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Role of Information Technology in
Diabetes Healthcare Management - Merits
and Limits

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in Diabetic Foot Infection and their Clinical
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Atherosclerosis in Diabetes Mellitus:
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**TREATMENT OF
DIABETIC NEUROPATHY**

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◆ Pranatharthy Venkatesan
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Role of Information Technology in Diabetes Healthcare Management - Merits and Limits

Many doctors appreciate technology, some doctors adopt it, but very few have applied technology in their day-to-day practice, even though the writing is clear that the future of medical informatics and innovations lie in this direction. The following article attempts an analysis on this topic of futuristic importance.

Introduction

The fusion of information/communication technology with healthcare is commonly known as "telemedicine". For over three decades, many developing nations are actively involved in developing patient centric telehealth systems.

Telemedicine has been defined as the use of telecommu-

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nications to provide medical information and services¹.

- It may be as simple as two health professionals discussing a case over the telephone.
- As sophisticated as using satellite technology to broadcast a consultation between providers at facilities in two countries, using video conferencing equipment or robotic technology - using available technology in each country.

While the first one is used daily by most healthcare professionals, the latter is used by the military and some large medical centers around the world.

These days number of patients and their physicians use e-mail to communicate with each other for basic communication and even for drug prescriptions.

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up is provided to patients at a distance with the use of telecommunications/internet², where comprehensive personal medical record of the patient is accessible online through a secured system.

"How electronic communication is changing healthcare" an entire issue (May 2004)³ was

devoted by the *British Medical Journal* with wide ranging topics involving future of electronic communication and healthcare, National Program for Information Technology. The first-generation of E-patients and "Patients experience with Diabetes Support Program based on an Interactive Electronic Medical Record; Qualitative Study", plus various other topics were reported.

Much earlier (October 2002)⁴ we had presented the preliminary experience with the Personal Electronic Medical Record System of our dynamic interactive portal on clinical diabetes in 197 persons with diabetes viz., www.diabetopaedia.com and their successful distant – management using our customized E-consult facility.

Technologies

There are two types of technologies widely used in telemedicine. The first, called store and forward, is used in teleradiology, which is in practice across the world for a long time and now also in the field of telepathology. Here digital images are stored and are transferred from one location to another be it within the country or outside, using the internet.

The second one is called the two-way interactive television (IATV), where different institutions at various levels offer 'face-to-face' consultation and is actively pursued using this technology. This is popularly known as video conferencing and this is achievable only with very high bandwidth and connectivity.

This technology can be very useful for a rural patient to consult with a specialist in an urban locality without having to travel long distances.

When we talk about tele/distance medicine, we've got to take into consideration the diversity of diseases, varied healthcare systems and outcome expectations around the world⁵. Many developing nations have a temptation to induce western technologies into their health systems that are naïve to western approaches to healthcare. Without paying greater attention to the historical underpinnings, cultural and technological readiness of every nation, right from the basic conceptualization to suit that country's health practices, much effort could yield none or sometimes negative results⁵.

Applications

Almost all specialties of medicine have been found to be conducive to telemedicine consultation, but more so for the treatment of chronic ailments like diabetes, hypertension, neurological conditions, etc. where surveillance of the patients' by their doctor is more important than personal meetings with doctors.

There are a number of research initiatives happening around the world to connect peripheral devices to computers to aid in an interactive examination. In the field of diabetes, for instance, a glucometer can be connected to a computer to send out CBG readings as alerts to the patients' consulting doctors' mobile phone. Another

instance of an electronic stethoscope allows the consulting physician to hear the patient's heartbeat.

Mobile ambulances use wireless technology for connectivity while transporting patients from home to hospitals and are sophisticated enough to provide mobile telemedicine services².

Advantages

Diabetes is a tough disease to tackle. The most important challenge/aim is to improve the coordination of care, to reduce the number of hospitalizations and to prevent severe complications among persons with diabetes.

A case-study discussion led by HBS Professor Nancy Beaulieu⁶ have come with some important points that encourages the use of internet based telemedicine systems in coming out with several approaches in management of patients with diabetes to increase patient awareness and empowerment.

The simplest is probably to offer a monitoring system for patients who have already been diagnosed as diabetics, by sending out e-mails or making phone calls to remind patients of test and check-up dates.

Another route is to offer a combined monitoring, tracking and alert system. This method automatically lets the healthcare provider know if patients skip their tests or if a more intensive treatment seemed warranted by the latest test results.

A third approach although less common is to create a coordinated

“virtual team” around the patient, by sharing lab data insurance claims data and pharmacy data in an attempt to enhance overall care⁶.

The telehealth model

An ideal telehealth system should have three important functions for any healthcare delivery system to be implemented successfully and for sustained approach:

- Education and information module
- A comprehensive online electronic patient data storage and retrieval system (electronic medical record [EMR]/electronic health record [EHR])
- A dynamic interaction platform for:

Patient - doctor interaction.

Doctor - doctor Interaction.

The education and information model should provide up-to-date useful information about diabetes and its related complications in a simple patient friendly language without threatening them.

Such a model would prove to be a boon in scientific-management of several chronic disorders (during the asymptomatic stage) like diabetes, hypertension, etc. and would definitely lessen the burden of complications, improve the quality-of-life, productivity and prove cost-effective both for the persons affected and for the country.

Online electronic medical record storage and retrieval system (EMR/EHR)

Online EMR is an exhaustive

health file, which offers convenience, confidentiality and maintains comprehensive record retrospectively and prospectively for the patients and their personal doctors. This system aids any doctor in viewing his/her patient's records in part/totality from anywhere in the world.

Without this foundation, available to the healthcarer, any E-consult facility is liable to be casual and subject to medical errors. It will be a mere E-correspondence and not E-consult in the true sense.

The EMR/EHR database is the core of the entire network.

- It is an able interface that aids in the centralized data storage and retrieval for the entire network.
- It also assumes the responsibility for proper coordination and maintenance of the entire network.
- It assists in telemedical interaction and flow of expert data from centers with expertise to centers that require that expertise, bridging the distances in space and time.

Dynamic interaction module

This module would be a confidential and secured medium of interaction to aid in mutual interaction of two groups viz.

- Patient-doctor interaction.
- Doctor-doctor (referral specialists') interaction.

This robust medium would provide a 'positional independence' and allows the patient and doctors to interact from anywhere, anytime.

Telemedicine-patients' acceptance and satisfaction

Any solution/service in healthcare is not complete when it does not satisfy or bring in patient acceptance. There are many studies that have been conducted and published in many leading *International Journals* on the use of web-based systems and tools in treating/managing diabetes. A case study that is published in *British Medical Journal* reports that when a web-based chronic disease management program was introduced to nine type 2 diabetic patients, they felt much secure about their health and healthcare and said that they were looked after well by their healthcare providers⁷.

The largest study with a sample size of 495 patients was conducted at the Telemedicine Center at East Carolina University School of Medicine in Greenville, NC in the year 2000 – titled “Patient Satisfaction With Tele-medicine 2000”.

The objective of this study was to evaluate patient satisfaction when telemedicine is used for clinical consultations.

Patient satisfaction from real-time interactive telemedicine clinical consultations was examined in relation to patient age, gender, race, income, education and insurance and overall patient satisfaction was found to be 98.3%⁸.

Merits

As explained earlier telemedicine provides an able interface for a patient to obtain

advice from their own doctor or a referral opinion without having to move out of their home or hometown. This means specialty care is easily accessible to both rural and urban populations, particularly useful in areas where distances and transportation is difficult, time-consuming and expensive. Also, this modality is very useful for management of elderly/dementia persons at home or in care-institutions.

The use of video consultations from a rural clinic to a specialist though not feasible today will become more affordable in days to come as infrastructure is just coming up now.

Video conferencing also opens up new possibilities for accessing programs like CME's, exhibitions, conferences for education or training for isolated or rural health practitioners.

While studies have yet to confirm this, it appears that the use of telemedicine can also cut costs of medical care for those in rural areas².

EMR/EHR with well-planned networking could play a pivotal role in understanding and planning of epidemiology and prevention of important global health threats of the future viz. AIDS, infections like Bird Flu, Mad Cow disease, etc., apart from the ever increasing diabetes, coronary artery disease, cancer, dementia, stroke, etc.

Limits

There are many challenges that we may have to face while addressing about telemedicine.

Restrictions for telemedicine

reimbursement when compared to face-to-face consultations.

Fear of malpractice suits – medicolegal issues.

Lack of infrastructure like bandwidth, connectivity and communication links.

As we all know many rural areas still do not have access to high bandwidth connectivity that is required for those who could most benefit from telemedicine.

Acceptance and support from Government/Public Health Initiatives.

Motivating medical professionals and paramedical professionals to embrace information technology and putting in to use in their profession.

Various standards and compliances like HL-7, HIPAA, DICOM, Encryption, Security and Privacy in storing and transmitting patient data and interoperability between various systems.

Conclusion

- An interactive education and information module with up-to-date information to empower the patient with thorough knowledge about their health condition without threatening them. This would be ideal/preferred to be in both English and in regional/local language for easy reach and better assimilation.
- A validated and comprehensive EHR system to maintain retrospective and prospective health data of all patients' involved in the program in a chronological order that provides authentic

and credible medical data from urban, semi-urban and rural areas, which will cover all the fields of epidemiology, management and education of all important diseases.

- Telemedicine system provides the ideal platform to develop a community based healthcare strategy and access to ongoing specialized healthcare to all, thereby making distances and changes inconsequential, thus, opening up an opportunity to a global perspective to treatment plan and specialist opinions.
- Internet based health system replaces cumbersome manual record keeping, unnecessary visit to doctor's clinics (for chronic and life-long disorders with minimal/no symptoms), and at the same time getting the same personalized regular, timely and ongoing monitoring and advice by the patients' own doctors.
- While many countries and states are actively looking at the possibility for creating centralized health data repositories, issues like patient privacy, security of health data, access controls and privileges and inter-operability across different health systems with control and most importantly backup and disaster recovery systems should properly be evolved and implemented without compromising on standards and compliances that are presently available and should be upgraded/updated with the latest emerging technologies.

Analytical Study

- The most important aspect is that companies developing such systems should appreciate and understand the limits of using technology up to the point beyond which human/medical practitioners interface is inevitable.
- Also companies involved in the development of solutions for the healthcare industry should have core domain expertise and total commitment to this industry.

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