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## *Telemedicine Trends and Technologies*

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## Synopsis of this Report

This report provides a comprehensive overview of the telemedicine industry and technologies, the drivers of and barriers to telemedicine adoption, case studies, and strategies for identifying and developing telemedicine initiatives for healthcare organizations.

## Telemedicine: Definition and Context

Telemedicine is the use of technology to provide or enable the delivery of medical care remotely. Telemedicine connects patients, primary care and specialty providers via telephone, computer, and/or video and enables the exchange of data between sites of care.

“Telehealth” is a broader term describing the clinical and non-clinical services technology can facilitate, such as video conferencing, and remote medical education and research.<sup>1</sup> eHealth commonly refers to the use of consumer-centric health technologies such as Personal Health Records (PHRs), home monitoring devices, and patient portals to engage consumers in their healthcare. Increasingly, there is a web of interconnectivity among these tools and technologies. The landscape is further clouded by other products and “toys” that help monitor and manage health and fitness, such as Wii virtual fitness programs, which are far outside the traditional walls of medical offices and hospitals.

Telemedicine can be asynchronous, aka “store and forward” or synchronous, aka “real time.” Asynchronous is primarily used for transferring digital images (X-rays, MRIs, etc.) from site of origin to a location where appropriately skilled health professionals can review them for diagnostic purposes. Asynchronous telemedicine services enable hospitals or medical groups without certain specialists to provide patients with these specialists’ services from a distance. Synchronous, real time telemedicine uses video conferencing and patient monitoring technologies to connect a provider to either to a patient for direct care, to other healthcare providers for consultation and collaboration, or a combination of the two.<sup>2</sup>

## Drivers and Benefits of Telemedicine

The rise in the need for and use of telemedicine is driven by several factors, including an aging population with a high incidence of chronic disease, physician shortages, its broad applicability and proven cost-effectiveness, and the emergence of faster, better infrastructure, telemedicine technologies and devices.

As of 2005, roughly 45% of the US population had one or more chronic conditions, and this rate continues to increase, especially for some age cohorts. From 1995 – 2005, there was a 63% increase in the incidence of chronic conditions for those ages 45 – 64.<sup>3</sup> Telemedicine has

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<sup>1</sup> UnitedHealth Group’s Connected Care: <http://www.connectedcareamerica.com>, updated 2009, viewed 12/2009.

<sup>2</sup> “eHealth 201: Designing the Virtual Hospital” American Electronics Association, [http://www.aeanet.org/publications/idj\\_telemedicine\\_overview.asp](http://www.aeanet.org/publications/idj_telemedicine_overview.asp), published 12/2007, viewed 12/2009.

<sup>3</sup> Paez, Katherine, et. al.. “Rising Out-of-Pocket Spending for Chronic Conditions: a Ten-Year Trend”, *Health Affairs*, <http://content.healthaffairs.org/cgi/content/abstract/28/1/15>, published January/February 2009, viewed 12/2009.

proven to be an effective strategy for monitoring and managing some of today's most prevalent chronic conditions, including diabetes<sup>4</sup>, and Chronic Obstructive Pulmonary Disease (COPD)<sup>5</sup>.

The shortage of physicians is also contributing to the rise of telemedicine. The shortfall is most prevalent in – and will continue to be – primary care. It is estimated almost 60 million people in the US, including 37% of rural residents currently do not have access to a primary care physician.<sup>6</sup> On the other end of the spectrum, select sub-specialty providers and intensivists serving critically ill patients are also in short supply. The Department of Health and Human Services projects the demand for intensivists will continue to be greater than available supply for the next three decades.<sup>7</sup> By connecting patients and providers across geography, telemedicine helps close the provider shortage and geography gaps.

Telemedicine is not limited to monitoring of chronic conditions and remote ICUs. The use of telemedicine is expanding on many fronts, including: mental health triage; treatment for incarcerated individuals; patients presenting in emergency departments; primary care and specialty consultations to remote military stations and cruise ships; teledermatology; and remote rehabilitation. Additional innovative applications of telemedicine continue to emerge.

In addition to improving access to care and extending the reach of a limited number of providers, numerous studies cite cost savings from using telemedicine. A study from the University of Texas Medical Branch estimated our healthcare system could save more than \$4 billion annually with widespread use of telemedicine<sup>8</sup>. Another study from 2008, as reported in the Wall Street Journal found that annual savings from remote monitoring could be:

- \$10.1 billion for U.S. residents with congestive heart failure;
- \$6.1 billion for U.S. residents with diabetes; and
- \$4.9 billion for U.S. residents with COPD<sup>9</sup>.

Representative examples of innovative and cost-effective application of telemedicine are presented in the case studies below.

Appropriate utilization of telemedicine has a positive impact on patient safety and outcomes. In addition to improving access to needed care for rural and underserved populations, the automated monitoring and downloading of patient data enabled by telemedicine can decrease the risks of omissions and errors, enable richer quality reporting, and improve providers access to timely information. Telemedicine that includes remote video allows providers to pick up visual cues not discernable from data or phone conversations. Real time video communication among patients and two or more providers simultaneously also enables a rich flow of vital information.

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<sup>4</sup> "Telemedicine-Based Diabetes Management Program Focusing on Education and Eye Exams Improves Self-Management Capabilities and Outcomes For Low-Income Rural Patients," AHRQ Website, <http://www.innovations.ahrq.gov/content.aspx?id=1767#a3>, updated 11/2009, viewed 12/2009.

<sup>5</sup> "Telemedicine Increases Compliance, Reduces Costs in Patients With COPD." Medscape Today <http://www.medscape.com/viewarticle/712265>, published 11/12/2009, viewed 12/2009.

<sup>6</sup> UnitedHealth Group's Connected Care: <http://www.connectedcareamerica.com>, updated 2009, viewed 12/2009.

<sup>7</sup> Landro, Laura. "The Picture of Health", Wall Street Journal, <http://online.wsj.com/article/SB10001424052970204488304574428960127233136.html>, published 10/27, 2009, viewed 12/2009.

<sup>8</sup> UnitedHealth Group's Connected Care: <http://www.connectedcareamerica.com>, updated 2009, viewed 12/2009.

<sup>9</sup> "Companies Tap Wireless Technology To Boost Care, Reduce Costs" iHealthbeat.org <http://www.ihealthbeat.org/articles/2009/8/5/companies-tap-wireless-technology-to-boost-care-reduce-costs.aspx>, published 8/5/2009, viewed 12/2009.

## Telemedicine Technology

Essentially, there are two technology components in telemedicine, (1) **the broadband infrastructure** that enables the flow of vast amounts of information among sites of care and (2) the multitude of **monitoring and communication devices** used by patients and providers.

Access to broadband determines the feasibility of telemedicine. The FCC's minimum speed for broadband is 200 kilobits/second. At this speed, transmitting an X-ray takes 27 minutes. With broadband of 100 megabits/second it takes just four seconds.<sup>10</sup> The deployment of fast, affordable broadband connectivity has increased dramatically in recent years, but not consistently across geographies and economic classes. Many areas in the country still lack adequate access to broadband. Furthermore, broadband in the U.S. is on average two to three times slower than broadband in Japan and South Korea and yet costs more here.<sup>11</sup>

## The Telemedicine Industry: Where Is It and Where Is It Going?

Today's telemedicine market is the "the tip of the iceberg," both in innovative uses, emerging technologies, and prevalence. A November 2009 study by research firm Pike and Fisher anticipates the market for telemedicine devices and services will generate almost \$3.6B in services in the next 5 years<sup>12</sup> Furthermore, according to Gartner Research, by 2013, 25% of patient encounters in North America, Western Europe and Asia/Pacific that can be conducted virtually, will be.<sup>13</sup>

The ARRA of 2009 provided \$2.5B for the U.S. Department of Agriculture's Distance Learning, Telemedicine, and Broadband Program for the deployment of broadband, primarily to rural areas. In November 2009, the USDA released \$13M of these broadband grants. The ARRA also provides an additional ~\$4.7B in grant funding for the expansion of broadband in support of health data exchange and distance learning. The ARRA incentives for the adoption of EHRs by hospitals and physician offices will also help build the framework of technology across the industry needed to maximize the usefulness of telemedicine.

In the private sector, there is significant interest in telemedicine. One of the most notable programs is "Connected Care" a partnership between UnitedHealth Group and Cisco with a goal of developing a national telemedicine network connecting patients in underserved communities with specialists. UnitedHealth Group is uniquely positioned to foster – and directly benefit from – the program. It reports serving over 70 million individuals, having a national network of 590,000 care providers, and contracts with more than 4,900 hospitals. Cisco will provide the backbone for data transmission on an open network that will integrate with a range of EHRs and other IT platforms. At present, there are six pilot Connected Care programs underway and further expansion is planned.<sup>14</sup>

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<sup>10</sup> "eHealth 201: Designing the Virtual Hospital" American Electronics Association, [http://www.aeanet.org/publications/idji\\_telemedicine\\_overview.asp](http://www.aeanet.org/publications/idji_telemedicine_overview.asp), published 12/2007, viewed 12/2009.

<sup>11</sup> Williams, Walt. "Telehealth Network Connects Clinics to Hospitals", [www.statejournal.com/story.cfm?func=viewstory&storyid=67650](http://www.statejournal.com/story.cfm?func=viewstory&storyid=67650), published 10/1/2009, viewed 12/2009.

<sup>12</sup> Monegain, Bernie. "New Research Forecasts Swelling Telemedicine Market." Healthcare IT News, <http://www.healthcareitnews.com/news/new-research-projects-swelling-telemedicine-market>, published 10/8/2009, viewed 11/2009.

<sup>13</sup> UnitedHealth Group's Connected Care: <http://www.connectedcareamerica.com>, updated 2009, viewed 12/2009.

<sup>14</sup> Ibid.

In October 2009, Google Health<sup>15</sup> entered the world of telemedicine through a partnership with MDLiveCare, a telemedicine company that provides 24/7/365 access to doctors and licensed therapists via video, phone, and email. The partnership will allow Google Health users to share their PHRs with MDLiveCare providers and it will allow physician/therapist notes to be directly and completely ported into a patient's Google Health Record.

The telemedicine technology and device market is expanding, if not exploding. Interactive video, tele-robotics, and virtual reality technologies – and of course, the iPhone - are also being used for telemedicine alongside established modalities such as voice, e-mail, and PC data/imaging sending/retrieval.

The Pike and Fischer report highlights several market trends, notably that mobile services companies, such as AT&T, Verizon, and Sprint are positioned to have strong roles – and revenue - in the growing field. It also predicts significant mergers and acquisitions of smaller software and device manufacturers. Numerous technology powerhouses are also entering the telemedicine device and infrastructure market. For example, in April 2009, Intel and General Electric announced plans to invest over \$250 million over five years to develop health IT and home healthcare monitoring tools<sup>16</sup>.

If a major Healthcare Reform initiative is passed and it embraces broader use of and improved reimbursement for telemedicine, the industry could grow at an even faster pace.

## Barriers to Telemedicine Adoption

While telemedicine holds great promise, numerous challenges beyond broadband connectivity – thwart its adoption. Barriers include, but are not limited to:

- **Cost** – Building an organizational telemedicine capacity requires large up front investments in equipment, software, and training. This can be a great burden for healthcare entities, especially rural and safety net organizations, which in many cases are the organizations that could benefit most from the technologies. Typically, the investment offset comes not from increased revenue, but from increased utilization and economy-of-scale efficiencies. As more patients and providers are integrated into a highly networked telemedicine system, greater efficiencies and lower costs are achieved.
- **Reimbursement** – Today, Medicare reimbursement for telehealth services remains convoluted and limited primarily to rural health professional shortage areas. Medicare Part B pays for select, specific 1) remote patient face-to-face services via live video conferencing, or 2) non-face-to-face services conducted either through live video conferencing or via store-and-forward telecommunication service. As of December 2008, telehealth home care services remain outside the scope of the Medicare home health benefit and home health Prospective Payment System (PPS). CMS policies state nothing precludes a home health agency from using telemedicine technologies, but those technologies will not be recognized or reimbursed under Medicare home health benefits.<sup>17</sup>

<sup>15</sup> Merrill, Molly. "Google Health Adds Telehealth to the Mix." Healthcare IT News, <http://www.healthcareitnews.com/news/google-health-adds-telehealth-services-mix>, published 10/8/2009, viewed 11/2009.

<sup>16</sup> "Intel, GE Team Up To Develop Health IT, Telehealth Products" ihealthbeat, <http://www.ihealthbeat.org/articles/2009/4/2/intel-ge-team-up-to-develop-health-it-telehealth-products.aspx>, published 4/2/2009, viewed 11/2009.

<sup>17</sup> "Medicare Payment of Telemedicine and Telehealth Services." American Telemedicine Association, <http://www.americantelemed.org>, published 12/2008, viewed 12/2009.

Medicaid uses substantially the same definition for telemedicine as Medicare's definition of telehealth. Per the CMS website "States are encouraged to use the flexibility inherent in federal law to create innovative payment methodologies for services that incorporate telemedicine technology." The CMS website provides several examples of Medicaid reimbursement schemas.<sup>18</sup>

Commercial insurance payment for telemedicine varies widely. Some insurers are embracing telemedicine as a cost effective service model, as evidenced by UHG's Connected Care program. Others insurance companies reimburse on a case-by-case basis, and some not at all. A consistent policy and reasonable payment model across major commercial insurers is needed to drive the use of telemedicine.

- **Evolutionary Acceptance** – Telemedicine requires the buy-in of both patients and providers. The tradition of medicine has been "high touch; telemedicine pushes the far edge of "high tech" in the delivery of care and adapting to it will be an progressive process. The longstanding tradition of medicine being delivered in hospitals and physicians offices, combined with health information security and privacy concerns will require time, education of patients and providers, and proven security of data and information to change the paradigm.
- **Slow growth in EHR penetration** – The value of telemedicine is often optimized when data from remote devices can be automatically downloaded and analyzed in the receiving party's EHR or related technology. However, even after 30 years of evolution of EHR systems, only about 17% of physician practices have EHRs with advanced functionality.<sup>19</sup> Use of robust EHRs in hospitals equally low. As EHR usage increases and advanced functionality is embraced, there is increasing opportunity to tie telemedicine into the continuum of care.
- **Regulatory Roulette** – Telemedicine exists in a virtual healthcare ecosystem; laws for healthcare providers based in one state to remotely serve patients in another are not fully developed. For example some states will reimburse the fee for a radiologist to interpret – via telemedicine – a CT scan for a patient in another state, but it will nor reimburse the healthcare entities for the cost of transmitting the image or the equipment needed to support the services.<sup>20</sup> Similar inconsistencies exist for quality and reporting requirements. To foster the growth of inter-state telemedicine, states will need to promote cross-licensing agreements.
- **Lack of Best Practices and Evidence Based Care** – Consistent with most emerging, evolving practices and systems, telemedicine lacks published best practices and guidelines for evidenced based care. The lack of these essential frameworks is both driven by the lack of adoption and funding for telemedicine, and also contributing to it. Solid, embraced best practices for telemedicine could help foster adoption and insurance reimbursement, but it is difficult to identify best practices and establish evidenced-based models of care without a significant basis of experience.

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<sup>18</sup> Centers for Medicare & Medicaid Services website <http://www.cms.hhs.gov/Telemedicine>, updated 9/15/2009, viewed 1/2010.

<sup>19</sup> DesRoches, Catherine, et. al., "Electronic Health Records in Ambulatory Care - A National Survey of Physicians." New England Journal of Medicine, <http://content.nejm.org/cgi/content/full/NEJMsa0802005>, published 7/3/2008, viewed 12/2009.

<sup>20</sup> UnitedHealth Group's Connected Care: <http://www.connectedcareamerica.com>, updated 2009, viewed 12/2009.

## Towards a Telehealth Strategy

There are several key components that must be considered by healthcare organizations as they formulate strategies on telemedicine technologies and services:

- **Scope** – While the industry has established working definitions of telemedicine, telehealth, and eHealth, organizations must establish and share internal definitions of and boundaries for their telemedicine initiatives. Given the nascent stage of the industry and basis of experience, healthcare organizations should carefully select early initiatives that have a promising ROI, can be managed in good part with existing resources, and can be mined for lessons learned to apply for future expansion efforts.
- **Capacity build out** – The foundation of telemedicine is not the devices, but rather the technical infrastructure and a highly evolved EHR so information received from devices and other systems can be imported into patients' records in an actionable format. For organizations well into EHR planning and rollouts, now is the time to ensure telemedicine needs have been considered and the EHR has been configured to support envisioned telemedicine efforts. Organizations in earlier stages of EHR procurement and planning should recognize telemedicine as a growing delivery model and ensure the functional capabilities to support telemedicine and data exchange are embedded into the system design and/or build.
- **Collaboration** – By definition, telemedicine requires collaboration with and among healthcare entities. A myriad of connections and partnerships exist among healthcare providers: large academic centers affiliating with community hospitals, rural hospitals banding together, community health centers expanding their reach, medical groups acquiring hospitals. In each of these relationships telemedicine can and will play a role. Planning for it proactively will help keep all parties expectations, strategies and timelines in sync. As noted above, the true value of telemedicine comes as the network of institutional and individual users expands.
- **HIE Opportunities** – The ARRA of 2009 allocated billions of dollars to telemedicine and broadband in recognition of the growing importance of and need for expanding healthcare services through the use of technology. Organizations formulating telemedicine strategies should identify how to tap into the federal, state, and regional funding opportunities and build the internal capabilities (infrastructure/networks, HIT, and EHRs) to support health information exchange (HIE) efforts, including telemedicine. Concurrently, organizations must work with business partners to develop telemedicine programs and initiatives that align with overarching regional needs, and healthcare reform and expansion objectives.

## Telemedicine Case Studies

- **West Virginia's "Metro Fiber Build"** – In the fall of 2009, West Virginia announced it will use broadband to link several community clinics primarily in the rural and medically underserved Appalachia region with larger urban hospitals. It is the start of a larger effort to get 300 healthcare organizations across the state on-line. The initiative is funded by nearly \$10M in federal, state, and participating institutions' funds. The nonprofit West Virginia Telehealth Alliance recently was formed to promote the expansion of telemedicine in the state. It brings

together healthcare providers, government, business and labor representatives and will be heavily involved in the Metro Fiber Build project.<sup>21</sup>

- **Missouri Telehealth Interpretation Project**<sup>22</sup> - A project, a partnership between the Missouri Telehealth Network and a St. Louis interpreter service called “Language Access Metro Project” (LAMP), trains interpreters in specialized medical interpretation skills so they can provide services – free of charge for the first two years of the program – at clinics and hospitals in the St. Louis area. Through video service, they can interpret and watch for cultural signs and body language. The program is off to a slow start in St. Louis, but its coordinators are optimistic it will accelerate as more equipment is installed and more people learn of the program; a similar program in Kansas City has been quite successful.
- **Avera Health System 18-hospital, five-state eICU** – The Sioux Falls, South Dakota based Avera Health System uses its VISICU eICU system to cover 72 intensive-care beds in 18 hospitals spread over five states. At Avera, ICU mortality has been significantly lower than expected based on a predictive rating scale. That improved performance translates into about 400 lives saved. Rural hospitals in the Avera network estimated a nearly 38% reduction in the number of patients being transferred to larger hospitals after the system went live, saving more than \$1.2 million. Overall, reduced length of stay (LOS) in the ICU saved Avera \$8M.<sup>23</sup>

The 11-year-old VISICU company (now owned by Phillips Electronics) that provided Avera’s eICU system supplies the technology to 42 health systems and serves about 10% of the nation’s ICU beds. The technology typically costs \$4 - \$5 million to install, and can cost \$2 million annually to staff and maintain. But hospitals – large and small, urban and rural – that use such systems say they soon pay for themselves in reduced costs, mortality and length of stay in the ICU.<sup>24</sup>

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<sup>21</sup> Williams, Walt. “Telehealth Network Connects Clinics to Hospitals”, [www.statejournal.com/story.cfm?func=viewstory&storyid=67650](http://www.statejournal.com/story.cfm?func=viewstory&storyid=67650), published 10/1/2009, viewed 12/2009.

<sup>22</sup> <http://www.lampagency.com>, viewed 1/2010.

<sup>23</sup> Landro, Laura. “The Picture of Health”, Wall Street Journal, <http://online.wsj.com/article/SB10001424052970204488304574428960127233136.html>, published 10/27/2009, viewed 12/2009.

<sup>24</sup> Ibid.