



Telehealth's promising global future

Yet barriers remain for much-needed transformation of healthcare delivery models.



BY RAJIB GHOSH (LEFT) AND THEO AHADOME (RIGHT)

Chronic disease burden is growing around the world. In the United States alone, 48.3 percent of the population is expected to have one or more chronic disease conditions by 2020 [1]. As income rises in developing nations, chronic disease conditions such as diabetes are spreading rapidly, thus straining fledgling economic growth. In the case of the United States, chronic disease has serious financial consequences as

healthcare costs are expected to claim 20 percent of the country's GDP by 2019 [2]. Meanwhile, thanks to the 2010 reform legislation, an estimated 32 million more uninsured U.S. citizens will enter health insurance plans over the next few years [3]. Additionally, at the current rates of physicians graduating and retiring, the United States could experience a shortage of 150,000 physicians in 15 years, according to the Association of American Medical Colleges.

Basic microeconomic theory tells us that when the demand for a service outpaces the supply, the price for the service goes up. If the price increase is artificially controlled, then the quality and timeliness of the delivery of service tends to decline. Given the impending supply shortage, how can nations such as the United States find ways to "bend the cost curve" while improving quality, access and continuum of care beyond what is currently available?

Telehealth, which includes low-touch ways of remote monitoring patients in their home, is one potential answer. Telehealth, however, faces a number of major barriers to wide-scale adoption. Analytics can help break down the barriers.

WHAT IS TELEHEALTH?

Telehealth, a loosely used term in the healthcare industry, includes monitoring of patients' vital signs remotely and managing their disease progression with





continuous health-risk assessment via automated question-and-answer sessions. While telehealth can include video-based remote consultation between a patient and a health-care professional, it is not a means to practice medicine

using a video network. The latter definition rightly falls under telemedicine. Data collected from telehealth modality, which includes both objective data such as vital sign measures and subjective data such as symptoms, knowledge and patient behavior, are then used by an intelligent system to determine a risk level for each patient.

The system enables an efficient, yet effective, patient population management by a healthcare professional. The intelligent system is based on the rules defined by the healthcare professional for each patient or a population of patients suffering from the same or similar conditions. Such an intelligent system can then be extended to analyze past information for the patient and suggest possible future outcomes, triggering timely intervention by the healthcare professional. Such an expert system can also route the action plan necessary for a patient to the appropriate health-care professional – a nurse, a primary

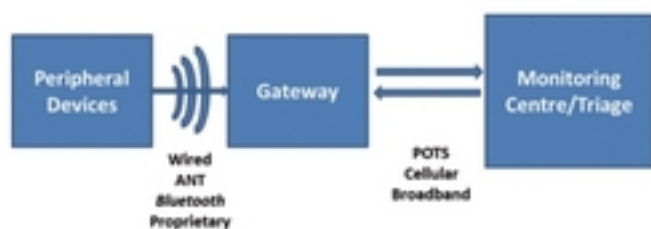


Figure 1. Telehealth system.

care physician responsible for the patient or even to a specialist if the medical system of the provider organization or the region allows for such automatic routing. In other words, telehealth is a mechanism to expand bandwidth of healthcare professionals for delivering the right treatment at the right time and in the right place to their patients.

BARRIERS TO ADOPTION

The concept of telehealth has been available for almost two decades. However, adoption remains relatively low. In the United States, a successful, large-scale telehealth program was pioneered by the Veterans Health Administration (VHA) in the initial trials of the Care Coordination and Home Telehealth (CCHT) program beginning in 2001. The CCHT program was based on the VHA's recognition that high-risk, high-cost veterans representing 4 percent of the Veterans Integrated Service Network's (VISN) population accounted for 40 percent of its costs.

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Since the inception of this service, the VA has increased the number of patients under its telehealth regimen to more than 50,000 and aims to increase that to around 100,000 during the next few years. In a case study published in 2008 involving 17,025 patients, the VHA experienced a dramatic reduction of hospital admissions, inpatient days and care costs while generating high levels of patient satisfaction. Hospital admissions fell by 19.7 percent, while the average per patient per year cost came down to \$1,600 compared to \$13,121 for VHA in-home-based primary care and \$77,745 for nursing home care services. Despite such huge success, telehealth has not been accepted in the medical community as a standard of care, and the healthcare industry – payers and providers included – continue to test this modality in one trial after another.

Other countries have also fallen victim to this “trial paralysis” syndrome. In Canada, the TELUS Remote Patient Monitoring (RPM) system in the Pointe-de-l’Île Community Health Centre increased nurse productivity and lowered costs. Registered nurses increased the number of patients managed from 30 to 80 per week, resulting in a 167 percent increase in productivity. Using RPM, home visits per year were reduced from an average of 12

to two, which could save the healthcare system approximately \$450 per patient. The program was introduced in January 2009 at the Pointe-de-l’Île community health centre for patients with chronic diseases such as diabetes, hypertension, CHF and COPD [4]. Again, despite this, a wider scale adoption of remote patient monitoring is not being implemented.

In the United Kingdom, more than 100 telehealth projects are running across National Health Services (NHS) organizations to address patients with chronic conditions such as CHF, COPD and diabetes. The U.K. currently has approximately 10,000-12,000 telehealth installations, and a small number of primary care trusts (PCT) such as North Yorkshire are now looking at major implementations of 2,000 or more. Given that England has more than 15 million people with long-term conditions, there is a long way to go before we can say that telehealth has the same market penetration as telecare. Other than a handful of PCTs having major projects (more than 1,000 patient enrollments) most of the implementations are still small-scale, proof-of-concept studies (typically <100 patients enrolled).

The U.K., however, may soon recover from this trial syndrome. Results of its Whole System Demonstrator (WSD)

telehealth trial with 6,100 patients showed a 15 percent reduction in A&E visits, a 20 percent reduction in emergency admissions, a 14 percent reduction in elective admissions a 14 percent reduction in bed days, an 8 percent re-

duction in tariff costs, and, most importantly, a 45 percent reduction in mortality rates. Consequently, in December 2011, the NHS announced plans to implement telehealth to 3 million patients over the next five years. Should this go ahead, it will be the most significant telehealth roll-out worldwide, and if successful, it will go a long way to providing a strong clinical and economic case for telehealth. Consequently, the forecasts for subscriber numbers will look considerably different to that shown in Figure 2.

In China, telehealth has the opportunity to extend care to the extraordinarily large number of patients in remote rural areas. In November 2010, Ideal Life, a telehealth provider, announced that more than 100,000

patients across the Shandong Province in China would take part in a remote health monitoring initiative [5]. The program encourages patients to use interactive kiosks and remote health monitoring devices in villages and community hospitals across Shandong to record health information that is then electronically transmitted to their healthcare provider.

‘TRIAL BY PARALYSIS’ SYNDROME

Despite the handful of successes, the “trial by paralysis” syndrome has restricted the estimated number of patients currently on telehealth worldwide to 200,000 [6] compared to the 2 billion people with chronic disease. Various reasons explain this dichotomy:

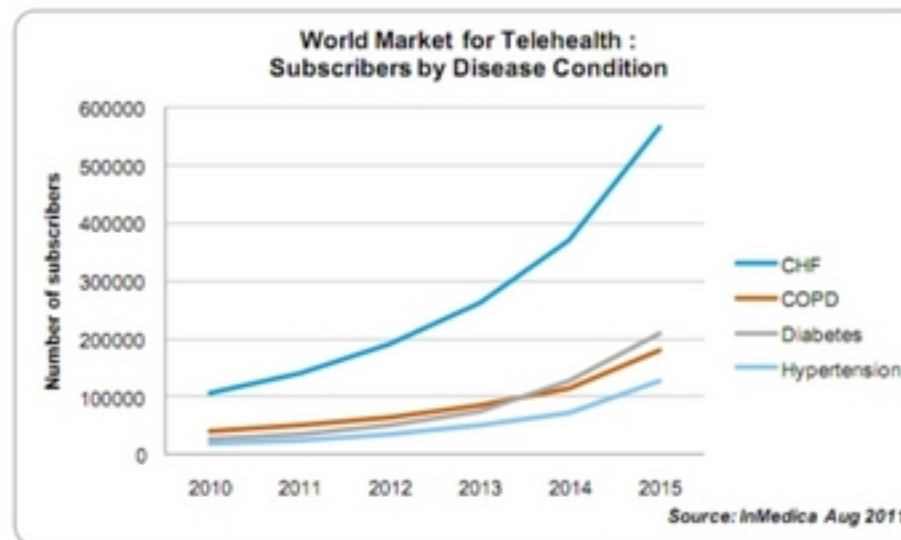


Figure 2. Telehealth subscribers by disease condition.



Telehealth produces a deluge of data including vital signs and symptoms collected from the patients. Physicians are worried that this critical information may get lost in the data tsunami and they may miss some early signs of disease exacerbation.

- 1. Lack of reimbursement.** The biggest challenge is the lack of reimbursement for telehealth. A successful telehealth program requires up-front investment and in many cases reorganization of the clinical workflow. Without a defined reimbursement model classified by the common procedure terminology (CPT) code for telehealth, the medical community is unwilling to take on this "extra" work.
- 2. Lack of clear evidence base.** Both providers and payers need clear evidence that shows the economic and clinical benefits of telehealth usage. The economic benefits, in terms of reduction of costs to the payer, are particularly important to establish in order for payers to consider paying for telehealth systems. At the moment, this is not firmly established from current trials. The recent announcement of the success of the U.K. trials showed an 8 percent reduction in costs. In a recently concluded demonstration pilot funded by Center for Medicare and Medicaid Services (CMS), 7.7 percent to 13.3 percent savings (per quarter per person) was reported involving 1,767 patients [7]. If further details of these trials are

released, they should start to form the foundation of the evidence base. Similar results will, however, need to be replicated in other countries and a clear methodology established.

- 3. Legal fears.** Telehealth produces a deluge of data including vital signs and symptoms collected from the patients. Physicians are worried that this critical information may get lost in the data tsunami and they may miss some early signs of disease exacerbation. This may cause them to be targets for malpractice lawsuits.
- 4. Different schools of thought in the medical community.** The medical community is split when it comes to embracing telehealth as a standard of care. While some are vocal about the necessity of wide-scale adoption of telehealth, others are not convinced that telehealth can actually improve quality of care delivered. This goes back to the lack of a clear evidence base.
- 5. Patient engagement.** A telehealth program can be successful if patients are engaged and hence compliant to the clinical regimen recommended by their healthcare provider. It is easier to empower an engaged patient to do self-management of his or her disease condition. While

patient compliance within VHA the patient population was very high (85 percent are in daily compliance), only 37 percent patient compliance has been reported in the aforementioned CMS funded study. This is a difficult problem to solve. Different companies are trying newer techniques like "gamification" or "social rewards," albeit with limited proven results so far.

- 6. Lack of interoperability standards.** Two levels of interoperability, or lack thereof, are often mentioned as barriers to adoption of telehealth. The first is the wireless interoperability between medical devices such as blood pressure monitors and a telehealth gateway device. The second is the interoperability between telehealth data and the data in a provider's Electronic Medical Record (EMR) system. Interoperability need of the first kind is currently addressed by the Continua Alliance, an industry consortium of 240 companies worldwide, with published standardized protocol specifications. However, a number of devices that are compliant to this standardized interface is still very low (40 products). Integrating data collected via telehealth to patient's EMR system is also a big challenge.

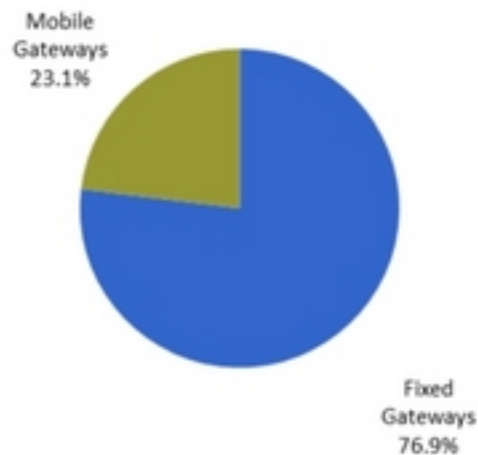


Figure 3. Relative proportions of gateway types, 2020 estimate.

Source: InMedica

We expect EMR systems of the future will utilize a similar standardized interface and will accept all kinds of telehealth data including but not limited to vital sign measures and patient's answer to symptoms, behavior and knowledge questions. Powerful business intelligence tools can then be utilized to gain new insights about patients and make smart predictions about anticipated "flare ups" of disease conditions.

WHAT WILL TELEHEALTH LOOK LIKE IN THE FUTURE?

A new challenge confronting health-care providers who are willing to embrace telehealth as a care-delivery modality is the changes in patient demographics and

their personal preferences in terms of the technology used [8]. Two phenomena, occurring simultaneously, help explain it:

1. A significant number of younger patients have entered the chronically ill population with chronic disease conditions such as diabetes, obesity and mental health disorders [9].
2. A rapid proliferation of advanced consumer electronics and personal communication tools, even among elderly patients, has caused patients to ask for newer and more modern care delivery channels.

Furthermore, younger patients are more mobile and they are more used to technology than their elderly counterparts. As baby boomers enter the chronically ill patient population, with their exposure to smart phones and the tablet PC and Internet world, traditional hub-based devices are no longer the preferred choice for telehealth. It is also important that mobile gateways are integrated into one's existing smartphone or PDA. According to InMedica, in 2010, only 6.7 percent of the gateway units shipped were estimated to be mobile. However, forecasts indicate that the number of mobile gateways sold yearly from 2010 to 2020 will grow rapidly at a compound annual growth rate (CAGR) of more than 68 percent, which

is much faster than the overall telehealth market growth of 48.8 percent CAGR.

Patients increasingly prefer small, wireless vital signs monitors that they can wear on the move. These devices provide better mobility and make telehealth non-obtrusive to patients' daily lives – an essential factor for improving patient compliance. InMedica research shows that the vast majority of current vital signs monitors are wired devices, but wireless devices are forecast to account for nearly half of all vital signs monitors by 2020.

As a result, a new "multi-modal," non-obtrusive, telehealth delivery system is slowly but surely emerging as a requirement for keeping patients emotionally engaged and compliant, two key critical success factors for a telehealth program. A "multi-modal" telehealth system can include various channels of patient-to-system communication: via a traditional telehealth hub device, Web (PC or tablet), mobile phone, interactive TV or interactive voice response system (IVR). Each "modality" has its own usability paradigm that needs to be understood and carefully modeled within the context of the communication in order to deliver the best value. At the same time, this "multi-modal" patient-system interaction needs to be transparent to a healthcare professional; otherwise, a "multi-modal" telehealth system cannot be implemented at scale.

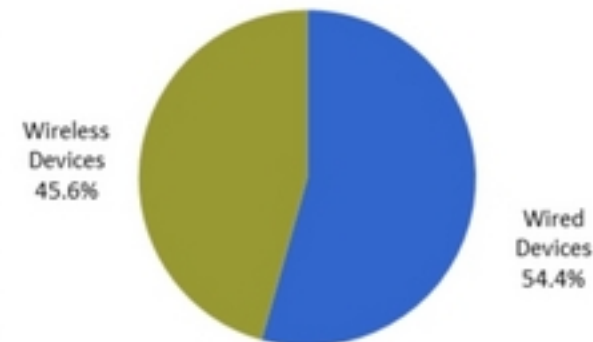


Figure 4. Relative proportions of peripheral device types, 2020 estimate.

Source: InMedica

CAN ANALYTICS SOLVE TELEHEALTH ADOPTION BARRIERS?

The application of data analytics can improve telehealth adoption in a number of ways, including:

1. **Choosing patients for telehealth programs.** In order for a telehealth program to be effective and successful it needs to be better targeted. As with any other drug or medical procedure, telehealth is not appropriate for every patient. It is important to identify which patients will benefit most from such a care-delivery model based on a variety of information about the patients collected by care providers over time including, but not limited to, insurance claims, disease/condition and patients' ability to use technology. Patient selection plays an important



role in determining the success of a telehealth program. It is, however, possible to build smart algorithms in a telehealth system to digest all these data and identify a certain population of patients within the large pool of patients for whom telehealth makes sense vs. traditional delivery models. This will improve the chances of success with a telehealth program and produce a better return on investment.

2. **Establishing an evidence base.**

As discussed earlier, the lack of clear evidence on the economic and clinical benefits of telehealth remains a significant barrier to reimbursement and subsequent adoption. Although a few trials have shown success, the healthcare industry has not always been in agreement on methodology and scalability of the results. Part of the problem is an agreed method of assessing what the outcomes for a patient would have been without telehealth. By integrating individual patient histories, predictive analytics can evaluate the most likely disease paths for that particular patient in the current healthcare delivery

system vs. that particular patient's results from a telehealth programs. This also allows an assessment of the costs of care from both care delivery pathways (telehealth vs. traditional). With clearly established systems for such predictive analysis, telehealth can overcome the evidence-base issue.

3. **Establishing personalized patient care delivery.**

Once the right patients are chosen and better outcomes are broadly expected by using telehealth, analytics can go one step further: the delivery of care that closely matches a patient's requirements. Patients are currently monitored within hospitals and clinics. Telehealth allows this monitoring to continue once they leave these facilities. By combining these systems, continuous monitoring across the care continuum is achieved. Consequently, healthcare providers can start making smarter decisions about what solutions, drugs, etc. to provide to particular patients based on the continuous data collected about them. Continuous monitoring, together with analytics, can help the healthcare system move into



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ADDITIONAL INFORMATION

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the realm of more personalized delivery by better understanding the full meaning of patients' vital signs readings, allowing providers to respond appropriately to changes. In other words, 98.6 degrees Fahrenheit is normal body temperature – but not normal for everyone.

CONCLUSION

The future of telehealth on a global scale is promising, but it is not a silver bullet for addressing the chronic care burden of every country. Telehealth is a means of enhancing an organization's ability to provide quality care in patients' homes and delay the need for expensive hospital admissions or traditional nursing home care. Besides cost savings and bridging healthcare access barriers in rural regions or developing nations, telehealth provides the opportunity to gain significant medical insights by analyzing continuous health data for a patient collected through remote monitoring, combined with other data sources such as labs, pharmacy and EMR. Analytics can unleash the potential of this big data to make healthcare delivery more predictive, preemptive and personalized – a welcome change from today's reactive "sick-care" model. |

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