which could lead to dramatic cost savings for this disease alone.[65]

- *Telemedicine reduces the need for costly physician involvement*, which can be adequately replaced, in many cases, by nurse practitioners and physician assistants.[66] These types of healthcare providers can provide effective treatment for a wide range of ailments and can augment their skills and knowledge by using various services provided via a telemedicine network.
- *Cost savings result from using broadband for the continuing education of healthcare providers*. Rural healthcare facilities "often have to pay transportation, hotel, and per diem for out-of-area continuing education for professional personnel."[67] Broadband-enabled educational opportunities decrease or eliminate many of these costs by allowing providers to participate in these classes remotely.
- *Commercially-available broadband connections oftentimes represent a much more affordable option* for delivering telemedicine services than older, less reliable, and more costly alternatives (see Case Study 3).

CASE STUDY 3
The Telemedicine Program at Texas Tech University

Based in a rural part of Texas, Texas Tech University has quickly emerged as a leading provider of telemedicine services in the state. Launched in 1989 to link four campuses of the Health Sciences Center located in Lubbock, Amarillo, Odessa, and El Paso, the Telemedicine Program at Texas Tech (www.ttuhsc.edu/telemedicine) currently supports a broad range of services in rural areas, correctional institutions, and assisted living communities.

Debbie Voyles, Director of the Telemedicine Program at Texas Tech's University Health Sciences Center, observes that technology costs have played a major role in the level and type of services provided by the program over the past 18 years. Initially, "all services were provided via satellite," explains Voyles. "We have areas that are very remote and this was the only way to reach those rural communities."

In 1999, the program was able to convert from satellite to faster T1 lines, which allowed for tremendous savings ($20,000 per year compared to $150,000 per year). Currently, the program is in the process of rolling out DSL-based programs. DSL, which is widely available, will lower their monthly bill from $300 to $90 without losing quality of service.

3.4 Broadband-Enabled Telemedicine Enhances Healthcare for Children, Seniors, and People with Disabilities

Broadband-enabled telemedicine services and applications hold much promise for those segments of the population that oftentimes are unable to obtain adequate healthcare on their own.

Children, particularly those living in low-income or rural areas of the country, stand to benefit greatly from enhanced telemedicine services. In particular:

- The number of pediatricians in rural parts of the United States remains low relative to the percentage of the population that lives in these areas. A 2001 study found that only 8 percent of pediatricians are located in rural parts of the country.[68] Telemedicine allows specialists and other medical professionals to establish a local presence via broadband without having to physically relocate their practice.
- Nationwide, nearly 14 percent of children have a "special healthcare need," which means they are at risk of developing a wide range of conditions and require healthcare above and beyond that of other children their age.[69] Telemedicine increases the availability of quality healthcare for these children.[70]
- Additional broadband-enabled telemedicine services available to children include remote dental exams,[71] vision screening,[72] and mental health tracking.[73]

Senior citizens and people with disabilities also stand to benefit greatly from broadband-enabled healthcare services. Seniors currently account for 12 percent of the population.[74] The total number of seniors is poised to double by 2050.[75] Moreover, there are currently over 50 million people with disabilities living in the United States, many of whom are older.[76] Healthcare costs for seniors and people with disabilities are expected to increase dramatically in the coming years. Broadband-enabled telemedicine applications will help to contain costs while improving care. For example:

- It has been estimated that broadband-based health resources can save approximately $927 billion in healthcare costs for seniors and people with disabilities over the 25-year period between 2005 and 2030.[77]
- In-home monitoring systems will allow seniors to receive critical services at home, which will greatly decrease reliance on nursing homes and other caregivers.[78] In addition, such systems enable more effective and individualized care for people with a variety of disabilities.

- Increased use of broadband among seniors and people with disabilities allows them to access health websites and other critical tools that will enable them to stay abreast of current treatments, options, drugs, and other pertinent information.[79]
- Broadband facilitates efforts by seniors and people with disabilities to stay in touch with family, friends, and community, and to participate in an array of activities, all of which may decrease debilitating symptoms of depression and sustain mental acuity.[80]

3.5 Conclusions

The reach and efficacy of telemedicine was enhanced by digital technologies like the Internet and HIT, and has thrived in the broadband era. Broadband-enabled telemedicine holds much promise and has already had a profound impact on rural patients, children, and seniors, among others.

The full potential of telemedicine will not be realized without wider broadband deployment and adoption. As such, government must continue to implement policies that encourage further investment in and innovation of broadband networks and broadband-enabled telemedicine applications. To this end, policies that facilitate and support various public and private telemedicine efforts by, among other things, funding pilot projects and otherwise creating incentives for the deployment of these services to rural and unserved parts of the country are essential to fostering a robust telemedicine sector and to continuing the transformation of the U.S. healthcare sector.

4. THE ROLE OF BROADBAND IN THE CURRENT TELEMEDICINE SECTOR: A SURVEY OF PUBLIC & PRIVATE APPROACHES

Broadband has become an essential feature of innovation in the telemedicine sector by facilitating the development and deployment of a growing number of cutting-edge tools and services. Innovators across the sector have ready access to a robust broadband infrastructure that is characterized by rapidly expanding bandwidth and consistently lower access prices. As a result, broadband-enabled telemedicine services and applications have led to healthcare cost savings, more expansive medical services, and efficiencies in the management of critical healthcare data.

Yet, despite these many advances, the telemedicine sector remains, in many respects, a niche industry with a primarily rural focus. As this section details, a significant portion of federal and state telemedicine funding supports programs, pilot projects, and other initiatives that are deployed to remote parts of the country. In particular, funding is being used to encourage the build out of advanced broadband architecture across states,

creating large networks of telemedicine providers and users that link rural patients with urban facilities and doctors. However, as these networks become more robust, the telemedicine services provided over them will become more attractive, affordable, and useful to non-rural users. Similarly, as more individuals adopt broadband[81] and understand its role in enabling the delivery of advanced telemedicine services, demand for these services will increase across all demographics and geographies.

This section provides a survey of the broad range of telemedicine efforts that are being pursued across the country, at every level of government, and by both public and private sector entities. In particular, this section focuses on:

- Federal telemedicine grant initiatives;
- State-level telemedicine programs that leverage statewide broadband networks;
- Public-private and hybrid approaches that combine public resources with private sector innovation; and
- Private-sector entities that are developing and deploying broadband-enabled telemedicine services in a variety of ways in order gather key data regarding efficacy and value.

4.1 Federal Efforts

The federal government has consistently played an active role in spurring innovation and use of telemedicine services. Over the past few decades, the federal government has allotted hundreds of millions of dollars to a variety of agencies and programs that support state and local telemedicine initiatives.[82] Three of these efforts are examined:

- The FCC Rural Healthcare Pilot Program;
- The Office of Health IT Adoption, based in the U.S. Department of Health & Human Services; and
- The Department of Agriculture's Rural Development Telecommunications Program.

Each of these programs recognizes the critical role that broadband plays in the delivery of advanced telemedicine services and actively encourages the deployment and use of high-speed networks in order to expand their reach.

4.1.1 FCC Rural Healthcare Pilot Program

Launched in November 2007, the FCC's Rural Healthcare Pilot Program is designed to facilitate the creation of a nationwide broadband network dedicated to "healthcare, connecting public and private non-profit healthcare providers in rural and urban locations."[83] Under this pilot project, "selected participants [are] eligible for universal service funding to support up to 85 percent of the costs associated with the construction of state or regional broadband healthcare networks and with the advanced telecommunications and information services provided over those networks."[84] The goal of this program is to "bring the benefits of telehealth and telemedicine to areas where the need for these benefits is most acute; allow patients to access critically needed specialists in a variety of practices; and enhance the healthcare community's ability to provide a rapid and coordinated response in the event of a national healthcare crisis."[85] Total funding for the program is approximately $417 million over three years.[86]

This initiative will have two immediate effects. First, it will spur the development and deployment of statewide broadband networks dedicated to facilitating the delivery of broadband-enabled telemedicine applications.[87] *These systems can also be used to create a robust healthcare network among hospitals, clinics, and other care providers within the state and among different states in a region* (see Case Study 4).

CASE STUDY 4
The Illinois Rural Health Network

The Illinois Rural HealthNet ("IRHN") (www.niu.edu/irhn) is a high-speed, fiber-optic broadband network connecting rural Illinois hospitals with specialists at larger facilities throughout the state and nation. The IRHN will receive $21 million over three years from the FCC's Rural Healthcare Pilot Program to build and maintain this network.

A unique feature of IRHN is that it is also part of the Regional Development Institute ("RDI") at Northern Illinois University. RDI seeks to improve regional economic development and develop best practices across a wide array of issues, including energy, education, and healthcare. In its first phase, the RDI will help to connect 88 rural communities to the IRHN network by 2010. Currently, the IRHN supports over 200 hospitals, including 80 located in rural areas and 52 Critical Access Hospitals. IRHN is also exploring the feasibility of using point-to-point wireless systems to expand its footprint.

According to Alan Kraus, Executive Director of the Broadband Development Group at the RDI, broadband is a "game changer." "What we're doing is a state-wide effort," says Kraus. "We looked at being able to put broadband at the center of healthcare development because we see it as an enabler, changing how people do things."

Second, *quality healthcare will be increasingly available to patients regardless of geographic location or socioeconomic background*. Services initially aimed at rural users will eventually be used by non-rural users as the convenience, effectiveness, and value of these services become more well-known.

The FCC's pilot program will increase the availability and use of broadband-enabled telemedicine services, spur further innovation and demand among patients across entire states, and drive the telemedicine sector towards becoming accepted as a mainstream healthcare alternative.

4.1.2 Office of Health IT Adoption

Housed within the U.S. Department of Health and Human Services, the Office of Health IT Adoption promotes the adoption and implementation of interoperable information technologies that seek to streamline the administrative functions of healthcare providers and make health information more widely available and accessible to patients, doctors, and other healthcare providers.[88] These efforts stem, in part, from a Presidential Executive Order issued in 2004 that created the position of National Coordinator for Health IT in order to "provide leadership for the development and nationwide implementation of an interoperable HIT infrastructure to improve the quality and efficiency of healthcare."[89]

Broadband plays a key role in facilitating the flow of medical information over HIT systems (see Snapshot 2). Indeed, according to HHS, "these connected systems are the future of safer, more affordable healthcare in America, and they depend on broadband access. By enabling rapid exchange of large amounts of data, broadband has become a critical component of robust health IT systems."[90] The implementation of a robust HIT policy will complement and enhance advanced telemedicine service by providing ready access to critical health information. A key component of this policy is the adoption of EHRs.[91]

SNAPSHOT 2
Broadband-Enabled Health IT Enhances Telemedicine

Dr. Karen Bell, Director of the Office of Health IT Adoption at HHS, sees the adoption of technologies like EHRs as an essential precursor to more robust innovation and deployment of telemedicine.

"In order to capture, store, and transmit critical health information, you need a broadband connection," says Bell. Her office foresees the entire infrastructure of health IT moving toward "virtual care," which allows for the real-time provision of lifesaving healthcare services. These and other advanced telemedicine applications are dependent on the wide availability and adoption of broadband by hospitals, doctors, and patients.

An EHR is an individual patient's digitized medical record. In 2006, 68 percent of hospitals reported at least limited implementation of EHRs, but only 11 percent reported full implementation.[92] Even fewer individual doctors have fully adopted EHRs. According to HHS, only four percent of physicians have adopted fully functional EHR systems.[93] However, the vast majority of doctors who use EHRs say they have helped improve the quality and timeliness of care.[94] Another study among radiologists found that "62 percent cite [lack of consistent] access to patient medical records as an impediment to their work and 96 percent agreed or strongly agreed that this problem creates medical risks for patients."[95]

Oftentimes, physicians are reluctant to adopt these types of advanced telemedicine applications because of the high fixed costs associated with them.[96] As discussed in more detail in Section 6, *there are a number of insurance and regulatory reforms that could be implemented in order to create incentives for using these services*. In addition, both the federal government and individual states are experimenting with ways to increase the adoption and use of EHRs. In June 2008, for example, the federal government announced a $150 million Medicare pilot program that will offer doctors in 12 cities and states (1,200 small practices in total) across the U.S. funding to move from paper to EHRs.[97] This program is part of a broader plan by HHS to reach the goal set forth in the Executive Order of providing U.S. residents with access to EHRs by 2014. In New York City, the local Department of Health recently launched a $60 million pilot that compensates participating doctors who adopt and use EHRs.[98] The city's goal is to aggregate patient data for the purposes of tracking disease and other macro-trends.[99]

4.1.3 U.S. Department of Agriculture Rural Development Telecommunications Program

The United States Department of Agriculture's ("USDA") Rural Development Telecommunications Program provides funding for a wide range of rural initiatives that seek to enhance rural life.[100] Since 2001, this program has invested more than $76 billion to spur growth in home ownership, encourage business development, and deploy critical community and technology infrastructure.[101] A key component of the Program is the grants it provides to telemedicine providers. In 2008, USDA Rural Development provided over $28 million in funding for distance learning and telemedicine organizations, many of which leverage high-speed broadband connections to provide enhanced services to the underserved across the country.[102]

4.2 State & University Programs

States and state-focused initiatives are also playing a key role in spurring the deployment and use of broadband-enabled telemedicine services by providing funding and other support for innovative initiatives. For example, in March 2008, New York

awarded $105 million in grants to 19 community-based HIT projects designed to promote the use of EHRs throughout the state.[103] These systems will "ensure that clinical information is in the hands of clinicians and their patients to help guide medical decisions and support the delivery of more coordinated, patient-centered care."[104] Similarly, in August 2008, Massachusetts enacted a law that will "promote cost containment, transparency and efficiency in the delivery of quality healthcare" by making available $25 million per year to assist in the transition to statewide electronic recordkeeping for health records by 2015. [105]

Similar efforts have been observed in nearly every state across the country. This section examines the efforts of four states—Alaska, California, Oklahoma, and Texas. Each state promotes the use of broadband-enabled telemedicine services by implementing a carefully tailored, state-specific strategy for the deployment of these services. The following discussion underscores the fact that the most effective strategies are those that leverage readily available academic, medical, and technological expertise.

4.2.1 Alaska

One of the most rural and sparsely populated states in the union, Alaska is by necessity home to an array of approaches that use broadband to deliver vital telemedicine services. Indeed, a number of unique programs have been developed over the past decade, providing much of the state with critical and effective healthcare.

For example, the Alaska Native Tribal Health Consortium ("ANTHC"), a "non-profit health organization owned and managed by Alaska Native tribal governments and their regional health organizations,"[106] was recently awarded over $9 million under the FCC's Rural Healthcare Pilot Program.[107] Broadband plays a key role in ANTHC's telemedicine program. For example, broadband enables videoconferencing, which allows for remote consultations in many parts of Alaska that are isolated or difficult to travel through. These types of services have been successful in the state. *According to ANTHC's 2007 Annual Report, 68 percent of its telehealth cases prevented unnecessary patient travel, while in eight percent of telehealth assessments doctors were able to diagnose serious ailments in their early stages, preventing further complications*.[108]

Another innovator in the state is the Yukon-Kuskokwim Health Corporation ("YKHC"). YKHC administers a "comprehensive healthcare delivery system for 50 rural communities in southwest Alaska."[109] According to recent testimony before the Senate Commerce Committee, YKHC's CEO Gene Peltola observed that "broadband deployment has transformed the delivery of healthcare services" throughout the southwest region of Alaska where YKHC operates.[110] YKHC uses a terrestrial microwave broadband network to transmit its telemedicine services.[111] Among many other services provided over this system, YKHC uses its broadband network to outsource radiological data to Dayton, Ohio for diagnosis.[112]

4.2.2 *California*

In 2006, California Governor Arnold Schwarzenegger signed two Executive Orders that sought to spur the deployment and use of broadband for telemedicine purposes. The first was the Health Information Technology Executive Order, which allocated up to $240 million for the "implementation of a mix of public/private financing alternatives to facilitate rapid adoption and sustainability of HIT for hospitals, physician groups, physicians, and other healthcare providers."[113] The second was the Broadband Executive Order, which established a statewide Broadband Task Force to examine best practices for bringing broadband to all residents and to determine which types of services could be offered via these networks.[114]

In January 2008, the Broadband Task Force released its findings regarding the availability of broadband in the state and made a number of recommendations for using broadband to deliver critical public services. One of the recommendations was to create a statewide e-health network that would provide "Californians with electronic access to health services and health-related information [to] assist in preventing disease, promoting health and wellness, simplifying access to health coverage, and reducing healthcare costs."[115] This program would supplement the California Telehealth Network, which recently received $22 million over three years from the FCC's Rural Healthcare Pilot Program.[116]

Universities located throughout the state also contribute to the deployment of broadband-enabled telemedicine services. For example, the University of California, Davis has established a program that uses broadband videoconferencing to provide rural hospitals with pediatric expertise. Over the past seven years, physicians have participated in over 200 remote consultations, many of which come during time-sensitive trauma situations.[117] But for a broadband connection, such efforts would not be possible.

4.2.3 *Oklahoma*

Many of the telemedicine services in Oklahoma originate from or flow through its universities, particularly Oklahoma State University ("OSU"). Over the past several years, OSU has developed a robust series of complementary telemedicine programs that provide advanced healthcare services to nearly every corner of the state. One of the primary centers of activity is the OSU Distance Learning & Telemedicine Center.[118]

OSU leverages the state's public broadband network—OneNet[119]—to deliver its telemedicine services. OneNet provides ample bandwidth (upwards of 100 megabits per second) to transport real-time medical services to rural healthcare facilities and to hospitals across the state. According to John Barnaby, Network Operations Manager for

the OSU Telemedicine Program, the wide availability of broadband has significantly decreased the cost of providing telemedicine services on OSU's end and the cost of using these services by physicians and patient.

Given the rural nature of the state, OSU has developed a number of hybrid approaches for using broadband in the delivery of telemedicine services. For example, OSU recently deployed a Mobile Telemedicine Clinic ("MTC") to cover remote parts of the state. The MTC is a state-of-the-art bus that has been outfitted with a variety of broadband-enabled telemedicine equipment, including a satellite dish to upload and down critical information.[120] This type of approach exemplifies the profound impact that broadband can have on the delivery of life-enhancing and lifesaving telemedicine services (see Snapshot 3).

SNAPSHOT 3
The Economic Impact of Broadband on Telemedicine

Even though there have been enormous improvements and advances in the provision of telemedicine services to rural areas, a number of remote areas remain unconnected. In Paris, IL, for example, the director of radiology at the local community hospital reached out to the Illinois Rural Health Net for help in enhancing its radiology services. The director complained that it took upwards of three hours to upload one set of x-rays using a slow Internet connection, which costs the hospital $1,000 per month. If this small hospital were connected to the IRHN, such transmissions would take 15 seconds and cost much less. IRHN is working with its colleagues in Paris to develop a solution.

Source: IRHN

4.2.4 Texas

Texas has long been a leader in the field of telemedicine. Indeed, in 1989 it launched one of the first statewide telemedicine programs in the country.[121] Many of these initial efforts were based at the Texas Tech Health Sciences Center in Lubbock, which launched its Telemedicine Program that same year.[122] To date, the Telemedicine Program has established sixteen correctional facility telemedicine sites (see Case Study 5) and nine community-based sites across the southwest part of the state. Each site is connected to the program's proprietary broadband network via dedicated T1 lines. These lines are capable of transmitting real-time audio, video, and data. Because its broadband network is available in large swaths of the state, a number of innovative telemedicine programs have been launched.

CASE STUDY 5
Using Broadband-Enabled Telemedicine to Enhance Healthcare in Correctional Facilities

Providing telemedicine services to correctional facilities decreases the cost and risk of transporting prisoners to off-site medical facilities.

In 2001, medical spending on state prisoners totaled over $3 billion. Moreover, 21 percent of state inmates and 22 percent of federal inmates said they had a medical problem after being incarcerated. The cost savings associated with establishing a telemedicine program in a prison are substantial. A recent study by the National Institute of Justice observed that the costs of implementing a telemedicine system in a prison are usually offset by the resulting cost savings, which average $14,200 per month after the break-even point.

The Texas Tech Health Sciences University's Telemedicine program currently provides telemedicine services to 16 prisons across the state (totaling over 30,000 inmates). In addition to providing basic care, telemedicine enables ancillary health services that otherwise would not be available. These include more robust psychiatry, dermatology, orthopedic, and internal medical services.

Sources: American Telemedicine Association; Texas Tech

One example is a program that provides remote burn care. Burn care services are provided via broadband to areas in and around El Paso. Prior to this program, burn victims in the southwest part of the state had to drive upwards of six hours to reach burn specialists at Texas Tech in Lubbock. This program has decreased the amount of unnecessary travel and increased the effectiveness of burn care, which requires a number of follow-up visits.[123]

The Texas Tech Telemedicine Program has also launched two telepharmacy sites in Texas—one in Turkey (2002) and one in Earth (2006).[124] Telepharmacy uses broadband Internet connections to bring the expertise of a pharmacist to these areas by using Web cams and microphones to facilitate a virtual, broadband-enabled consultation between the pharmacist and patient.

Each of these programs has been well received, and Program Director Debbie Voyles predicts much more success in the future. "Everyone is very pleased to have telemedicine services available to them," she observes, "especially those in the most remote areas of Texas." Looking ahead, Voyles observes that "the baby boom generation is going to dictate the future of telemedicine because they're going to want access to their doctors at the drop of a hat. As the cost of technology is coming down, the cost of connectivity is coming down with it. And 10 years from now, [telemedicine] will likely be in many people's home."

4.3 Public-Private & Hybrid Approaches

In addition to the many federal and state-level efforts aimed at deploying and promoting the use of broadband-enabled telemedicine services, a number of public-private and hybrid partnerships have been forged to pursue the same goals. Indeed, such approaches have been particularly successful in niche areas of telemedicine, including the increased use and effectiveness of mental health tools, the development of more robust remote monitoring, diagnostic and treatment services, and the establishment of various vehicles for harmonizing standards and efforts in this area.

4.3.1 Mental Health

Videoconferencing technology first enabled telepsychiatry services beginning in the 1960s. However, broadband has had two major impacts on this particular telemedicine service. First, the wide availability of broadband, either via private or public networks, has increased the footprint of telepsychiatry. As a result, these types of services are increasingly available to rural patients and prison inmates, among other underserved groups.[125] Second, broadband has brought down the cost of telepsychiatry, which has made it more affordable for lower-income patients living in remote areas.

Telepsychiatry has begun to thrive due to unique public-private partnerships, which pair public funding with private expertise to increase the reach of effective mental healthcare.[126] Arizona has been a leader in providing telepsychiatry services via videoconferencing. Since its creation, the Arizona Regional Behavioral Health Authority ("RBHA") has provided telepsychiatry services to over 42,000 patients across the state.[127] Launched in 1995, the RBHA is supported by a combination of state and federal funding.[128] Similar public-private telepsychiatry programs have been launched in Washington[129], Missouri[130], and New York,[131] among many other states.

Studies indicate that broadband-enabled telepsychiatry services are effective and useful in many cases. The technology facilitates more consultations with a wider swath of the population and encourages multiple psychiatrists to work as a team in the treatment of extreme cases.[132] In addition, a study of telepsychiatry services in Britain concluded that "the greatest benefits [of telepsychiatry] are likely to lie in improving communications in the local service where it could reduce delays in discharging patients into the community, save travel costs, and potentially result in very significant savings in the amount of private care contracted. Links with the private hospitals who care for significant numbers of patient will improve the quality of life for patients."[133] Moreover, patients have responded positively.[134] The continued deployment of robust broadband networks will continue to spur innovation in and use of these types of services across the country.

4.3.2 Remote Monitoring, Diagnostics & Treatment

A promising extension of traditional telemedicine services is the use of broadband-enabled sensors to remotely monitor the health of a patient.[135] While mainstream adoption of these types of technologies may be a few years away, a number of public-private pilot programs are actively studying the impact of these services on patients.

One such program is the Oregon Center for Aging & Technology ("ORCAT"). Funded in part by the National Institute on Aging, ORCAT recently partnered with Intel's Home Health Research to study the use of in-home motion sensors as a way to track cognitive decline. Sensors collect real-time motion data to create a robust personal profile, against which data is analyzed over time to identify changes in behavior and potentially to diagnosis early onset Alzheimer's disease.[136] This in-home system relies on a wireless broadband connection to upload daily information from the patient to the ORCAT facilities.[137]

The use of broadband-enabled in-home monitoring technologies has many positive impacts on patients, particularly senior citizens. The cost savings associated with more widespread use of these systems could be significant. Consider that the average cost for a private room in a nursing home is $213 per day or $77,745 annually.[138] The average monthly cost of living in an assisted living facility is $2,969 or $35,628 annually.[139] And the average hourly rate for a certified home health aide is $32.37.[140] Medicare and Medicaid pay for the vast majority of long-term care.[141] Effective implementation of an in-home monitoring system could reduce or eliminate certain expenses for many seniors, and the concomitant burden on federal funds, at least for a period of time. From a wellbeing standpoint, aging in place offers many seniors a more comfortable and mentally rewarding lifestyle. Moreover, these innovative new technologies enable seniors to monitor their health in real-time and potentially preempt fatal or degenerative disease.

The Veterans Health Administration ("VHA"), which is housed within the U.S. Department of Veterans Affairs ("VA"), has been a leader in implementing telemedicine solutions, setting an example for the private sector. Recently, the VHA experimented with remote monitoring technologies. In 2002 the VHA introduced its Care Coordination/Home Telehealth ("CCHT") program, which sought to "provide routine [in-home] and chronic care management to veteran patients" with a number of chronic diseases, including diabetes, hypertension, depression, and post-traumatic stress disorder.[142] Over the course of five years, the CCHT program treated over 30,000 patients, 86 percent of which reported being satisfied with the program.[143] Perhaps most importantly, the annual per-patient cost of the CCHT program is $1,600, which is almost $12,000 per year less that the VHA's traditional home-based primary care services.[144] Given the success of this program, the VA plans to increase the number of CCHT patients to 50,000 by 2011.[145]

Monitoring technologies are also being used to link specialists with remote hospitals that lack access to such doctors. For example, in Massachusetts, two Harvard University training hospitals have launched a TeleStroke program that allows their neurologists to remotely diagnose and treat stroke patients.[146] This service has proven to be effective in saving lives and in decreasing costs associated with past attempts by remote hospitals to provide similar services. The main hospital on Martha's Vineyard, for instance, spends $10,000 per year to use this service and take advantage of the TeleStroke doctors' expertise, rather than spending hundreds of thousands, if not millions, to keep and maintain the equipment and staff on-site at all times.[147] The TeleStroke services rely on robust broadband connections to put specialists in touch with at-risk patients via real-time video and image transmission.

Over the next decade, these types of services likely will be commonplace in homes with access to reliable broadband connections.

4.3.3 Standards & Certification

Going forward, one of the most important advancements in the field of telemedicine will be the development and adoption of standards and certification criteria that will enable the interoperability of various services and technologies. The widespread availability and use of broadband has facilitated the creation of a number of software programs and applications that seek to enhance existing telemedicine services. However, if these new applications (e.g., various proprietary EHR programs) are unable to work with one another, then their value will be limited.

To prevent this from happening, a variety of standards-setting bodies have been established to ensure continued interoperability. HHS, for example, launched the Healthcare IT Standards Panel ("HITSP") in 2005. This panel "serve[s] as a cooperative partnership between the public and private sectors for the purpose of achieving a widely accepted and useful set of standards specifically to enable and support widespread interoperability among healthcare software applications, as they will interact in a local, regional, and national health information network for the United States."[148] As doctors and hospitals across the country migrate from paper-based medical records to EHRs, and as innovative new broadband-enabled telemedicine tools like Microsoft's HealthVault continue to be deployed (see Section 5.2), HITSP will ensure that these new innovations are interoperable and thus of value to all stakeholders.[149]

HHS also manages the development of the Nationwide Health Information Network ("NHIN"), which seeks to "provide a secure, nationwide, interoperable health information infrastructure that will connect providers, consumers, and others involved in supporting health and healthcare."[150] HHS is working with stakeholders to develop

"capabilities for standards-based, secure data exchange nationwide" in order to "promote a more effective marketplace, greater competition, and increased choice through accessibility to accurate information on healthcare costs, quality, and outcomes."[151] To date, HHS has provided over $22 million in funding to launch a pilot initiative that will test its prototype architecture for the NHIN before opening it up to the public.[152]

Another collaborator in this space is the National Institute for Standards & Technology ("NIST"), which is a "non-regulatory federal agency" based in the U.S. Department of Commerce that "works with industry, research, and government organizations to make information technology more usable, more secure, more scalable, and more interoperable than it is today."[153] NIST collaborates with the healthcare industry to promote the use of HIT. To this end, it was recently awarded $20 million under the American Recovery and Reinvestment Act of 2009 ("ARRA") to support its work in testing and analyzing standards for EHRs.[154]

A similar effort in the private-sector is the Certification Commission for Health IT (www.cchit.org) ("CCHIT"), which certifies a variety of EHR products. CCHIT is a voluntary initiative[155] that leverages its reputation as a leading certifier of EHRs to create incentives for doctors to adopt and use the efficient tools in order to bolster their quality of patient care and to protect against medical liabilities.[156]

Recently, HHS launched a public-private initiative—the National eHealth Collaborative ("NeHC") (www.nationalhealth.org)—that seeks to facilitate the development of a national, interoperable HIT infrastructure by harmonizing the efforts of bodies like HITSP and CCHIT. NeHC is a "voluntary consensus standards body to bring together consumers, the public health community, healthcare professionals, government, and industry to accelerate HIT adoption by providing a credible and transparent forum to help establish priorities and leverage the value of both the public and private sectors."[157] The successful coordination of these efforts will be crucial in light of the recently adopted economic stimulus bill that has allotted billions of dollars for the development of a robust HIT system.[158]

4.4 Private-Sector Initiatives

Many recent breakthroughs in telemedicine have originated in the private sector. A growing number of private companies are expanding their research and development departments to investigate cutting-edge telemedicine services and applications in the hope of finding commercially viable products. These efforts play an important role in spurring innovation across the telemedicine sector. Three examples are illustrative.

First, a variety of telecommunications companies are leveraging their networks to enable a wide range of telemedicine services. Wireless carriers, for example, have begun to use their next-generation networks and handsets to provide a series of broadband-enabled telemedicine services and applications. As a recent report to Congress noted, "when married with wireless technology, broadband enables the real-time, reliable transmission of bandwidth intensive information in a mobile environment."[159] With wireless penetration at 84 percent[160] and third-generation networks widely available across the United States,[161] wireless telemedicine services and applications are flourishing. For example:

- Verizon Wireless recently launched its "Pill Phone," which makes information from the "Pill Book" available on its mobile phones.[162] This application provides users with information on more than 1,800 common drugs and facilitates the scheduling and notification of taking or administering required dosage. The library contains information about what medications look like, dosing, contraindications, possible side effects and conflicts as well.[163]
- T-Mobile also makes available a number of personal healthcare applications for download and use on its Smartphones.[164] One such application is called Health Tracker, which allows users to store personal health information (e.g. weight, blood pressures, etc.) on their BlackBerry.[165]
- AT&T's iPhone is being used to deliver telemedicine applications. For example, the Mobile MIM Application for the iPhone "allows a referring physician or patient to view medical images remotely, without being tied to an imaging workstation."[166]

Additional innovations are likely as increasingly open wireless platforms invite developers to create multimedia applications that leverage 3G and 4G networks, more sophisticated handsets, and peripherals like built-in rotating digital cameras that will facilitate mobile health conferencing. This rotation technology is an example of how providers are contemplating the future uses of devices to meet needs.

Wireline broadband providers are also active participants in the telemedicine sector, both as participants in and supporters of the development of new services. Examples include:

- AT&T has partnered with a number of hospitals and other healthcare providers to enable a variety of telemedicine, telehealth, and HIT solutions. For example, AT&T has partnered with Baptist Health in Arkansas to provide patients in rural parts of the state with access to intensive care services via a 45 megabit per second broadband

connection.[167] AT&T is also developing its own set of in-home monitoring technologies and services.[168]

- Verizon, in 2008, provided funding and other support to hospitals and clinics around the country. For example, it recently awarded a sizeable grant to La Maestra Community Health Centers in San Diego, California to purchase new telemedicine tools and to upgrade its telehealth offerings.[169] Another innovative example is the Mobile Medical Monitor ("M3") Project that Verizon has helped to support at the New York & Presbyterian Hospital.[170] Now in its third phase, M3 provides a clinician with a portable, wireless technology that enables the collection, aggregation, and summarization of patient information in an accessible format regardless of location. It automatically inferences the data against similar cases, which enhances care decisions, and provides automated alerts when the patient status changes. M3 is an innovative, cost- and time-saving solution to fractured patient information resulting in medical errors and disruption in continuity of care.
- Cox Cable recently partnered with Oklahoma hospitals in the Integris Health network to upgrade data capabilities such that health providers are now able to "execute remote video consultations, real-time information exchange, imaging, and voice-over-Internet-protocol applications."[171]
- ConnectMD, a subsidiary of GCI cable, has established a large healthcare footprint in Alaska, providing 140 facilities with sufficient bandwidth to enable the transmission of health information and the use of a variety of HIT services.[172]

Second, the efforts of multinational conglomerates like General Electric ("GE") have had an enormous impact on technological innovation on the hardware side of telemedicine. GE Healthcare is a $17 billion unit of GE Worldwide and has created a series of cutting-edge new tools that enhance current-generation telemedicine services.[173] These include research and development focused on diagnostic imaging, surgery, clinical systems, life sciences, medical diagnostics, and HIT.[174] The quality of these technologies has been widely recognized and adopted by telemedicine providers across the country. For example, in 2002, NASA for the first time began using non-proprietary heart monitoring and information systems produced by GE to monitor the health of astronauts while they are outside their spacecraft.[175]

Third, Intel has long been active in the telemedicine arena. Intel has partnered with educational institutions across the country to determine the effectiveness of in-home wireless sensors on tracking cognitive decline. An added advantage of a company like

Intel is that it can leverage its global footprint to launch a series of concurrent studies and trials. To this end, in 2007, Intel announced a joint venture with a number of programs in Ireland to establish a Technology Research for Independent Living Centre in the country.[176] Similarly, Intel has the flexibility and capital to partner with other companies that are focused on telemedicine to speed innovation and deployment. For example, Intel recently partnered with GE Healthcare and Motion Computing to develop a mobile medical device that will accelerate the collection of a patient's vital health information.[177] This device creates synergies between data collection and storage and represents another step towards more fully converged, broadband-enabled telemedicine devices.

4.5 Conclusions

To date, the combined efforts of stakeholders in the federal, state, local, nonprofit, and private arenas have produced a vibrant telemedicine industry that continues to develop and deploy lifesaving services and applications to patients and healthcare providers across the country. Broadband networks enable these services with a reliable and fast medium through which they can be made available to even the most rural users. As discussed in the next section, broadband will continue to play a key role in enabling future telemedicine innovations and in transforming the healthcare paradigm.

5. THE IMPACT OF GREATER BROADBAND AVAILABILITY & TECHNOLOGICAL ADVANCES ON TELEMEDICINE

Greater broadband availability and continued technological advances will result in a number of positive impacts on telemedicine in the coming years.

5.1 Innovation at the Network Level

Innovation at the network level will enable a number of near-term advancements by providing more robust infrastructure, faster speeds, and more reliability.

Over the next several years, network owners will continue investing in their networks in order to provide all users with better broadband connections. Traditional telco and cable companies, for example, will continue to deploy fiber-optic systems, which have the potential to transmit data at speeds above 100 megabits per second. Recent fiber deployments by Verizon,[178] AT&T,[179] and Comcast,[180] among others, signal a dedication to providing end-users with faster, more reliable and more versatile next-generation connections. Similarly, wireless carriers will leverage their advanced spectrum licenses and more effective spectrum management techniques to build out third- and fourth-generation networks. Moreover, public-private endeavors, like the Illinois Rural Health

Network, will continue to build out and bolster proprietary broadband networks, connect more users, and enable the delivery of next-generation telemedicine services and applications.

In addition to faster speeds and wider availability, *network managers will deploy more sophisticated protocols and methods for ensuring the secure transmission of high-priority data associated with telemedicine services to doctors, caregivers, family members, and, when necessary, emergency medical personnel*. The ability to reliably and instantaneously transmit time-sensitive data is essential to many emerging telemedicine services.[181] Networks that can guarantee this level of service will likely see robust telemedicine innovation at its edges. Thus, network managers will design and implement the techniques necessary to optimize the user experience and to decongest network traffic that could degrade the transmission of potentially lifesaving telemedicine services.

Innovation at the network level and at its edges will continue to develop under a regulatory framework that promotes competition, innovation, and experimentation. In view of the nation's current financial crisis and credit crunch, policies at every level of government should strive to promote investment and job creation. The build-out, maintenance, and management of advanced networks, along with the development of broadband-enabled telemedicine services and applications, cost billions of dollars. Thus, legislative and regulatory policies should be shaped that continue to encourage these advances.

5.2 Near-Term Outlook

In the near-term, three trends in the field of telemedicine will continue to drive innovation and adoption of these critical services.

First, broadband will continue to be incorporated into most telemedicine services, allowing these technologies to have a more national footprint. To this end, public and private efforts regarding the build out of broadband networks will be crucial. Over the next three years, the FCC's Rural Healthcare Pilot will provide support to programs in nearly every state for the development of robust broadband network infrastructure that is dedicated to the transmission of telemedicine services. Although this pilot project was only recently launched, successes are already evident. The Illinois Rural Health Net, for example, has successfully deployed a statewide broadband network and connected a variety of hospitals, clinics, and other healthcare institutions to it.

Moreover, public and private actors will also begin to leverage the existing broadband infrastructure to deliver emergency medical services. For example, recent natural disasters like Hurricanes Katrina and Ike have highlighted the need for robust emergency services that can be provided over broadband networks. To this end, in February 2008, the Joint Advisory Committee on Communications Capabilities of

Emergency Medical and Public Healthcare Facilities ("JAC") released a report that recommended using broadband as the basis for developing a "systematic, coordinated, and comprehensive strategy to improve emergency communications throughout the ranks of first responders and public health facilities."[182] The JAC recommended using advanced broadband technologies to improve immediate emergency responses and to link families, patients, and doctors in order to enhance emergency medical treatments. The JAC also acknowledged that efforts made in the emergency response arena must be supported by a wider recognition of the potentially lifesaving impacts of telemedicine, remote monitoring, and similar broadband-enabled medical services.[183]

Second, the rising popularity and effectiveness of remote care services will increase, first among senior citizens and eventually among the general public. Due to the emergence of broadband, telemedicine has become much more interactive, facilitating more robust transfers of time-sensitive information. Rising healthcare costs, along with a large increase in the senior population, have spurred the development of broadband-enabled telemedicine services that facilitate "aging in place." The efforts of organizations like Intel and ORCAT are pushing healthcare into homes via remote monitoring technologies like in-home sensors and other broadband-enabled devices.

Cisco is also experimenting with a remote care technology called HealthPresence. Using Cisco's telepresence technology, this device leverages the "[broadband] network as a platform" and combines "state-of-the-art video, audio, and medical information to create an environment similar to what most people experience when they visit their doctor or health specialist."[184] In practice, it operates like a kiosk. A patient enters a private area and is able to communicate with her doctor via telepresence. Trials are currently underway in Scotland and New Zealand.[185]

Another initiative focused on providing remote care to the general public via broadband is American Well (www.americanwell.com). American Well is a "new healthcare marketplace where consumers and physicians can come together online, to acquire and provide convenient and immediate healthcare services. Using the latest technologies in Web communications and digital telephony, [American Well] extends traditional healthcare services to the home setting."[186] American Well provides patients with the opportunity to have scheduled and unscheduled teleconsultations with doctors. An e-nurse application "triages" a patient and recommends a doctor.[187] Once the patient speaks remotely with a doctor via Web-cam, the patient has the ability to forward the results of the consultation—notes, preliminary diagnoses, recommendations, etc.—to her primary care physician.[188] A small but growing handful of insurance companies allow subscribers to use American Well as part of their health plan and the program provides affordable services to the uninsured.[189]

The increasing popularity of remote care is helping to shift many perceptions associated with traditional healthcare. *In-home monitoring, consultations, and other broadband-enabled*

services that facilitate the real-time collection of critical health data are moving the healthcare paradigm away from disease treatment and towards disease prevention.[190] IBM Global Business Services predicts that by 2015 "the emphasis of healthcare systems around the world will expand from acute care services to include prevention and chronic condition management."[191] The near-term success of various in-home monitoring trials of senior citizens will determine whether these types of broadband-enabled monitoring devices are a niche service for the elderly or whether they are useful to the general population.

Third, and related, broadband will empower individuals with the knowledge and tools necessary to become informed of and engaged in the management of their healthcare. In addition to enabling more personalized, in-home care, broadband is also being used to facilitate the wider availability of personal medical information for use by individuals. Providing individuals with ready access to their medical history and other pertinent health information in an EHR would allow them to make more informed choices about which treatments to pursue, which doctors to go to, and which health plans to purchase. IBM has observed that "as consumers become more directly accountable for their health and healthcare choices, they can also become wiser, more value-based purchasers, improve their health through better choices, and at the same, exert pressure to keep system costs in line."[192]

Use of these services is currently growing and individual companies and organizations are taking the lead to promote the value and convenience of EHRs. For example, in 2007 Verizon became an early adopter when it partnered with WebMD to make available to its employees their individual EHRs.[193] A number of more widely available personal health management tools have been deployed, including Microsoft's Health Vault (see Case Study 6), Google Health,[194] and Dossia.[195] Each of these applications relies on a robust broadband connection to enable the full universe of services available through these portals.

President Obama has emphasized the use of HIT, especially EHRs, as a key tool in changing the healthcare paradigm, cutting costs, and improving care. To this end, the ARRA included some $19 billion for the continued deployment and adoption of EHRs by providers across the country.[196] In particular, some of these funds will be used to incentivize the adoption of and penalize the failure to use EHRs via a variety of Medicare and Medicaid reimbursement mechanisms.[197] It is hoped that these funds will spur "meaningful" adoption of EHRs by large and small healthcare providers over the next few years.[198] Thus, it is likely that a significant number of doctors and patients will adopt and use these key healthcare tools in the near future.

CASE STUDY 6
Microsoft HealthVault

Launched in October 2007, HealthVault (www.healthvault.com) is a free online portal that allows individuals and their families to collect, store, and share valuable healthcare information. Data that can be stored in the HealthVault includes EHRs from doctors, test results, real-time monitoring information collected and uploaded via one of the many HealthVault compatible medical devices, prescription information, and an entire universe of other health data.

Microsoft views this innovation as a way to combat the vast fragmentation of personal health data that currently floats around between doctors, hospitals, and insurance companies. George Scriban, a Senior Product Manager for HealthVault, describes this tool as creating an "ecosystem" of personal healthcare tools. "Pervasive broadband is important to put rich tools in front of people," Scriban says. Broadband enables users to leverage the full potential of HealthVault, which along with similar programs will continue to transform the U.S. healthcare paradigm.

* * * * * *

These three trends, along with many other innovations facilitated by broadband, will continue to transform the telemedicine industry over the next decade. Also over this period of time, lawmakers, healthcare providers, and a larger portion of the population will learn about and begin to experience the cost saving and lifesaving aspects of telemedicine. In the long-term, telemedicine could very well replace many traditional medical methods and fundamentally alter present-day notions of healthcare.

5.3 Long-Term Outlook

The future of telemedicine is very bright, provided policymakers adhere to policies that promote investment in broadband infrastructure and certainty for innovators.

Current pilot programs and cutting-edge telemedicine applications could become mainstream techniques in a decade or two. For example, wider acceptance and tolerance for the outsourcing of radiology data could lead to continued outsourcing of additional medical services, leading to more efficiencies and cost savings. High-speed broadband applications could also supplant the current phenomenon of "medical tourism,"[199] which requires physical travel, with broadband-enabled teleconsultations,[200] e-prescriptions, and cybersurgery.[201] Indeed, remote cybersurgery, enabled by high-speed broadband networks and devices, holds much promise and is often referred to as "the ultimate advance in telemedicine."[202] Cybersurgery will be further enhanced by innovations like telepresence,[203] which increases the human element during the surgery. Such advances could help to ensure that every American

has access to quality surgeons regardless of geographic location. Moreover, cybersurgery could also represent a new market for U.S.-based doctors who wish to export their expertise abroad.[204]

These types of advanced services will be supplemented with telemedicine services and applications that are deployed in a patient's home, worn on the body, and incorporated into everyday objects. For example, the cell phone is seen as a logical and convenient vehicle for telemedicine.[205] As previously discussed, wireless providers are currently bolstering their networks to provide faster broadband service, which allows for the development of telemedicine applications for the current generation of handsets (e.g., Smartphones). In the near-term, basic services like text messaging are being leveraged to provide a primitive platform for patients to transmit personal health data like blood sugar to a doctor for monitoring purposes.[206] In the long-term, however, wireless devices are poised to play a critical role in telemedicine innovation.

OfCom, the British regulator of communications, recently released a report predicting that wireless telemedicine technologies will play a large role in enhancing more individualized healthcare.[207] In particular, OfCom predicts that innovators will leverage the ubiquity of mobile handsets and the decreasing costs of wireless sensors to produce services that can monitor personal information in real-time and send emergency alerts when a person gets into an accident or suffers a sudden health event like a heart attack.[208] These and other products, like in-home "smart" devices, rely on fast broadband connections to deliver real-time services that can save lives or detect the early onset of chronic diseases.

The amount of data collected from these types of devices, along with the wider availability and increased use of next-generation EHRs, will enhance online portals like HealthVault and Google Health, and further empower individuals to more effectively manage personal health decisions. Moreover, healthcare providers will increasingly outsource back-office operations like customer service and claims-processing, which could save upwards of $75 billion per year in the United States.[209] These types of efficiencies, both on the patient's end and the provider's end, have the potential to drastically decrease healthcare costs across the board.

5.4 Conclusions

With annual healthcare spending in the United States expected to balloon to nearly $4 trillion by 2016, and with the imminent retirement of millions of baby boomers, broadband-enabled telemedicine services hold much promise for pushing healthcare services into the home, driving down costs, and increasing the quality of care available to all Americans in both the near- and long-term. Technology and innovation will help to shift the healthcare paradigm away from institutionalized disease treatment and

towards personal wellness and preventative care, which in turn will have enormous impacts on individual economic wellbeing and the broader U.S. economy.

6. GOVERNMENT, TELEMEDICINE & BROADBAND: RECOMMENDATIONS FOR MEANINGFUL POLICYMAKING

In order to realize the full potential of telemedicine, policymakers must grapple with a number of legal and regulatory issues in the near-term. Policymakers can facilitate continued innovation and adoption of broadband-enabled telemedicine services by revising medical, insurance, and other laws to reflect the modern healthcare marketplace and to encourage continued investment in and innovation of broadband-enabled telemedicine services, applications, and devices.

Recommendations for meaningful policymaking include:

1. Insurance laws, particularly reimbursement mechanisms, should be updated to promote greater adoption and use of telemedicine services.
2. Modernize and harmonize privacy laws to ensure more robust adoption and use of telemedicine services by healthcare providers and patients.
3. Craft and implement security standards to ensure that telemedicine services are secure and confidential.
4. Create an efficient and uniform physician licensure system that allows and encourages doctors to use broadband-enabled telemedicine services in the treatment of patients regardless of geographic location.
5. Tort reform is needed to protect telemedicine practitioners from frivolous lawsuits and to encourage the continued adoption of broadband-enabled telemedicine devices and services.
6. A combination of targeted policymaking and public-private partnerships should be used to facilitate the deployment of broadband to unserved areas of the country and to educate consumers about the benefits of telemedicine.
7. Bolster the nation's pro-investment regulatory framework for broadband in order to encourage continued innovation of networks and telemedicine technologies.

6.1 RECOMMENDATION #1

Insurance laws, particularly reimbursement mechanisms, should be updated to promote greater adoption and use of telemedicine services.

A formidable barrier to the continued expansion of broadband-enabled telemedicine applications is an antiquated set of insurance laws that do not provide adequate economic incentives for healthcare providers to adopt and use these types of services.[210] *For example, most public and private health plans do not reimburse doctors for using telemedicine applications*. Without a reimbursement scheme that compensates a doctor for both "real" and "virtual" medical consultations and procedures, the healthcare paradigm in this country will continue to be rooted in traditional face-to-face encounters and will not sufficiently migrate towards more efficient, ubiquitous, and affordable healthcare via broadband-enabled telemedicine.

Healthcare in the United States is financed by two streams of funding: 1) the collection of money for healthcare (e.g. insurance premiums and taxes), and 2) the reimbursement of health service providers for healthcare (e.g., money to doctors from insurance carriers or the government).[211] Telemedicine cost issues are primarily concerned with the latter. The mechanics of most private health plans typically mirror those of government at both the state and federal level, especially on issues of reimbursement. *Thus, it is vital for state and federal governments to take the lead by updating their reimbursement schemes to include the full spectrum of telemedicine services*.

Government healthcare is largely disbursed via Medicare and Medicaid. Medicare is a single-payer program that covers some 42 million Americans—35.4 million senior citizens and 6.3 million people under age 65 with permanent disabilities.[212] It is financed by federal income taxes, a payroll tax shared by employers and employees, and individual enrollee premiums.[213] Medicaid, on the other hand, is operated at the state level and covers approximately 55 million low-income Americans.[214] Medicaid programs are financed jointly by the states and federal government through taxes so that every dollar spent by a state on Medicaid is matched by the federal government by at least 100 percent.[215]

Given the broad reach of these programs, Medicare and Medicaid account for substantial percentages of healthcare providers' revenues. However, under the current reimbursement structure for these programs, many advanced telemedicine services generally are not reimbursable. As a result, *healthcare providers often lack a financial incentive to adopt and use these types of services*. Recent reforms signal a growing recognition of the value of telemedicine services.

Over the past few years, Medicare has expanded to include certain types of telemedicine and telehealth services.[216] *However, the scope of the new reimbursement structure is still limited.* For example, Medicare will only pay for telemedicine services that are provided via video conference.[217] Medicare has a much narrower and less inclusive view of in-home telemedicine; it does not cover in-home medical service provided via a telecommunications service.[218] "Store and forward" services like teleradiology are covered but only certain certified healthcare facilities are eligible to provide Medicare-supported telemedicine services.[219] Recently, Medicare announced a pilot program in Arizona and Utah that allows beneficiaries to maintain and manage EHRs.[220] However, beneficiaries can only choose from among a limited list of participating EHR providers.[221]

Medicare and Medicaid reforms vis-à-vis telemedicine are encouraging, but more can be done. For example, most reimbursements are given to telemedicine providers who serve rural areas. While telemedicine was originally developed, and is still primarily used, for the provision of healthcare to remote patients, these types of services are increasingly used in urban and suburban settings. *Limiting reimbursement to rural telemedicine would slow the adoption and use of these services across the entire population*. As Debbie Voyles of Texas Tech observes: "There are a lot of patients in inner-cities that have difficulty getting in to see a physician, but they're excluded from reimbursement." Unfortunately, policymaking cannot keep pace with technological innovation, as evidenced by the antiquated notions included in many insurance plans.

Reimbursement mechanisms must evolve with the healthcare system. This includes recognizing the increased use and effectiveness of telemedicine services and providing reimbursement mechanisms for them regardless of where and to whom the services are administered. Reforms adopted and implemented by the federal government will likely prod state governments and private insurers to follow suit. Moreover, private insurers should be encouraged to experiment with telemedicine reimbursement independent of federal or state reforms. Indeed, a handful of states require private insurers to provide some form of telemedicine reimbursement.[222] Otherwise, the U.S. healthcare system will continue to bloat and will be unable to realize the potentially enormous cost savings associated with broadband-enabled telemedicine services.

6.2 RECOMMENDATION #2

Modernize and harmonize privacy laws to ensure more robust adoption and use of telemedicine services by healthcare providers and patients.

In addition to updating insurance laws, policymakers must also address a variety of legal issues that could potentially block wider adoption of lifesaving telemedicine services. Foremost among these is privacy.

The security of personal health information is paramount to doctors and patients as more advanced telemedicine services and devices collect and transmit an increasingly large volume of medical data over the Internet. Although transferring personal health information electronically via e-mail or an EHR may be efficient, it also raises important issues regarding the confidentiality of patient data and the possibility of private medical information being illegally viewed or stolen by a third-party.[223]

To date, many states have enacted laws of general applicability regarding the electronic transmission of health information. These laws were crafted in response to the mostly intrastate nature of many modern telemedicine services that have been launched. However, newer broadband-enabled telemedicine services allow for the transmission of health data in real-time manner across state lines and international borders. Thus, *the existence of a patchwork system of privacy standards forged to address intrastate services increases compliance costs in a borderless digital world and decreases the incentive for doctors to share data with healthcare providers in other states*.

In order to resolve these discrepancies, policymakers should consider adopting a national framework for ensuring the privacy of interstate electronic health communications in the United States. This would improve the efficiency and effectiveness of the nation's healthcare system by encouraging the widespread use of broadband-enabled telemedicine services and applications like EHRs and remote monitoring systems regardless of geographic location.[224] Unfortunately, the current set of health privacy policies is out of date, which risks slowing the deployment and adoption of critical telemedicine tools.

In 1996, Congress passed the Health Insurance Portability and Accountability Act ("HIPAA") to, among other things, streamline electronic medical record systems while protecting patients, improving healthcare efficiency, and reducing fraud and abuse.[225] HIPAA requires healthcare providers, health plans, and business associates to adopt security and privacy standards for electronic communications, medical records, and medical transactions.[226] Prior to HIPAA, a "comprehensive personal right to privacy in one's medical affairs did not exist."[227]

HIPAA, however, only addresses some of the privacy concerns related to the electronic transmission of health data. The HIPAA privacy component, which creates standards for maintaining the integrity of protected health information, is applied to information that is transmitted for healthcare operations, as well as financial or administrative purposes.[228] Covered entities, which include all health plans, healthcare clearinghouses, and healthcare providers who conduct electronic healthcare transactions, are

responsible for ensuring HIPAA compliance from their business associates who receive protected health information in the process of providing services to the covered entity.[229] Yet the advent of more advanced broadband-enabled telemedicine services raises several privacy issues that are not typically encountered during conventional medical practice.[230] These include:

- Telemedicine could reasonably be regarded as a healthcare operation and therefore fall under the "treatment, payment, or healthcare operations" categorization, which permits the use and disclosure of protected health information without patient consent.
- Teleconsultations may require additional non-clinical personnel (e.g., technicians, camera operators, etc.) who do not participate in traditional medical care but who nonetheless would be required to comply with all HIPAA regulations.
- In traditional medical care, providers typically have existing relationships with the medical specialists with whom they consult. However, when dealing with telemedicine, patients and their on-site medical providers often will not know which clinical and non-clinical personnel will be involved at the distant site. HIPAA does not directly address this situation.

Solutions to these privacy issues have been offered by a number of organizations. For example, Connecting for Health,[231] an initiative supported by the Markle Foundation,[232] recently issued a comprehensive Common Framework for Networked Personal Health Information[233] ("Framework"), which offers solutions for many of these concerns. The Framework, which addresses privacy issues from both the consumer perspective and the technical perspective,[234] defines a set of practices that can help protect personal information, enhance consumer participation in online personal health records, and is available free of charge on the Connecting for Health Website.[235] Ultimately, the Framework seeks to empower individual users with full access to and control over personal medical information while providing them with a sense of absolute privacy in the management of their health information. A diverse array of healthcare-related groups, including consumer and privacy organizations (e.g. AARP), health insurers, healthcare providers, and technology companies (e.g. Dossia, Google, Intuit, Microsoft, and WebMD) have endorsed this framework.[236]

Current telemedicine providers have used some of the strategies recommended by the Framework, such as the use of consent forms and patient releases. Lisa Gaudet of Northeast Health states that her programs requires "[all patients] to sign a release, which spells out the method that their data will be transmitted and viewed, the risks associated with that method, and the efforts we will take to protect their health related information." Thus far, Northeast Health has not experienced any legal issues with

data privacy or data security. Similarly, Oklahoma state law requires telemedicine providers like the Oklahoma State University Telemedicine Program to obtain the consent of every patient who is to receive telemedicine services by signing a Legal Consent Form. This allows patients to make informed decisions regarding the services that they are about to receive. Moreover, in order to further ensure that privacy is not compromised, the Oklahoma State University Telemedicine Program does not record any of their telemedicine sessions. All procedures are completed in real time, just as they are in a local physician's office.

Policymakers have the opportunity to update laws like HIPAA and harmonize conflicting state privacy laws in order to ensure the continued use of broadband-enabled telemedicine services.[237] Decreasing the amount of privacy-related compliance costs would increase the incentive to adopt these new services and would increase the availability of effective and affordable healthcare.

6.3 RECOMMENDATION #3

Craft and implement security standards to ensure that telemedicine services are secure and confidential.

As more and more healthcare services migrate online, questions regarding the security of sensitive health information being transmitted over the Internet have been raised. Many consumers worry about identity theft, spam, hacking, and other nefarious intrusions. Indeed, a recent study by Pew found that 75 percent of Internet users do not like giving out their credit card or personal information online.[238] In the realm of healthcare, trust and security are at the center of the traditional doctor-patient relationship. As digital healthcare continues to evolve, it is essential that network and data security are addressed by telemedicine developers, users, and patients.

At the network level, security includes the development and implementation of standards for the secure transmission of health information. To date, the development of such standards has been slow.[239] The continued prevalence of intrusive applications like spam frustrates users, decreases their enjoyment of the Web, and could delay further adoption of broadband-enabled telemedicine.[240] Similarly, the increased use of Wi-Fi networks for in-home monitoring raises additional security issues. These types of networks tend to be less secure than wire-based ones, but their relative affordability and ability to interact with other wireless technologies (e.g., wireless sensors) have made them very attractive to researchers and patients. However, given the rising prominence of telemedicine services and their importance to the future of healthcare, private sector innovators have begun working together to address security issues.

For example, in April 2005, SafetySend formed a partnership with the American Association for Medical Transcription to create a private system that securely transmits personal health information.[241] SafetySend's service (www.safetysend.com) includes solutions for organizations needing secure file transfers that comply with HIPAA privacy standards.[242] It also offers secure e-mail and fax components and is available for purchase by individuals for as little as $8 per month.[243]

In addition, more secure wireless technologies continue to be developed. A team at the Rochester Institute of Technology has been working on integrating radio frequency identification ("RFID") technology into cardiac sensor networks, which are used to remotely monitor a patient's heartbeat pattern and blood pressure.[244] This method will help transfer critical cardiologic information to doctors and hospitals, increasing the quality of diagnosis and reducing the need for medical supervision.[245]

Many network security issues, however, may be solved as the bandwidth available to telemedicine providers increases. For example, according to Doug Power, Senior Consultant and Research Associate at the Regional Development Institute Northern Illinois University, which supports the Illinois Rural Health Network, robust fiber-optic broadband networks will allow telemedicine users and providers to send "secure transmission packets, via their own Virtual Private Network riding over the IRHN." These types of dedicated networks will greatly enhance network security and increase consumer confidence in broadband-enabled telemedicine services.

6.4 RECOMMENDATION #4

Create an efficient and uniform physician licensure system that allows and encourages doctors to use broadband-enabled telemedicine services in the treatment of patients regardless of geographic location.

The interstate (and global) nature of broadband-enabled telemedicine services is also challenging traditional notions of physician licensure, which currently limit doctors to practicing only in the states where they are licensed. The historical basis for state regulation of the practice of medicine is rooted in the Tenth Amendment, which delegates to states the power to, among other things, preserve the public health, welfare and safety of their residents.[246] As a result, states have created licensing requirements and oversight boards to monitor health and medical practices across their territories. But in the modern healthcare marketplace, such laws are not reflective of the borderless nature of many telemedicine services. Thus, licensure laws that limit the practice of medicine to one state might unduly decrease the reach of telemedicine.

In 1997 and 2001, Telemedicine Reports to Congress identified licensure as a major barrier to the development and use of telemedicine services.[247] Additional reports also recommended a more consistent framework to encourage interstate telemedicine.[248] Thus far, incremental progress has been made as a number of alternative licensure models have been offered and considered. Many of these proposals are based on the notion of reciprocity, a system that permits one state to recognize a license in good standing that a practitioner holds in another jurisdiction.[249] These and other models limit the pool of doctors who are allowed to use telemedicine services in the treatment of patients regardless of geographic location. Having to comply with myriad licensure rules could delay treatment and deny a patient the services of a specialist who does not reside in an eligible state under the home state's reciprocity rules.

One recommendation is for the adoption of a national licensure system for telemedicine. Such a system would expand the market for telemedicine, promote both the use and development of new technologies, and eliminate many of the legal and regulatory ambiguities that plague and constrain the present system.[250] A national system would involve the issuance of a license based on a standard set of criteria for the practice of telemedicine throughout the United States. Disciplinary actions resulting from malpractice or other negligence would continue to be carried out at the state level subject to the national standards.[251]

Outdated licensure systems represent a major obstacle to the expansion of telemedicine services. While telemedicine originated primarily as an intrastate service, broadband has removed physical state barriers and has the power to connect doctors and patients located anywhere in the world. As such, licensure models must be revised to provide for interstate (and eventually international) telemedicine services.

6.5 RECOMMENDATION #5

Tort reform is needed to protect telemedicine practitioners from frivolous lawsuits and to encourage the continued adoption of broadband-enabled telemedicine devices and services.

The number of medical malpractice suits and settlements continues to increase each year. Indeed, the cost of medical malpractice torts had the largest growth among U.S. tort costs, totaling $28.7 billion in 2004, having increased an average of 11.7 percent annually since 1975.[252] Telemedicine, by its nature an emerging and cutting-edge medical service, expands the reach of healthcare and thus increases the possibility of medical malpractice suits.[253] As a result, many physicians are hesitant to adopt broadband-enabled telemedicine applications for fear of exposing themselves to greater liability. While doctors who use telemedicine services and tools negligently should certainly not be immune from lawsuits, policymakers should consider reforms that

encourage the use of these services by updating tort laws to include telemedicine and telehealth.

As with licensure, tort laws are largely state-specific. Traditionally in tort cases, an important jurisdictional determination is where a tort occurred.[254] Telemedicine complicates this determination because the doctor and patient are physically separated, which muddies the traditional perception of the doctor-patient relationship.[255] While federal tort law generally holds that the law of the patient's home state controls, telemedicine injects some uncertainty because doctor and patient are connected only by a broadband connection.[256] The possibility exists that a telemedicine provider could be exposed to a number of different tort laws should negligence occur.

The current uncertainty regarding tort law and telemedicine may discourage healthcare providers from adopting broadband-enabled telemedicine devices and services and using them to provide interstate care. Policymakers must recognize that broadband-enabled telemedicine has the potential to radically transform the U.S healthcare paradigm and that antiquated tort laws may potentially discourage physicians and other healthcare providers from using these tools to provide medical care to patients regardless of geographic location.

6.6 RECOMMENDATION #6

A combination of targeted policymaking and public-private partnerships should be used to facilitate the deployment of broadband to unserved areas of the country and to educate consumers about the benefits of telemedicine.

The availability of robust broadband infrastructure is vitally important to the future of telemedicine. Devices and applications will become increasingly more bandwidth-intensive as they provide more sophisticated real-time monitoring, emergency alert, and other time-sensitive services. Thus, for telemedicine to be most effective, broadband must be made available to and adopted by users in every corner of the United States.

To date, broadband network owners have responded to growing demand for more bandwidth by investing billions of dollars in next-generation networks.[257] Yet, for a wide variety of reasons, parts of the country remain unserved.[258] Indeed, even though the FCC has found that "more than 99 percent of the country's population lives in 99 percent of zip codes" in which there is at least one broadband provider, broadband remains relatively scare in those zip codes with the lowest population density.[259] As a result, the public and private sectors must work together on a solution for deploying advanced network infrastructure to unserved parts of the country and to educate the public about the profound impact that broadband services generally, and broadband-

enabled telemedicine services specifically, can have on personal wellbeing. A number of tools are available.

First, as mentioned in Section 4, the federal government should continue to strategically use universal service funding to create unique programs and incentives for deploying advanced telemedicine infrastructure to unserved parts of the country. The FCC's Rural Healthcare Pilot, which, among other things, promotes the creation of proprietary broadband networks dedicated to the transmission of health-related services, has already been successful in spurring innovation and deployment of broadband across the country. Unique approaches like the Illinois Rural Health Net, the University of Virginia's Southwest Virginia Alliance for Telemedicine, and various efforts in Alaska should be looked to as models for crafting solutions that fit specific local or state needs.

Second, local, state, and federal government should promote the use of public-private partnerships to bring broadband and broadband-enabled telemedicine services to rural, low-income, and other unserved consumers. The Connected Nation model, for example, has succeeded in spurring broadband availability and adoption in Kentucky[260] and has been adopted in Minnesota, Ohio, Tennessee, and West Virginia.[261] Additional efforts have succeeded in facilitating the deployment of robust telemedicine services to those most in need. University-based programs that are funded in part by federal grants have been especially successful to date. Similar approaches have led to breakthroughs in the fields of telepsychiatry and remote monitoring, and have helped to harmonize efforts by instituting a public-private standards-setting body for the HIT and telemedicine device sectors.

Third, these efforts must be coupled with efforts to raise awareness regarding the life-enhancing impacts of broadband-enabled telemedicine among a wider swath of patients and care givers. A number of organizations that specialize in bringing broadband to specific segments of the population (e.g., Older Adults Technology Services for senior citizens[262] and One Economy for low-income users[263]) should be used as models to spur demand for and use of these critical tools.

In the near term, special efforts should be made to bolster demand and use of broadband among senior citizens, as this large segment of the population stands to benefit the most from adopting broadband. A high-speed connection facilitates a wide range of social, economic, and health-related benefits for seniors,[264] including a number of previously discussed telemedicine tools and services. Additional efforts might include education campaigns that target seniors, ensuring that online tools are designed in a senior-friendly way, and supporting local initiatives aimed at training seniors to use computers and the Internet.[265]

Overall, a national commitment to incorporating telemedicine into a new healthcare paradigm is critical to transforming how medical care is provided in this country.[266]

6.7 RECOMMENDATION #7

Bolster the nation's pro-investment regulatory framework for broadband in order to encourage continued innovation of networks and telemedicine technologies.

An essential prerequisite for cutting-edge innovation in the telemedicine industry is the wide availability of advanced broadband infrastructure. Indeed, many current telemedicine services rely on robust broadband connections to be effective. Over the next few years, most of the next-generation telemedicine applications and devices developed will be increasingly intertwined with broadband as the network becomes an ecosystem for more individualized medical care. Policymakers should thus bolster the pro-investment policies that have fostered an innovative broadband marketplace over the last decade in order to ensure that the telemedicine sector continues to thrive.

Investment in broadband network infrastructure, robust management and security protocols, and research and development are essential to ensuring continued innovation by developers of telemedicine services and applications. To this end, current economic conditions require careful policymaking that provides investors and innovators with certainty that their efforts will not be made in vain. Federal funding for the deployment of broadband via the recently adopted economic stimulus package will supplement USF funding in the short-term to support further network build-out to unserved parts of the country.[267] In addition, funding that is allocated for expanding and promoting the use of EHRs and other health IT could also be used to bolster the adoption of broadband-enabled telemedicine services in hospitals, care centers, and other medical facilities across the country.[268]

Additional vehicles for strategically targeting these funds to support the deployment of broadband networks to unserved areas and to spur further innovation in the telemedicine sector could include tax breaks to network owners, grants to support telemedicine-focused university programs and public-private initiatives, and innovative incentives for private entities to devote resources to the research and development of cutting-edge services.[269]

7. Conclusion

Healthcare in the United States is an overloaded system that is poised to be furthered burdened as the baby boomers begin to retire.[270] Moreover, a number of reports have questioned the quality of healthcare in the United States by highlighting the high number of avoidable deaths and internal inefficiencies that serve only to raise costs.[271] However, as detailed at length in this paper, broadband-enabled telemedicine has the potential to transform U.S. healthcare.

Broadband is driving innovation across the telemedicine industry. It is increasing the efficacy of HIT by connecting more institutions and allowing for the faster transmission of vital information; it is pushing healthcare into homes and will eventually decrease reliance on hospitals and nursing homes; and it is empowering individual patients by providing them with access to personal health and medical information. As a result, healthcare costs have generally decreased where telemedicine services have been implemented.

In its most recent report to Congress, the Joint Advisory Committee on Communications Capabilities of Emergency Medical and Public Healthcare Facilities noted that "[e]nsuring that every American has access to broadband service throughout the country is… an essential healthcare communications imperative. Broadband access can mean access to telemedicine applications, health information, and the ability of healthcare workers to work remotely in an emergency."[272] The future of healthcare is tied to the continued development of broadband-enabled telemedicine applications. Further, the development of these tools is dependent on the continued deployment of advanced broadband networks.

Without a robust, efficiently managed broadband infrastructure that can provide telemedicine users with large amounts of bandwidth, innovation will slow and adoption of these tools will stall. Policymakers should thus continue to implement policies that support investment and encourage innovation while also reforming and updating a variety of healthcare-related laws in order to spur the adoption and use of telemedicine services. By doing so, policymakers will transform the U.S. healthcare system by increasing its reach, enhancing its effectiveness, and decreasing its costs.

ENDNOTES

[1] *See* Dept. of Health & Human Services, Centers for Medicare & Medicaid Services, National Health Expenditure (NHE) Fact Sheet, http://www.cms.hhs.gov/NationalHealthExpendData/25_NHE_Fact_Sheet.asp#TopOfPage.

[2] *See* Carmen DeNavas-Walt, Bernadette D. Proctor, and Jessica C. Smith, *Current Population Reports*: *Income, Poverty, and Health Insurance Coverage in the United States: 2007*, at p. 21, U.S. Census Bureau (2008), *available at* http://www.census.gov/prod/2008pubs/p60-235.pdf.

[3] *Id*. at 19.

[4] According to the Agency for Healthcare Research and Quality's 2007 *National Healthcare Quality Report* ("*NHQR*"): "The average annual rate of improvement reported across the core measures included in this year's fifth annual NHQR is 2.3%, based on data spanning 1994 to 2005. An analysis of selected core measures, which cover data from 2000 to 2005, shows that quality has slowed to an annual rate of 1.5%," at p. iv. This report, released in February 2008, is *available at* http://www.ahrq.gov/qual/nhqr07/nhqr07.pdf.

[5] *Id.* at pp. 3-5.

[6] *See* Jeffrey S. Passel and D'Vera Cohn, *U.S. Population Projections: 2005-2050*, at p. 20, Pew Research Center (Feb. 2008), *available at* http://pewhispanic.org/files/reports/85.pdf.

[7] *See, e.g.,* Cara Buckley, *For Uninsured Young Adults, Do-It-Yourself Healthcare*, Feb. 17, 2009, N.Y. TIMES, *available at* http://www.nytimes.com/2009/02/18/nyregion/18insure.html?_r=1&hp (noting that in 2007 there were over 13 million young adults without health insurance in the United States).

[8] For example, a key component of the recently enacted economic stimulus plan is the allocation of $19 billion for the universal implementation and use of electronic health records. *See* Nancy Ferris, *$19 Billion is Health IT Total in Final Stimulus Bill*, Feb. 12, 2009, GOV. HEALTH IT, *available at* http://govhealthit.com/articles/2009/02/12/19-billion-is-health-it-total-in-final-stimulus-bill.aspx ("*Health IT Stimulus*").

[9] *See* Issue Paper, *Telemedicine, Telehealth, and Health Information Technology*, at p. 3, AMERICAN TELEMEDICINE ASSOCIATION (May 2006), *available at* http://www.americantelemed.org/files/public/policy/HIT_Paper.pdf ("*ATA HIT Paper*").

[10] *Id.*

[11] *Id.*

[12] *Id*. at 2.

[13] *Id.* at 4.

[14] *See, e.g.,* Eric Dishman, *Inventing Wellness Systems for Aging in Place,* at p. 35, COMPUTER MAGAZINE (May 2004) ("*Inventing Wellness*").

[15] See Richard Hillestad et al., *Can Electronic Medical Record Systems Transform Healthcare? Potential Health Benefits, Savings, and Costs*, at p. 1103, HEALTH AFFAIRS, Vol. 24, No. 5 (2005). It is estimated, however, that implementing EHRs across the entire U.S. healthcare system could cost upwards of $100 billion. *See* David Goldman, *Obama's Healthcare Challenge*, Jan. 12, 2008, CNN MONEY, *available at* http://money.cnn.com/2009/01/12/technology/stimulus_health_care/index.htm.

[16] For example, it has been argued that the adoption of Computerized Physician Order Entry systems, which allow doctors to prescribe medicine electronically, can "substantially decrease the overuse, under use, and misuse of healthcare services." *See* Gilad J. Kuperman & Richard F. Gibson, *Computer Physician Order Entry: Benefits, Costs, and Issues*, at p. 31, ANNALS OF INTERNAL MEDICINE, Vol. 139, No.1 (2003),

available at http://www.annals.org/cgi/reprint/139/1/31.pdf. Moreover, studies have found that this type of technology enables cost savings for patients by "allowing doctors to check, with a patient's consent, the relative cost of co-payments for generic, formulary, and non-formulary drugs in a patient's health plan." *See* Laura Landro, *Incentives to Push More Doctors to e-Prescribe*, Jan. 21, 2009, WALL ST. J.

[17] *See* Robert D. Atkinson, Daniel Castro & Stephen J. Ezell, *The Digital Road to Recovery: A Stimulus Plan to Create Jobs, Boost Productivity and Revitalize America*, at p. 1, Info. Tech. & Innov. Found. (Jan. 2009), *available at* http://www.itif.org/files/roadtorecovery.pdf.

[18] *See* Report to Congressional Requesters, *Telemedicine: Federal Strategy is Needed to Guide Investments,* at p. 17, U.S. General Accounting Office (Feb. 1997), *available at* http://frwebgate.access.gpo.gov/cgi-bin/getdoc.cgi?dbname=gao&docid=f:n397067.pdf ("*GAO Report on Telemedicine*").

[19] *See, e.g.*, California Telemedicine and e-Health Center, History of Telemedicine, http://www.cteconline.org/telemedicine_history.html (describing "experiments using radio telecardiology (from the 1910s), telephone-mediated telestethoscopy (from the 1920s), and radiology image transfer and videophone experiments (from the early 1950s).").

[20] *GAO Report on Telemedicine* at p. 16.

[21] *Id.*

[22] *See Telemedicine for the Medicare Population: Update*, Agency for Healthcare Research & Quality, U.S. Dept. of Health & Human Services, No. 131 (Feb. 2006), *available at* http://www.ncbi.nlm.nih.gov/books/bv.fcgi?rid=hstat1b.section.28721 ("In store-and-forward telemedicine, clinical data are collected, stored, and then forwarded to be interpreted later. A store-and-forward system eliminates the need for the patient and the clinician to be available at either the same time or place.").

[23] *GAO Report on Telemedicine* at p. 17 (observing that, by the 1980s, telemedicine began to become prohibitively expensive and that, but for public funding, many innovations and advancements might have ceased altogether.).

[24] According to a 1997 government report, "Telemedicine can be described in many different ways, depending on the level of technology used, main purpose of its use, and transmission timing. At the lowest level, telemedicine could be the exchange of health or medical information via the telephone or facsimile (fax) machine. At the next level, telemedicine could be the exchange of data and image information on a delayed basis. A third level could involve interactive audio-visual consultations between medical provider and patient using high-resolution monitors, cameras, and electronic stethoscopes. This level is currently receiving much attention in literature and demonstrations." *GAO Report on Telemedicine at p. 16.*

[25] *See, e.g.*, Alexander H. Vo, *The Telehealth Promise: Better Healthcare and Cost Savings for the 21st Century*, at p. 1, Univ. Texas Medical Branch, *available at* http://attcenter.utmb.edu/presentations/The%20Telehealth%20Promise-Better%20Health%20Care%20and%20Cost%20Savings%20for%20the%2021st%20Century.pdf ("*21st-Century Telehealth*").

[26] *See* ConnectMD, News & Events, Technology, Telemedicine & Telebabies, http://www.connectmd.com/news_cs_technology.htm.

[27] *See, e.g.*, Elizabeth Olson, *High-Tech Offers Elderly the Chance to "Age in Place,"* May 25, 2008, NY TIMES.

[28] *See* Susannah Fox & Lee Rainie, *The Online Healthcare Revolution: How the Web Helps Americans Take Better Care of Themselves,* at p. 3, Pew Internet & American Life Project (Nov. 2000), *available at* http://www.pewinternet.org/pdfs/PIP_Health_Report.pdf.

[29] *See* Susannah Fox, *The Engaged e-Patient Population*, at p. 1, Pew Internet & American Life Project (Aug. 2008), *available at* http://www.pewinternet.org/pdfs/PIP_Health_Aug08.pdf.

[30] *See, e.g.*, Press Release, *National Survey of Radiologists Reveals Systemic Problems Hurting Industry and Patient Care,* Dec. 3, 2008, Compressus, *available at* http://www.compressus.com/publicwww4/PDF_Press%20Releases/FH%20Compressus%20Survey%20Release%20Final-120208.pdf (reporting the results of a survey that found, among things, that ""Ninety-four percent [of surveyed radiologists] connected the inability of medical imaging systems to communicate with information systems of physicians and hospitals with missed or delayed diagnosis" and "[71] percent of radiologists consider this failure to share data with other physicians and hospitals as a growing crisis for the industry.") ("*Radiologists Survey*").

[31] *See* Report to the Ranking Minority Member, Committee on Health, Education, Labor, and Pensions, U.S. Senate, *Information Technology: Benefits Realized for Selected Healthcare Functions,* at 24, U.S. General Accounting Office (Oct. 2003), *available at* http://www.gao.gov/new.items/d04224.pdf.

[32] http://www.hhs.gov/healthit/community/background/; see also http://www.hhs.gov/healthit/ahiccharter.pdf.

[33] *See Continued Progress: Hospital Use of Health Information Technology,* at p. 1, American Hospital Association (2007), *available at* http://www.aha.org/aha/issues/HIT/resources.html ("*Continued Progress*").

[34] For example, the Marshfield Clinic in Wisconsin has successfully adopted a wide range of health IT tools. "Marshfield's 790 doctors and their support staff at 43 locations in Wisconsin all use the tablet PCs. At the end of last year, the group eliminated paper charts for the more than 365,000 patients its doctors see each year, freeing up storage space the size of a football field at the main clinic in Marshfield." Tablet PCs route patient data to EHRs, which are continuously updated and "include [a patient's] health history, medications, lab tests, treatment guidelines and doctors' and nurses' notes." *See* Steve Lohr, *Healthcare That Puts a Computer on the Team*, Dec. 26, 2008, N.Y. TIMES, *available at* http://www.nytimes.com/2008/12/27/business/27record.html?_r=2&ref=business.

[35] *Continued Progress.*

[36] In October 2008, then-Senator and presidential candidate Barack Obama penned an article for the New England Journal of Medicine that outlined his vision for healthcare reform. Obama focused on the need for modernizing the U.S. healthcare system by, among other things, investing heavily in health IT in order to realize cost savings and reduce medical errors. *See* Barack Obama, *Modern Healthcare for All Americans*, NEW ENG. J. OF MED., Vol. 359, No. 15, pp. 1537-1541 (Oct. 9, 2008), *available at* http://content.nejm.org/cgi/content/full/359/15/1537.

[37] *See In the Matter of Inquiry Concerning the Deployment of Advanced Telecommunications Capability to All Americans in a Reasonable and Timely Fashion, and Possible Steps to Accelerate Such Deployment Pursuant to Section 706 of the Telecommunications Act of 1996*, First Report, CC Docket No. 98-146, para. 2 (rel. Feb. 2, 1999).

[38] *Id.* at para. 35.

[39] *See High-Speed Services for Internet Access: Status as of December 31, 2007,* FCC Wireline Competition Bureau Report (Jan. 2009), Table 10, *available at* http://hraunfoss.fcc.gov/edocs_public/attachmatch/DOC-287962A1.pdf ("*FCC Broadband Stats - Jan. 2009*").

[40] *See High-Speed Services for Internet Access: Status as of December 31, 2006,* FCC Wireline Competition Bureau Report (Oct. 2007), Table 10, *available at* http://hraunfoss.fcc.gov/edocs_public/attachmatch/DOC-277784A1.pdf.

[41] *See* U.S. Department of Health and Human Services, HHS Broadband Fact Sheet, http://www.hhs.gov/news/facts/broadbandaccess_.html.

[42] *Id.*

[43] *See, e.g.,* Jim Baller & Casey Lide, *Capturing the Promise of Broadband for the Future of North Carolina & America,* at p. 21, E-NC (June 2008), *available at* http://www.e-nc.org/2008/pdf/Broadband_report_composite.pdf.

[44] *State of Connectivity* at p. 15.

[45] *See, e.g.,* Andrew Pollack, *Who's Reading Your X-Ray?*, Nov. 16, 2003, N.Y. TIMES.

[46] *See* Archie A. Alexander, III, *American Diagnostic Radiology Moves Offshore: Is This Field Riding the "Internet" Wave Into a Regulatory Abyss?* 20 J.L. & Health 199 (2007) (explaining the controversy surrounding outsourcing in general and arguing in favor of teleradiology as beneficial to patients and doctors.) ("*Radiology Moves Offshore*").

[47] *See* Myrle Crosdale, *Admissions Process Aims to Boost Rural Doctors*, Feb. 7, 2005, AMERICAN MEDICAL ASSOCIATION AMEDNEWS.COM, *available at* http://www.ama-assn.org/amednews/2005/02/07/prsb0207.htm.

[48] *See* Texas Tech Health Sciences Center, Telemedicine Training & Consulting, http://www.ttuhsc.edu/telemedicine/institute.aspx.

[49] *See* Joint Advisory Committee on Communications Capabilities of Emergency Medical and Public Healthcare Facilities, *Report to Congress*, at p. 41 (Feb., 2008), *available at* http://energycommerce.house.gov/Press_110/JAC.Report_FINAL%20Jan.3.2008.pdf ("*Joint Advisory Committee Report to Congress*").

[50] MedApps, for example, has released an FDA-approved product that allows for information gleaned from its glucose measuring to be sent via Bluetooth to a patient's cell phone and transmits the information to a central server in near real-time. *See MedApps D-PAL Remote Patient Monitoring System for Diabetes,* July 12, 2007, MEDGADGET.COM, *available at* http://medgadget.com/archives/2007/07/medapps_dpal_remote_patient_monitoring_system_for_diabetes.html.

[51] *See* Robert Litan, *Vital Signs via Broadband: Remote Health Monitoring Transmit Savings, Enhances Lives,* at p. 2, White Paper of Better Healthcare Together (Oct. 2008), *available at* http://betterhealthcaretogether.org/SitesResources/bhctv2/Resources/Documents/VITAL%20SIGNS%20via%20BROADBAND%20FINAL%20with%20FOREWORD%20and%20TITLE%20pp%2010%2022.pdf ("*Vital Signs*").

[52] *See Senior Citizens to See High Tech Sensors in Homes, on Bodies to Monitor Health*, Dec. 6, 2007, SENIOR JOURNAL, *available at* http://www.seniorjournal.com/NEWS/Features/2007/7-12-06-SenCit2See.htm.

[53] *Id.*

[54] *See* Marlis Meyer, Rita Kobb & Patricia Ryan, *Virtually Healthy: Chronic Disease Management in the Home*, at p. 1, *Disease Management* Vol. 5, No. 2 (June 2002), *available at* www1.va.gov/visn8/v8/clinical/cccs/articles/virtually.doc.

[55] *See* Mark Terry, *Three Modalities of Cardiovascular Telemedicine*, 14 J. TELEMED. & E-HEALTH 1031, 1032 (Dec. 2008).

[56] *See* Press Release, *Viterion Telehealthcare Announces Agreement with the Visiting Nurse Service of New York to Provide Telehealth to Home Health Patients at Risk for Re-Hospitalization*, July 12, 2007, VITERION.COM,

available at http://www.viterion.com/web_docs/Viterion-VNSNY%20Press%20Release%2007-12-2007%20rev.pdf.

[57] *See, e.g.*, American Telemedicine Association, Telemedicine Cost Efficiency, http://www.atmeda.org/news/mediaguide/costefficiency.htm.

[58] *Id.* (citing a study of 1,000 patients in Tennessee who were spared having to drive a combined 62,000 miles thanks to various telemedicine services.).

[59] According to the California Broadband Task Force's Final Report, "83 percent of parents of children with special healthcare needs report driving more than an hour to see a specialist. For many of these families, this driving time results in lost work and missing wages. By allowing families the opportunity to be served at local clinics through telemedicine applications that enable remote screening, diagnosis, treatment, and monitoring, families can receive quality care in the communities in which they work and live." *See* California Broadband Task Force, *The State of Connectivity: Building Innovation through Broadband*, at p. 15 (Jan. 2008), *available at* http://www.calink.ca.gov/pdf/CBTF_FINAL_Report.pdf ("*State of Connectivity*").

[60] *21st-Century Telehealth* at p. 8.

[61] *See* Stacie Huie, *Facilitating Telemedicine: Reconciling National Access with State Licensing Laws,* 18 Hastings Comm. & Ent. L.J. 377, 389 (1996).

[62] *Id.*

[63] The Oregon Center for Aging & Technology ("ORCAT") is one institution that has launched a pilot program that uses in-home wireless sensors to monitor cognitive decline among older adults. For more information, *see* ORCAT, Current Research, http://www.orcatech.org/research.php#etac.

[64] *See* International Conference on Alzheimer's disease, *Highlights of Research Findings*, at p. 1, Alzheimer's Association, *available at* http://www.alz.org/icad/downloads/2008_ICADhighlights.pdf.

[65] *See* Press Release, *Alzheimer's disease to Quadruple Worldwide by 2050*, June 10, 2007, Johns Hopkins University Bloomberg School of Public Health, *available at* http://www.jhsph.edu/publichealthnews/press_releases/2007/brookmeyer_alzheimers_2050.html (announcing a study by Ron Brookmeyer et al. entitled *Forecasting the Global Burden of Alzheimer's Disease*).

[66] *See* Sarah Born, *Telemedicine in Massachusetts: A Better Way to Regulate*, 42 New Eng. L. Rev. 195, 202 (2007).

[67] *See* Glen Effertz, *Using a Business Case for Telehealth – A Model for Persuading Decision Makers*, Telemedicine Information Exchange (March/April 2004), *available at* http://tie.telemed.org/articles/article.asp?path=telemed101&article=businessCase_geffertz_tpr04.xml.

[68] *See* Greg Randolph, et al., *Trends in the Rural-Urban Distribution of General Pediatricians*, Pediatrics, Vol. 107, No. 2 (2001), *available at* http://pediatrics.aappublications.org/cgi/reprint/107/2/e18.pdf.

[69] *See* The Children's Partnership, *Meeting the Healthcare Needs of California's Children: The Role of Telemedicine*, at p. 5, Digital Opportunity for Youth Issue Brief, No. 3 (2nd Edition, Mar. 2008), *available at* http://www.childrenspartnership.org/AM/Template.cfm?Section=Home&Template=/CM/ContentDisplay.cfm&ContentID=11343 ("*Telemedicine & Children*").

[70] *Id.*

[71] The College of Dentistry at the University of Florida, for example, has a teledentistry program. *See* College of Dentistry, University of Florida, Overview, http://www.dental.ufl.edu/offices/teledentistry/.

[72] *Telemedicine & Children* at p. 6.

[73] *Id.*

[74] *See* U.S. Department of Health and Human Services, Administration on Aging, *A Statistical Profile o f Older Americans 65+* (June 2008), *available at* http://www.aoa.gov/press/prodsmats/fact/pdf/ss_stat_profile.pdf ("*Statistical Profile*").

[75] *See* Jeffrey S. Passel & D'Vera Cohn, *U.S. Population Projections: 2005-2050*, at p. 20, Pew Research Center (Feb. 2008), *available at* http://pewhispanic.org/files/reports/85.pdf.

[76] *See* Press Release, *Americans with Disabilities: July* 26, May29, 2007, U.S. Census Bureau, *available at* http://www.census.gov/Press-Release/www/releases/archives/facts_for_features_special_editions/010102.html

[77] *See* Robert E. Litan, *Great Expectations: Potential Economic Benefits to the Nation From Accelerated Broadband Deployment to Older Americans and Americans with Disabilities*, New Millennium Research Council (Dec. 2005), available at http://www.newmillenniumresearch.org/archive/Litan_FINAL_120805.pdf.

[78] *Vital Signs* at p. 34-37.

[79] *See generally* Charles M. Davidson & Michael J. Santorelli, *The Impact of Broadband on Senior Citizens*, U.S. Chamber of Commerce (Dec. 2008), *available at* http://www.uschamber.com/assets/env/broadbandseniors.pdf ("*Broadband & Seniors*").

[80] *Id.*

[81] Fifty-five percent of U.S. households have adopted broadband. *See* John Horrigan, *Home Broadband Adoption 2008*, at p.2, Pew Internet & American Life Project (July 2008), *available at* http://www.pewinternet.org/pdfs/PIP_Broadband_2008.pdf.

[82] For example, a 1997 GAO report estimated that "nine federal departments and independent agencies…invested at least $646 million in telemedicine projects from fiscal years 1994 to 1996."*GAO Report on Telemedicine* at p. 3.

[83] *See* FCC, Rural Healthcare Pilot Program, http://www.fcc.gov/cgb/rural/rhcp.html.

[84] *See In the Matter of Rural Healthcare Support Mechanism,* WC Docket No. 02-60 (rel. Nov. 19, 2007), at para. 2, *available at* http://hraunfoss.fcc.gov/edocs_public/attachmatch/DOC-279101A1.pdf ("*FCC Rural Health Pilot Order*").

[85] *Id.* at para. 39.

[86] *Id.*

[87] *See, e.g.,* Alan Joch, *Broadband Flows to Rural Clinics,* June 9, 2008, GOV. HEALTH IT, *available at* http://www.govhealthit.com/print/4_18/features/350394-1.html.

[88] For additional information, *please see* HHS: Heath Information Technology, http://www.hhs.gov/healthit/.

[89] *See* Executive Order 13335, issued April 27, 2004, *available at* http://www.whitehouse.gov/news/releases/2004/04/20040427-4.html.

[90] *See* Press Release, *HHS Broadband Fact Sheet*, Feb. 1, 2008, HHS, *available at* http://www.hhs.gov/news/facts/broadbandaccess_.html.

[91] *See* Office of the National Coordinator, *The ONC-Coordinated Federal Health IT Strategic Plan: 2008-2012*, at p.3, HHS (June 3, 2008), *available at* http://www.hhs.gov/healthit/resources/HITStrategicPlan.pdf ("*Federal IT Strategy*").

[92] *Continued Progress.*

[93] *See* Press Release, *Large Survey of Physicians Show Size and Setting Continue as Major Factors Influencing EHR Adoption Rates*, June 18, 2008, HHS, *available at* http://www.hitadoption.org/index.php?module=News&id=cntnt01&cntnt01action=detail&cntnt01articleid=4&cntnt01returnid=30.

[94] *See* Catheric M. DesRoches et al., *Electronic Health Records in Ambulatory Care – A National Survey of Physicians*, New England J. of Med., Vol. 359, No. 1 (2008), *available at* http://content.nejm.org/cgi/content/full/359/1/50 (finding that "Physicians reported positive effects of these systems on several dimensions of quality of care and high levels of satisfaction" and that "Physicians who use electronic health records believe such systems improve the quality of care and are generally satisfied with the systems."); *see also* Steve Lohr, *Most Doctors Aren't Using Electronic Health Records,* June 19, 2008, NY TIMES, *available at* http://www.nytimes.com/2008/06/19/technology/19patient.html ("*Doctors Aren't Using EHRs"*).

[95] *Radiologists Survey.*

[96] *Doctors Aren't Using EHRs* (estimating that implementing an EHR system could cost upwards of $20,000 per doctor). Moreover, it has been argued that the relative low usage rate of EHRs among physicians (as compared to adoption rates of other advanced technologies) is attributable to an inadequate value proposition. In other words, "For many physicians, writing with pen and paper still accomplishes [most] tasks better than electronic systems. And while [healthcare] providers are often expected to bear the cost of implementing an HER system, many of the benefits – such as improved patient safety, data security, care coordination, and disease prevention – accrue to patients, insurers, and payers, but not to providers." *See* Clayton M. Christensen, Jerome H. Grossman & Jason Hwang, THE INNOVATOR'S PRESCRIPTION: A DISRUPTIVE SOLUTION FOR HEALTHCARE 135 (McGraw-Hill 2009).

[97] *Id.*

[98] *See* Anemona Hartocollis, *City to Pay Doctors to Contribute to Database*, Dec. 29, 2008, N.Y. TIMES, *available at* http://www.nytimes.com/2008/12/30/nyregion/30records.html?_r=2&ref=nyregion ("The health department is providing subsidies for doctors to subscribe to the system and teams of trainers to support the transition; so far, more than 1 in 10 of the city's estimated 10,000 primary-care doctors have started using the system, and an additional 500 are in the pipeline.").

[99] *Id.*

[100] *See* USDA, Welcome to the Rural Development Telecommunications Program, *available at* http://www.usda.gov/rus/telecom/.

[101] *See* USDA home page, http://www.usda.gov/rus/telecom/commconnect.htm.

[102] *See* Press Release, *USDA Awards $28 Million for Distance Learning and Telemedicine Grants*, Sept. 18, 2008, USDA, *available at* http://www.rurdev.usda.gov/rd/newsroom/2008/20080918-DLTnewsrelease0908.pdf.

[103] *See* Press Release, *New York Awards $105 million in Health Information Technology Grants,* March 28, 2008, Office of the Governor of the State of New York, *available at* http://www.state.ny.us/governor/press/press_0328081.html.

[104] *Id.*

[105] *See* Massachusetts Senate, Bill No. 2863, *available at* http://www.mass.gov/legis/bills/senate/185/st02/st02863.htm.

[106] *See* Alaska Native Tribal Health Consortium, About, http://www.anthc.org/abt/.

[107] *FCC Rural Health Pilot Order* at Appendix B.

[108] *See Annual Report 2007,* at p. 14, Alaska Native Tribal Health Consortium, *available at* http://www.anthc.org/abt/annrept/upload/AnnMt_version_LoRez_Web.pdf.

[109] *See* Yukon-Kuskokwim Health Corporation, About, http://www.ykhc.org/682.cfm.

[110] *See Testimony of Gene Peltola before the Senate Commerce Committee*, at p. 1, Sept. 16, 2008, *available at* http://commerce.senate.gov/public/_files/GenePeltolaFullCommerceCommitteeTestimony91608FINAL.pdf.

[111] *Id*. at p. 2.

[112] *Id.*

[113] *See Executive Order S-12-06,* July 24, 2006, Office of the Governor of California, *available at* http://gov.ca.gov/executive-order/2616.

[114] *See Executive Order S-23-06,* November 28, 2006, Office of the Governor of California, *available at* http://gov.ca.gov/executive-order/4585.

[115] *State of Connectivity* at p. 71.

[116] *FCC Rural Health Pilot Order* at Appendix B.

[117] *See* Keith Easthouse, *Telemedicine Brings Faraway Patients, Physicians Together,* March 9, 2007, UC DAVIS DATELINE, *available at* http://www.dateline.ucdavis.edu/dl_detail.lasso?id=9358.

[118] For more information, *please see* http://www.healthsciences.okstate.edu/telemedicine/index.cfm.

[119] OneNet was launched in 1992 and has been funded primarily through taxpayer money. It currently serves over 1,600 clients across the state. For more information, *see* OneNet History, http://www.onenet.net/general/category1/sub1/history.htm.

[120] *See* OSU Mobile Telemedicine Clinic, http://www.healthsciences.okstate.edu/telemedicine/mtc/index.cfm.

[121] *See* Gilbert Eric DeLeon, *Telemedicine in Texas: Solving the Problems of Licensure, Privacy, and Reimbursement,* 34 St. Mary's L.J. 651, 661 (2003).

[122] *See* Texas Tech Health Sciences University, History, http://www.ttuhsc.edu/telemedicine/history.aspx.

[123] For more information, *please see* Texas Tech Health Sciences University, Other Projects, http://www.ttuhsc.edu/telemedicine/projects.aspx.

[124]*See* Michelle Cassady, *Telepharmacy System Comes to Earth,* April 6, 2006, DAILY TOREADOR, *available at* http://media.www.dailytoreador.com/media/storage/paper870/news/2006/04/06/News/Telepharmacy.System.Comes.To.Earth-1798047.shtml.

[125] *See, e.g.,* Kirk Johnson, *TV Screen, Not Couch, is Required for This Session,* June 8, 2006, N.Y. TIMES (noting that, as of 2006, "Psychiatry, especially in rural swaths of the nation that also often have deep social problems like poverty and drug abuse, is emerging as one of the most promising expressions of telemedicine. At least 18 states, up from only a handful a few years ago, now pay for some telemedicine care under their Medicaid programs, and at least eight specifically include psychiatry, according to the National Association of State Medicaid Directors. Six states, including California, require private insurers to reimburse patients for telepsychiatry, according to the National Conference of State Legislatures.").

[126] *See* Jamie Stengle, *Mental Health Treatment by Video Growing,* Oct. 9, 2006, USA TODAY, *available at* http://www.usatoday.com/tech/news/techinnovations/2006-10-09-telemedicine_x.htm?POE=TECISVA.

[127] *See* RBHA, Activity Data, http://www.rbha.net/data.html.

[128] *See* RBHA, History, http://www.rbha.net/overview_background.html.

[129] *See* Sharon Salyer, *3-D Video to Improve the Quality of Children's Psychiatric Services*, March 23, 2008, HERALDNET, available at http://www.heraldnet.com/article/20080323/NEWS01/4566228.

[130] *See* Alan Joch, *Broadband Flows to Rural Clinics*, June 9, 2008, GOV. HEALTH IT, *available at* http://www.govhealthit.com/print/4_18/features/350394-1.html.

[131] *See* Sara Foss, *Telepsychiatry Programs Aids Kids in Need,* May 18, 2008, DAILY GAZETTE, *available at* http://www.dailygazette.com/news/2008/may/18/0518_telepsych/.

[132] *See* American Psychiatry Association, Telepsychiatry, http://www.psych.org/Departments/HSF/UnderservedClearinghouse/Linkeddocuments/telepsychiatry.aspx.

[133] *See* Ian Jardine, Linda Kennedy & John Hunter, *A Feasibility Study of the Use of Videoconferencing to Improve Access to Mental Health Services for Mentally Disordered Offenders,* at p. 3, South London and Maudsley NHS Trust (Mar. 2003).

[134] *See* American Psychiatry Association, Telepsychiatry, http://www.psych.org/Departments/HSF/UnderservedClearinghouse/Linkeddocuments/telepsychiatry.aspx.

[135] *Inventing Wellness*.

[136] *See* ORCAT, Current Research, http://www.orcatech.org/research.php#etac.

[137] *See, e.g.,* Elizabeth Olson, *High-Tech Offers Elderly the Chance to "Age in Place,"* May 25, 2008, NY TIMES.

[138] *See* Aging Services: The Facts, *General Facts*, American Association of Homes and Services for the Aging ("AAHSA"), *available at* http://www.aahsa.org/aging_services/default.asp ("*AAHSA General Facts*").

[139] *Id.*

[140] *Id.*

[141] *Id.*

[142] *See* Adam Darkins et al., *Case Report – Care Coordination/Home Telehealth: The Systematic Implementation of Health Informatics, Home Telehealth, and Disease Management to Support the Care of Veteran Patients with Chronic Conditions*, 14 J. TELEMED. & E-HEALTH 1118, 1119-20 (Dec. 2008).

[143] *Id.* at 1122.

[144] *Id.* at 1123.

[145] *Id.* at 1124.

[146] *See* Massachusetts General Hospital, TeleStroke Services, http://www.massgeneral.org/stopstroke/telestroke.aspx.

[147] *See* Gina Kolata, *Cost Put a Stroke Treatment Out of Reach, Then Technology Made it Possible*, May 28, 2007, N.Y. TIMES.

[148] *See* Healthcare IT Standards Panel, About, http://hitsp.org/about_hitsp.aspx.

[149] *See Testimony of HITSP Program Director LeRoy Jones before the House Ways and Means Subcommittee on Health*, July 24, 2008, *available at* http://waysandmeans.house.gov/hearings.asp?formmode=view&id=7234.

[150] *See* HHS, NHIN – Background, http://www.hhs.gov/healthit/healthnetwork/background/.

[151] *Id.*

[152] *See* HHS, NHIN – Trial Implementations, http://www.hhs.gov/healthit/healthnetwork/trial/ (noting that "the NHIN trial implementations leveraged the ongoing work throughout HHS and its contractors and partners, including: the Healthcare Information Technology Standards Panel (HITSP), the Certification Commission for Healthcare Information Technology (CCHIT), the Health Information Security and Privacy Collaboration (HISPC) and the National Committee on Vital and Health Statistics (NCVHS)." Moreover, "once created, the NHIN Health Information Exchange (NHIE) Specifications, testing materials and trust agreements will be placed in the public domain to stimulate adoption.").

[153] *See* Press Release, *Certification Commission Announces Newly Certified EHR Products for Hospitals,* Jan. 22, 2008, CCHIT, *available at* http://www.cchit.org/about/news/releases/2008/Certification-Commission-Announces-Newly-Certified-EHR-Products-For-Hospitals.asp.

[154] *See* Joseph Conn, *Money to Boost EHR Initiatives Nationwide: Stimulus*, Feb. 23, 2009, MODERNHEALTHCARE.COM, *available at* http://www.modernhealthcare.com/article/20090223/REG/302239983 ("*Money to Boost EHR*").

[155] *See* CCHIT, About, http://www.cchit.org/about/index.asp.

[156] *See CCHIT Certified Electronic Health Records Reduce Malpractice Risk*, White Paper of CCHIT (2007), *available at* http://www.cchit.org/files/wpCCHITPhysicianBusinessCaseforCertEHR.pdf.

[157] *See* John Halamka, Mark Leavitt & John Tooker, *A Shared Roadmap and Vision for Health IT*, at p. 2, White Paper of NeHC (Feb. 2009), *available at* http://www.nationalehealth.org/uploadedFiles/Home/News/A%20Shared%20Roadmap%20and%20Vision%20for%20Health%20IT%20-%20Feb%2010%202009%20FINAL3.pdf.

[158] *See* Press Release, *NeHC Statement re American Recovery and Reinvestment Act of 2009*, Feb. 13, 2009, NeHC, *available at* http://www.nationalehealth.org/uploadedFiles/NeHC%20statement%20re%20American%20Recovery%20and%20Reinvestment%20Act%20conf%20report%20021309%20v2%20LM.pdf.

[159] *Joint Advisory Committee Report to Congress* at p. 2.

[160] *See* CTIA – The Wireless Association, Quick Facts, http://www.ctia.org/advocacy/research/index.cfm/AID/10323.

[161] *See* Tricia Duryee, *3G Adoption in the U.S. Exceeds Western Europe: Report*, Sept. 4, 2008, WASH. POST, *available at* http://www.washingtonpost.com/wp-dyn/content/article/2008/09/04/AR2008090400776.html.

[162] *See* Press Release, *Verizon Wireless Customers Can Now Get Medication Information and Dosing Reminders with the Pill Phone Application on Their Phones*, April 16, 2008, Verizon Wireless, *available at* http://www.prnewswire.com/cgi-bin/stories.pl?ACCT=109&STORY=/www/story/04-16-2008/0004793990&EDATE=.

[163] *See* The Pill Phone, https://www.pillphone.com/PillLogin.htm.

[164] A full listing of these applications can be found *at* https://t-mobile.handango.com/PlatformSoftwareSection.jsp?siteId=538&osId=592&topSectionId=6586&platformId=5&parentSectionId=6596&sectionId=6596&catalog=40&title=Personal+Healthcare.

[165] *See* T-Mobile, Production Information – Health Tracker for BlackBerry, https://t-mobile.handango.com/PlatformProductDetail.jsp?siteId=538&osId=592&jid=86583B652D35B5A17EC1C

X1227146F34&platformId=5&productType=2&productId=218317&sectionId=6596&catalog=40&topSectionId=6586.

[166] *See* MIM Vista, Mobile MIM for the iPhone, http://www.mimvista.com/iphone.

[167] *See Case Study: At Home or in Community Hospitals, Baptist Health Patients Get State-of-the-Art Care*, AT&T HEALTHCARE (2008), *available at* http://www.corp.att.com/healthcare/docs/cs_bh.pdf.

[168] *See* Time McKeough, *AT&T's Telehealth Wirelessly Monitors Patients' Health*, Jan. 15, 2009, FAST COMPANY, *available at* http://www.fastcompany.com/magazine/132/futurist-at-t-telehealth.html ("AT&T is developing a software tool and networking platform that will use wireless devices to record a patient's health measurements at home and send the data to the doctor. AT&T's system runs on both Wi-Fi – enabling videoconferencing -- and a second wireless technology named ZigBee, which receives data from medical sensors. ZigBee consumes considerably less power than Wi-Fi, so monitoring devices, including thermometers, pill dispensers, blood-pressure monitors, and pulse oximeters, can use small batteries to transmit data over long periods of time").

[169] *See* Press Release, *La Maestra Community Health Centers Expands Telemedicine Program*, Oct. 17, 2008, VERIZON MEDIA CENTER, *available at* http://newscenter.verizon.com/press-releases/verizon/2008/la-maestra-community-health.html.

[170] *See* Verizon Foundation, Healthcare & Accessibility Grants, http://foundation.verizon.com/core/health-featured_archive.shtml.

[171] *See* Linda Haugsted, *Cox Business Hooks Up Oklahoma Hospitals with Remote Data Tools*, Oct. 2, 2008, MULTICHANNEL NEWS, *available at* http://www.multichannel.com/article/134938-Cox_Business_Hooks_Up_Oklahoma_Hospitals_with_Remote_Data_Tools.php.

[172] *See* ConnectMD, News & Events, Technology, Telemedicine & Telebabies, http://www.connectmd.com/news_cs_technology.htm.

[173] *See* GE Healthcare, Fact Sheet, http://www.gehealthcare.com/usen/about/ge_factsheet.html.

[174] *Id.*

[175] *See* Press Release, *GE Medical Systems Provides NASA Important Heart Monitoring Systems for Space Mission; Advances Use of Telemedicine*, Mar. 1, 2002, GE, *available at* http://findarticles.com/p/articles/mi_m0EIN/is_2002_March_1/ai_83381142.

[176] *See* Press Release, *Intel Announced Digital Health Research Center for Ireland,* Jan. 2007, Ireland Dept. of Enterprise, Trade and Employment, *available at* http://www.entemp.ie/press/2007/20070130b.htm.

[177] *See* Press Release, *GE Healthcare Brings Mobile Computing to Point-of-Care for Enhanced Vital Sign Collection at UCSF*, Feb. 28, 2008, GE Healthcare, *available at* http://pressroom.gehealthcare.com/proom/internet/NewsandEvents.jsp?release_id=14025.

[178] Verizon will invest at least $23 billion dollars on its new FiOS system, *See* Peter Grant & Dionne Searcey, *Verizon's FiOS Challenges Cable's Clout*, WALL. ST. J., Oct. 24, 2007.

[179] AT&T invested upwards of $5 billion by the end of 2008 in its own fiber-optic network, *See* Todd Spangler, *AT&T Ups U-verse Spending Estimates by $500 Million,* MULTICHANNEL NEWS, Nov. 6, 2007.

[180] Comcast is currently deploying a new technology – DOCSIS 3.0 – which will boost broadband speeds that are comparable to fiber-optic speeds *See* Bob Wallace, *Comcast Details its First DOCSIS 3.0 Deployment*, XCHANGE, April 4, 2008, *available at* http://www.xchangemag.com/hotnews/comcast-details-its-first-docsis-3-0-deployme.html.

[181] *See, e.g.,* Charles M. Davidson & Michael J. Santorelli, *Network Effects: An Introduction to Broadband Technology & Regulation*, at p. 12-15, U.S. Chamber of Commerce (Dec. 2008), *available at* http://www.uschamber.com/assets/env/introbroadband.pdf.

[182] *Joint Advisory Committee Report to Congress* at p. 2.

[183] *Id.* at p. 3.

[184] *See* Cisco, HealthPresence, http://www.cisco.com/web/about/ac79/health/hp/index.html.

[185] *Id.*

[186] *See* American Well, About Us, http://www.americanwell.com/aboutus.html.

[187] *See* American Well, How it Works, http://www.americanwell.com/how_american_well_works.html.

[188] *Id.*

[189] *See* Claire Cain Miller, *The Doctor Will See You Now – Online*, Nov. 19, 2008, N.Y. TIMES BITS BLOG, *available at* http://bits.blogs.nytimes.com/2008/11/19/the-doctor-will-see-you-now-online/?scp=58&sq=telemedicine&st=cse (noting that "The first plan to sign on is Blue Cross Blue Shield of Hawaii, which starting in January will offer patients virtual visits with its doctors. Other states and health plans, yet to be announced, will also activate it in 2009…Patients who are members of the health plan pay a co-pay, just like at the doctor's office. Doctors hold 10-minute appointments, which can be extended for an optional fee, and can file prescriptions through the system. Uninsured patients can also use it, for a fee that the health plans choose but which will be less than $50, much less than a visit to the emergency room, which is where the uninsured often end up. Health plans pay American Well a license fee per member to use the software, as well as a transaction fee of about $2 a patient each time a patient sees a doctor.").

[190] *Inventing Wellness*.

[191] *See Healthcare 2015: Win-Win or Lose-Lose? A Portrait and a Path to Successful Transformation*, at p. 30, IBM Institute for Business Value (2006).

[192] *Id.* at p. 26.

[193] *See* Press Release, *Verizon CEO Announces Implementation of New Online Personal Health Records Program for Company Employees*, May 9, 2007, VERIZON NEWS CENTER, *available at* http://newscenter.verizon.com/press-releases/verizon/2007/verizon-ceo-announces.html.

[194] *See* Google Health, FAQ, https://www.google.com/health/html/faq.html.

[195] *See* Dossia, About, http://www.dossia.org/founders/index.html.

[196] *Money to Boost EHR.*

[197] *Id.*

[198] *Id.*

[199] *See, e.g., Operating Profit*, Aug. 14, 2008, THE ECONOMIST (noting that "A report published last month by Deloitte, a consultancy, predicts that the number of Americans traveling abroad for treatment will soar from 750,000 last year to 6m by 2010 and reach 10m by 2012. Its authors reckon that this exodus will be worth $21 billion a year to developing countries in four years' time.") ("*Operating Profit*").

[200] It has been observed that a doctor-patient relationship forged online can be as effective and beneficial as traditional face-to-face meetings. *See* John D. Blum, *Internet Medicine and the Evolving Legal Status of the Physician-Patient Relationship*, 24 J. Legal Med. 413, 455 (2003) (concluding that "A physician-patient relationship can be forged online, independent of a physical encounter. The potential benefits raised by

cybermedicine can only be realized in a meaningful way if this medium is drawn into the legitimate realm of medical practice, but such development clearly sparks challenges and fears that go beyond basic questions of legality."); *see also* Ronald F. Dixon & James E. Stahl, *Virtual Visits in a General Medicine Practice: A Pilot Study*, 14 J. TELEMED. & E-HEALTH 525, 528 (July/Aug. 2008).

[201] *See* R. Stephen Smith, *Telemedicine and Trauma Care,* 94 South. Med. J. 825-829 (2001), *available at* http://www.medscape.com/viewarticle/410822_print.

[202] *Id.*

[203] SRI International is one of a handful of companies experimenting with this new technology. For more information, *please see* http://www.sri.com/esd/med_devel/telepresence.html.

[204] *See* Meghan Hamilton-Piercy, *Cybersurgery: Why the United States Should Embrace this Emerging Technology*, 7 J. High Tech. L. 203 (2007) (arguing that "The international market for cybersurgeries performed by United States surgeons may be an incentive for the United States to encourage the growth of cybersurgery.").

[205] *See* Bill Crounse, *How the Internet and Wireless Devices Can Revolutionize Medicine,* Mar. 10, 2006, Microsoft, *available at* http://www.microsoft.com/industry/healthcare/providers/businessvalue/housecalls/telemedicine.mspx (observing that "wireless devices promise to make it feasible and less expensive to keep an eye on people who require more frequent attention. So patients who need a gentle reminder to exercise or check their blood sugar can get that reminder without an expensive office visit. Patients in need of rapid intervention can be summoned to a hospital or doctor's office in a timely fashion. The technology makes better use of healthcare resources.").

[206] *See* Mark Terry, *Text Messaging in Healthcare,* 14 J. TELEMED. & E-HEALTH 520, 521 (July/Aug. 2008).

[207] *See Tomorrow's Wireless World,* OfCom (rel. May 7, 2008), *available at* http://www.ofcom.org.uk/research/technology/overview/randd0708/randd0708.pdf.

[208] *Id.* at p. 12; *see also* Adam Sherwin, *New Wi-Fi Devices Warn Doctors of Heart Attacks,* May 7, 2008, THE TIMES, *available at* http://technology.timesonline.co.uk/tol/news/tech_and_web/article3883082.ece.

[209] *Operating Profit.*

[210] *See Innovation, Demand, and Investment in Telehealth*, at p. 70-71, Office of Tech. Policy, U.S. Dept. of Commerce, *available at* https://www.ncsbn.org/2004Report.pdf.

[211] *See* Kao-Ping Chua, *Overview of the U.S. Healthcare System*, at p. 3, American Medical Student Association (Feb. 2006), *available at* http://www.amsa.org/uhc/HealthCareSystemOverview.pdf.

[212] *See Medicare at a Glance,* KAISER FAMILY FOUNDATION (April 2005), *available at* http://www.kff.org/medicare/upload/Medicare-at-a-Glance-Fact-Sheet.pdf.

[213] *Id.*

[214] *See Medicaid: A Primer,* KAISER FAMILY FOUNDATION (Mar. 2007), *available at* http://www.kff.org/medicaid/upload/Medicaid-A-Primer-pdf.pdf.

[215] *Id.*

[216] *See, e.g., Medicare Payment of Telemedicine & Telehealth Services*, American Telemedicine Association (Jan. 2007), *available at* http://www.americantelemed.org/news/Medicare%20Payment%20Of%20Services.pdf.

[217] *Id.*

[218] *Id.*

[219] *Id.*

[220] *See Medicare Pilot to Maintain PHRs,* Aug. 13, 2008, FEDERAL TELEMEDICINE NEWS, *available at* http://telemedicinenews.blogspot.com/2008/08/medicare-pilot-to-maintain-phrs.html.

[221] *Id.*

[222] As of 2006, these included California, Louisiana, Texas, Oklahoma, and Kentucky. *See* Pamela Whitten & Laurie Buis, *Private Payer Reimbursement for Telemedicine Services in the United States*, at p. 2, White Paper, American Telemedicine Association (2006), *available at* http://www.atmeda.org/news/Whitepapers/2006%20Private%20Payer%20Report.pdf.

[223] *See* Robert Pear, *Privacy Issue Complicates Push to Link Medical Data*, Jan. 17, 2009, N.Y. TIMES, *available at* http://www.nytimes.com/2009/01/18/us/politics/18health.html?_r=2&ref=health (describing recent discussions regarding the need for more robust privacy safeguards in the use of EHRs and other electronic transmissions of medical data.").

[224] *See* Sharon R. Klein & William L. Manning, *Telemedicine and the Law*, http://www.netreach.net/~wmanning/telmedar.htm.

[225] *See* Glenn W. Wachter, *HIPAA's Privacy Rule Summarized: What Does It Mean For Telemedicine?*, Feb. 23, 2001, TELEMEDICINE INFORMATION EXCHANGE, *available at* http://tie.telemed.org/articles/article.asp?path=legal&article=h ipaaSummary_gw_tie01.xml.

[226] *Id.*

[227] *See* Jonathan Bick, *Emerging Internet Telemedicine Issues*, N.J. LAW J. (December 24, 2007), *available at* http://www.bicklaw.com/Telemed.htm.

[228] *Id.*

[229] *Id.*

[230] *Id.*

[231] *See* Connecting for Health, Home, http://www.connectingforhealth.org.

[232] *See* The Markle Foundation, Home, http://www.markle.org/.

[233] For an interactive version of the Framework, *see* Connecting for Heath, Connecting Consumers, http://www.connectingforhealth.org/phti/#guide.

[234] The Consumer Policy Brief can bet found *at* http://www.connectingforhealth.org/resources/CCPolicyBrief.pdf. The Technology Policy Brief can be found *at* http://www.connectingforhealth.org/resources/CCTechBrief.pdf.

[235] *See* Connecting for Health, Home, http://www.connectingforhealth.org.

[236] *Id.*

[237] Immediate past HHS Secretary Michael Leavitt recently articulated a set of guiding principles to bolster consumer privacy vis-à-vis digital health information. These included individual access to personal health information, openness and transparency, data integrity, and accountability. In addition, Secretary Leavitt also proposed the use of a label, modeled after the nutritional labels on food packaging, which would allow consumers to quickly compare personal health record products. *See* Press Release, *Secretary Leavitt Announces New Principles, Tools to Protect Privacy, Encourage More Effective Use of Patient Information to Improve Care*, Dec. 15, 2008, HHS, *available at* http://www.hhs.gov/news/press/2008pres/12/20081215a.html.

[238] *See* John Horrigan, *Online Shopping*, at p. 10, Pew Internet & American Life Project (Feb. 2008), *available at* http://www.pewinternet.org/pdfs/PIP_Online%20Shopping.pdf.

[239] *See Overcoming the Psychological Barriers to Telemedicine: Empowering Older Americans to Use Remote Health Monitoring Services,* at p. 6, New Millennium Research Council (Feb. 2007), *available at* http://www.newmillenniumresearch.org/archive/Telemedicine_Report_022607.pdf (noting that as of Feb. 2007, such standards had yet to be developed).

[240] Pew has found that "Spam continues to plague the internet as more Americans than ever say they are getting more spam than in the past." However, users are increasingly adept at adopting tools to manage spam and similar applications. Indeed, Pew found that 71 percent of Internet users use spam filters on their emails accounts. *See* Deborah Fallows, *Data Memo: The Volume of Spam is Growing in Americans' Personal and Workplace Email Accounts, but Email Users are Less Bothered By It*, at p. 1, Pew Internet & American Life Project (May 2007).

[241] *See* Devon M. Herrick, *Telemedicine Provides Benefits, but Security and Privacy Risks Abound,* EMAXHEALTH (2006), *available at* http://www.emaxhealth.com/34/6028.html.

[242] *Id.*

[243] *Id.*

[244] *See Enhancing Quality and Security of Wireless Telemedicine*, Sept. 9, 2007, Rochester Institute of Technology, *available at* http://www.sciencedaily.com/releases/2007/09/070917124408.htm.

[245] *Id.*

[246] *See* Glenn W. Wachter, *Interstate Licensure of Telemedicine Practitioners*, March 10, 2000, TELEMEDICINE INFORMATION EXCHANGE (Mar. 2000), *available at* http://tie.telemed.org/articles/article.asp?path=telemed101&article=interstate Licensure_gw_tie00.xml ("*Interstate Licesnsure*").

[247] *See Telemedicine Report to the Congress*, HHS, GPO No: 0126-E-04 (MF) (1997); *Telemedicine Report to Congress*, HHS, GPO No: 619-261/65410 (2001).

[248] *See, e.g., Telemedicine Licensure Report*, The Center for Telemedicine Law & The Office for the Advancement of Telehealth (June 2003), *available at* ftp://ftp.hrsa.gov/telehealth/licensure.pdf (citing two examples: In 2002, when the House Commerce Committee inserted language in the Safety Net Legislation that expressed the Congressional interest in collaboration among regulatory boards to facilitate elimination of barriers to telehealth practice. (Healthcare Safety Net Amendments of 2002, Pub. L. No. 107-251, 116 Stat. 1621). This legislation was ultimately signed by the President. Similar language was included in the Senate version of the prescription drug legislation pending on Capitol Hill. (See S. 1, 108th Cong., 1st Sess. § 450H, 2003).

[249] *Interstate Licesnsure.*

[250] *See* Peter D. Jacobson & Elizabeth Selvin, *Licensing Telemedicine: The Need for a National System*, 6 J. TELEMED. & E-HEALTH429-439 (Dec. 2000).

[251] *See Telemedicine Report to Congress, Legal Issues – Licensure and Telemedicine*, NTIA (1997), *available at* http://www.ntia.doc.gov/reports/telemed/legal.htm.

[252] *See* U.S. Chamber Institute for Legal Reform, *available at* http://www.instituteforlegalreform.com/issues/issue.cfm?issue=HLD.

[253] *See* Jeffery L. Rensberger, *Choice of Law, Medical Malpractice, and Telemedicine: The Present Diagnosis with a Prescription for the Future*, 55 U. MIAMI L. REV. 31 (2000).

[254] *See Regulatory Jurisdiction*, Mar. 12, 2008, Action for Health, *available at* http://ir.lib.sfu.ca/bitstream/1892/4094/1/Regulatory%20Jurisdiction.pdf.

[255] *See* Patricia C. Kuszler, *Telemedicine and Integrated Healthcare Delivery: Compounding Malpractice Liability*, 25 AM. J.L. & MED. 297 (1999).

[256] *See* Jonathan Bick, *Emerging Internet Telemedicine Issues*, Dec. 24, 2007, N.J. LAW J., *available at* http://www.bicklaw.com/Telemed.htm.

[257] It is estimated that companies will have invested upwards of $60 billion in communications infrastructure in 2008. *See Statement of Jonathan Banks to the Subcommittee on Telecommunications and the Internet, Committee on Energy and Commerce, U.S. House of Representatives*, p. 2, July 22, 2008, *available at* http://energycommerce.house.gov/images/stories/Documents/Hearings/PDF/Testimony/TI/110-ti-hrg.072208.Banks-testimony.pdf (quoting a projection made by Yankee Group).

[258] This gap, however, continues to narrow each year. According to the National Telecommunications Cooperative Association's 2008 Annual Broadband/Internet Availability Survey Report, 91 percent of customers in its 2008 Survey area had access to broadband, *NTCA 2008 Broadband/Internet Availability Survey Report*, p. 8, *available at* http://www.ntca.org/images/stories/Documents/Advocacy/SurveyReports/2008ntcabroadbandsurveyreport.pdf, up from 70 percent in 2007, *NTCA 2007 Broadband/Internet Availability Survey Report*, p. 7, *available at* http://www.ntca.org/images/stories/Documents/Advocacy/SurveyReports/2007ntcabroadbandsurveyreport.pdf.

[259] *FCC Broadband Stats - Jan. 2009* at p. 4 and Table 18 (noting that "High population density has a positive association with reports that high-speed subscribers are present, and low population density has an inverse association. For example, high-speed subscribers were reported to be present in more than 99% of the most densely populated Zip Codes and in 90% of Zip Codes with the lowest population densities.").

[260] Connected Kentucky, the predecessor to Connected Nation, helped increase broadband adoption in the state by 83 percent between 2005 and 2007. *See The Economic Impact of Stimulating Broadband Nationally*, at p. 15, A Report from Connected Nation (Feb. 2008), *available at* http://connectednation.com/_documents/Connected_Nation_EIS_Study_Full_Report_02212008.pdf ("*Connected Nation Report*"); *see also* Arik Hesseldahl, *Bringing Broadband to Rural America,* Sept. 18, 2008, BUSINESS WEEK, *available at* http://www.businessweek.com/technology/content/sep2008/tc20080917_797892.htm.

[261] *See* Connected Nation, State Programs, http://www.connectednation.com/state_programs/.

[262] *See* OATS, About, http://www.oatsny.org/about_us.htm.

[263] *See* One Economy, Our Work: Broadband/Hardware, http://www.one-economy.com/ourwork/broadband.

[264] *Broadband & Seniors.*

[265] *Id.* at 32-34 (discussing a number of ways to stimulate broadband demand among seniors).

[266] *See* Neal Neuberger, *Advancing Healthcare Through Broadband: Opening Up a World of Possibilities,* at p. 3, Internet Innovation Alliance White Paper (Oct. 2007), *available at* http://www.internetinnovation.org/DesktopModules/iBN%20News%20Articles/Download.aspx?AttachmentID=6.

[267] The final stimulus bill includes $7.2 billion for broadband deployment to unserved and under-served areas of the country. However, mechanisms for identifying these areas and structuring disbursement of

the funds were not included in the bill and will be developed by NTIA and the FCC. *See* Stephanie Condon, *Stimulus Bill Includes $7.2 Billion for Broadband,* Feb. 17, 2009, CNET NEWS.COM, *available at* http://news.cnet.com/8301-13578_3-10165726-38.html.

[268] *Health IT Stimulus*. However, some experts have suggested that these funds should be spent elsewhere, as the current generation of EHRs are unlikely to lead to promised welfare gains. *See* Lisa Wangsness, *Letter Highlights Hurdles in Digitizing Health Records*, Jan. 1, 2009, BOSTON GLOBE.

[269] For example, a number of executives working in the high-tech sector have recommended that any federal stimulus include tax credits for the investment in IT in order to promote continued innovation. *See* Janet Rae-Dupree, *Innovation Should Mean More Jobs, Not Less*, Jan. 4, 2009, N.Y. TIMES (noting that the plan "calls for a tax credit for companies that spend more than 80 percent of what they had been spending annually on information technology like computers and software.").

[270] *See The State of Aging and Health in America 2007,* at p. 2, Centers for Disease Control and Prevention and The Merck Company Foundation (2007), *available at* http://www.cdc.gov/aging/pdf/saha_2007.pdf.

[271] The Institute of Medicine in 2000 found that medical errors in hospitals cause upwards of 98,000 avoidable deaths each year. *See* Linda T. Kohn, Janet M. Corrigan, and Molla S. Donaldson, TO ERR IS HUMAN: BUILDING A SAFER HEALTH SYSTEM (National Academic Press 2000).

[272] *Joint Advisory Committee Report to Congress* at p. 40.

U.S. CHAMBER OF COMMERCE
ENVIRONMENT, TECHNOLOGY & REGULATORY AFFAIRS
1615 H Street, NW
Washington, DC 20062
Tel: 202-463-5533
Fax: 202-887-3445
www.uschamber.com/telecom