

Home-based Telehealth

a report by

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In the late 1960s, Dr Jay Sanders, then in residency training at Massachusetts General Hospital in Boston, worked with a team to link Logan Airport to the hospital using a television camera for emergency medical consultations. Since then, rapid progress has been made in the field of telemedicine. The challenges to telemedicine, not just in the US but worldwide, have never been in providing greater access to care for those who are isolated from care by reasons of geography, transportation or financial resources, but rather in its implementation and understanding.

It is said that telemedicine is 'a picture requiring a thousand words'. Whether it is available bandwidth, acceptable technology, cost-effective operating expenses or recognition by healthcare financiers of its value, telemedicine has stumbled over each of these obstacles. It can be said that it is an industry on the longest 'take-off roll' in history. The successes of telemedicine can be seen by the use of far more modest 'telehealth' tools, not from the hospital or clinic but, rather, from the home.

The Challenges of Telemedicine

The historic challenge with telemedicine was that it was conceived with the notion of benefiting the patient. However, any successful emerging technology in healthcare must recognise that there are four elements that must either be satisfied or otherwise considered if that technology is to find mainstream application. The patient comprises only one of these elements and has in fact been seen by some as the least important element in the equation. The interests of the other elements – providers (physicians, hospitals, nurses, etc.), payers (health maintenance organisations, governments, etc.) and pharmaceuticals (including device manufacturers) – are far more controlling in adopting and using emerging health technologies of any type. Hence, the migratory path from grant-funded research demonstration projects to mainstream daily utilisation for telemedicine has been long and arduous, which then raises the issue of why this is so.

By solving one problem of access to care for isolated patients, telemedicine created others that fell short of

satisfying the rules of the other three elements. For physicians, telemedical consultations often take longer than office visits, making them inefficient and not cost-effective. Moreover, until the recent migration of videoconferencing tools to the desktop, physicians were required to leave their offices and travel to a telemedicine studio, again neither efficient nor cost-effective.

For hospitals, patients consulted via collaborative telemedical means often meant loss of revenue and, again, inefficiencies in the care delivery schema. Even rural hospitals, often touted as logical telemedicine sites, would prefer to have a physician specialist travel to their hospital and perform procedures rather than merely 'seeing' a patient virtually. Payers have been understandably reluctant to pay for any process that, rather than reducing the numbers of nurses and doctors required to deliver care, adds to their number a team of video engineers, expensive bandwidth and video equipment. Moreover, many video consultations still resulted in a referral of that patient to a doctor for follow-on care and treatment, which is hardly a model of efficient care. Finally, the device manufacturers themselves, never at a loss to provide telemedically ready medical peripherals, often raised the cost of equipping a programme beyond the limits of even grant-funded programmes. Consequently, while surveys found patients to be quite satisfied with being consulted in a virtual environment, the collective bottom line of cost versus reimbursement was weighed down heavily.

New Approaches

A chronic condition is defined as a condition that requires on-going medical care, limits what one can do and is likely to last longer than one year. Typical diseases cited in this category include diabetes, hypertension, cardiovascular and long-term respiratory ailments, HIV/AIDS and obesity. These conditions are pervasive not just in the US where an estimated 120 million Americans have one or more chronic conditions, but on a global basis where increasing urbanisation, dietary and lifestyle changes and environmental conditions have produced a world at risk. Chronic conditions are often associated with an

ageing population and a recent study revealed that 83% of Americans over the age of 65 report a chronic condition and/or disability or functional limitation.¹

However, these conditions are not the sole province of an ageing population. Whether it is a growing sedentary lifestyle or dietetic changes, far more youth are being found at risk of obesity and diabetes than ever before. A collection of new trials, demonstrations and even successful business models has ventured forth from the telemedicine arena. These successes do not have common tools and approaches but a single common focus on those patients suffering from chronic disease, which is where the four elements that are the decision-drivers of healthcare meet the following four principles that are required for a successful immersion of technology into the continuum of care:

- compliance;
- connection/connectivity;
- community; and
- cost-efficacy.

The University of South Alabama introduced the BioTrac programme, a project designed to improve the health status of the chronic disease sufferer in Alabama. The State of Alabama has high statistical rankings in the areas of chronic disease sufferers including hypertension, diabetes and obesity. In addition, much of Alabama's population is rural and often isolated from speciality care. These rural patients face challenges in transportation, financial reimbursement for their required care, access to care and even infrastructure support that urban areas take for granted. To be successful, the project needed to achieve the four principles of successful chronic disease management in a telehealth environment.

Compliance

The programme had to focus on compliance, the act of following a care-giver's drug, diet and exercise advice, and a compliant patient would be better able to manage their condition with fewer complications than a non-compliant patient.

Connection/Connectivity

Improving the daily management of a chronic sufferer required connection in a near realtime manner to the patients' home in a means and manner most likely to be used by the patient. As these

patients' sole lifeline to the outside world is a standard telephone line, the connectivity had to utilise this narrow bandwidth highway.

Community

Chronic sufferers often require an ecosystem of care that features multiple providers. In some cases they are seen by home healthcare workers, in others by primary care physicians and, in other cases, by specialists or even family members. Creating a community-centred data home about the patient with appropriate, yet secure, access to this data by all approved members of the community of care is critical.

Cost-efficacy

The final principle is cost-efficacy. Scalability requires a value proposition that is borne of two equally important parts. First, the actual cost of the telehealth home monitoring equipment must be modest and, second, its impact of use must be clearly identifiable with cost-effective outcomes.

Grounding Truth in Chronic Care

It was believed that achieving these four principles would promote demonstrable positive outcomes in the lives of chronic patients. To demonstrate this approach, the focus was on chronic patients suffering from a range of conditions (some multiple conditions) including obesity, diabetes, congestive heart failure and hypertension.

The means of connectivity started with the choice of the CyberNet Medstar™ dual-tone frequency modulator modem. This device is about the size of a deck of cards, is battery-powered and standard telephone-line-operable with one-button-use technology. As many patients do not own a computer or do not have even rudimentary technological skills, the one-button-to-operate feature was paramount. In addition, the MedStar has multiple ports for data acquisition from a variety of medical peripherals. These peripherals include blood pressure, peak flow, pulse ox, scales and glucometer. This provided the ability to monitor multiple chronic disease states and to realise that there is no 'one-size-fits-all' solution but rather a 'one-size-fits-some' approach to managing chronic patients.

The medical peripherals plug into the MedStar, which then collects and transmits data in an encrypted format across the telephone line to a

1. "Partnership for Solutions", A Project of Johns Hopkins University and The Robert Wood Johnson Foundation.
2. "Fostering Rapid Advances in Health Care: Learning from System Demonstrations, Committee on Rapid Advance Demonstration Projects: Health Care Finance and Delivery Systems", Corrigan J M, Erickson S M, Greiner A, (eds), National Academy Press: 2003.

collection server and from there to a database server. Each patient's data is stored in a patient record, which is accessible only to a defined patient-specific community of care.

With the focus on compliance and early intervention with trending episodic events of these chronic illnesses, data is monitored as it is received by a trained nursing co-ordinator. The co-ordinator focuses first on whether the patient has provided timely transmission of their physiologic values (weight, blood pressure, blood sugars, etc.). Failure to transmit in a timely manner results in a gentle telephone reminder to the patient. Transmitted data that presents adverse trending as defined by the physician care-giver also results in a telephone call to the patient and to the physician. In many cases, this telephone call reveals a patient whose medication has run out, or whose diet may have varied from what was originally prescribed.

This human troubleshooting may result in a visit to the doctor or from a home health worker or simply a reminder of dietary or lifestyle restrictions. Clearly, the overall outcome is a patient who now has a connected community of care focused on compliance and early intervention, with far more data to optimally manage the patient than ever before.

The Suitability of this Approach

The University project has produced a litany of supportive patient testimonials. Moreover, in the patient population who were frequently admitted to hospital for their conditions, there was only one visit to an accident and emergency (A&E) department in the course of a year.

The Results of the Trial

The project's compliance-oriented, connected community of cost-efficacy clearly meets the criteria of the four-element standard enunciated at the outset of this article:

- The physicians have data to better manage their patients that have been acquired in a non-invasive manner, wholly supportive of their aims of good health management. For the hospitals, often stressed by over-utilisation of their A&E departments, this approach offers a welcome relief.
- For the payer, 95% of all healthcare expenditure is currently devoted to direct medical care services, mainly for the treatment of people with chronic diseases. This approach reduces the cost of care while enhancing patient health.
- For the device manufacturers, this field of home health telemedicine offers an excellent opportunity for providing cost-effective tools and resources in what is clearly a growth industry.
- Finally, and most importantly, the patient becomes a partner in their community of care ecosystem. They are given the tools, resources and reminders with which to stay healthier and to understand the consequences of decisions on their health status.

Home-based telehealth represents the fulfilled promise of telemedicine to enhance patient care. Despite taking nearly 50 years, take-off of the industry is upon us and global health outcomes will be the better for it. [n](#)