

TELEMEDICINE

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1: ABSTRACT

In this paper telecommunication and information technologies are used in order to provide clinical health care at a distance. It helps eliminate distance barriers and can improve access to medical services that would often not be consistently available in distant rural communities. It is also used to save lives in critical care and emergency situations.

Although there were distant precursors to telemedicine, it is essentially a product of 20th century telecommunication and information technologies. These technologies permit communications between patient and medical staff with both convenience and fidelity, as well as the transmission of medical, imaging and health informatics data from one site to another.

Early forms of telemedicine achieved with telephone and radio have been supplemented with video telephony, advanced diagnostic methods supported by distributed client/server applications, and additionally with telemedical devices to support in-home care.

2: INTRODUCTION

Telemedicine is the use of electronic information to communicate technologies to provide and support healthcare when distance separates the participants.

“Tele” is a Greek word meaning “distance” and “mederi” is a Latin word meaning “to heal”. Time magazine called telemedicine “healing by wire”. Although initially considered “futuristic” and “experimental,”

telemedicine is today a reality and has come to stay. Telemedicine has a variety of applications in patient care, education, research, administration and public health. Worldwide, people living in rural and remote areas struggle to access timely, good-quality specialty medical care. Residents of these areas often have substandard access to specialty healthcare, primarily because specialist physicians are more likely to be located in areas of concentrated urban population. Telemedicine has the potential to bridge this distance and facilitate healthcare in these remote areas.

3: HISTORY OF TELEMEDICINE

While the explosion of interest in Telemedicine over the past four or five years makes it appear that it's a relatively new use of telecommunications technology, the truth is that telemedicine has been in use in some form or other for over many years. In fact first telephone call can be argued as telemedicine call. “Watson, come here I want you” said Alexander Graham Bell on March 20, 1876, when he inadvertently spilled battery acid on himself, while making the world's first telephone call. Little did Bell realize that this was indeed the world's first telemedicine consultation!! The National Aeronautics and Space Administration (NASA) played an important part in the early development of telemedicine. NASA's efforts in telemedicine began in the early 1960s when humans began flying in space. Physiological parameters like pulse and blood pressure were transferred

using telemedicine from both the spacecraft and the space suits during missions. These early efforts and the enhancement in communications satellites fostered the development of telemedicine and many of the medical devices in the delivery of health care today. NASA provided much of the technology and funding for early telemedicine demonstrations. In India, Telemedicine was used during Kumbh mela & during earthquake in Gujarat in year

of 2001. Telemedicine services are utilized during tsunami in coastal areas in South India.

And many more such pioneering efforts have done in India and across globe.

“I think it is a very wonderful contribution to the healthcare of the people who live in rural villages and I hope that people all over the world will follow your lead, because if they do then the benefits of high-tech medicine can go to everyone and not just people who live in big cities” Quote by Mr. Bill Clinton, former president of United States during his visit to Telemedicine center at South India..

3: DEFINITIONS AND CONCEPTS

3.1 Telemedicine

The World Health Organization (WHO) defines Telemedicine as, “The delivery of healthcare services, where distance is a critical factor, by all healthcare professionals using information and communication technologies for the exchange of valid information for diagnosis, treatment and prevention of disease and injuries, research and evaluation and for the continuing education of healthcare providers, all in the interests of advancing the health of individuals and their communities.”

3.2 Telehealth

Telehealth is the use of electronic information and telecommunications technologies to support long-distance clinical healthcare, patient and professional health-related education and training, public health and health administration.

3.3 Telemedicine Consultation Centre (TCC)

Telemedicine Consulting Centre is the site where the patient is present. In a Telemedicine Consulting Centre, equipment for scanning / converting, transformation and communicating the patient's medical information can be available.

3.4 Telemedicine Specialty Centre (TSC)

Telemedicine Specialty Centre is a site, where the specialist is present. He can interact with the patient present in the remote site and view his reports and monitor his progress.

3.5 Telemedicine System

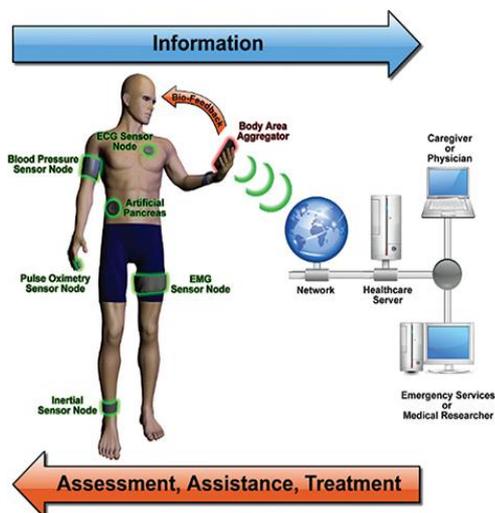
The Telemedicine system consists of an interface between hardware, software and a communication channel to eventually bridge two geographical locations to exchange information and enable teleconsultancy between two locations.

The hardware consists of a computer, printer, scanner, videoconferencing equipment etc. The software enables the acquisition of patient information (images, reports, films etc.). The communication channel enables the connectivity whereby two locations can connect to each other.

4: Types of Technology

Two different kinds of technology make up most of the telemedicine applications in use today. The first, called store and forward, is used to transfer digital images from one location to another. A digital image is taken using a digital camera, 'stored' and then sent ('forwarded') by a computer to another location. This is typically used for non-emergent situations, when a diagnosis or consultation may be made in the next 24-48 hours and sent back. Teleradiology, telepathology and teledermatology are a few examples.

The other widely used technology, the two-way interactive television (IATV), is used when a 'face-to-face' consultation is necessary. The patient and sometimes their provider or more commonly a nurse practitioner or telemedicine coordinator (or any combination of the three), are at the originating site. The specialist is at the referral site, most often at an urban medical center. Videoconferencing equipment at both locations allows a 'real-time' consultation to take place. Almost all specialties of medicine have been found to be conducive to this kind of consultation including psychiatry, internal medicine, rehabilitation, cardiology, pediatrics, obstetrics and gynecology and neurology.



5:TELEMEDICINE TECHNOLOGY EVOLUTION IN INDIA

The telemedicine centers could be broadly classified into the following classes:

- a) Point to point
- b) Point to multipoint
- b) Multipoint to multipoint
- c) Tele-education

- Point to point means one point patient to doctor communication.
- Point to multipoint means many centered doctor consulting a patient.
- Multipoint to multipoint communication means many doctors treating many patients at a time online.
- Tele-education means educating rural area about medical health.

6:Telecommunication Technologies

The first among the challenging questions arising when planning a telemedicine network is ‘What is bandwidth?’ Bandwidth is the capacity that determines how quickly bits may be sent down the channels in a telecommunication medium. Bandwidth is proportional to the complexity of the data for a given level of system performance. The following technologies are currently in use:

6.1 Integrated Services Digital Network (ISDN)

ISDN is a dial-up (not dedicated but used on a call-by-call basis) digital connection to the telecommunication carrier. An ISDN line can carry information at nearly five times the fastest rate achievable using analog modems over POTS (plain old telephone service).

6.2 T-1

This is the backbone of digital service provided to the end user (typically business) in USA today which transmits voice and data digitally at 1.554 megabits per second (Mbps). It can be used to carry analog and digital voice, data and video signals and can even be configured for ISDN service.

6.3 Plain Old Telephone Service (POTS)

POTS transmit data at a rate of up to 56 kilobits per second (kbps) (Bezar 1995) and are the most widely available telecommunication technology in the world. POTS can be suitable for audio conferencing, store-and-forward communication, Internet and low bandwidth videophone conferencing.

6.4 Internet

The Internet has a strong impact in delivering certain kinds of care to patients. In a survey of 1,000 Chief Intelligence Officers (CIOs) conducted by Internet Health Care Magazine, 65% said their organization had a Web presence and another 24% had one in development. With the increasing proliferation of e-health sites on the Web today, many consumers are finding access to online patient scheduling, health education, review of lab work and even e-mail consultations.

7: Application of Telemedicine in Public Health

- 1) It can give new insight into geographical distribution and gradients in disease prevalence and incidence and valuable insight into population health assessment.
- 2) It also provides valuable information of differential populations at risk based on risk factor profiles.
- 3) It helps in differentiating and delineating the risk factors in the population.
- 4) It also helps in interventional planning, assessment of various interventional strategies and their effectiveness.

- 5) It can play a pivotal role in anticipating epidemics.
- 6) It is an essential tool in real-time monitoring of diseases, locally and globally.
- 7) GIS provides the basic architecture and analytical tools to perform spatial-temporal modeling of climate, environment and disease transmission helpful in understanding the spread of vector-borne diseases. Remote sensing techniques have been recently been used in this regard.

7: CONCLUSION

It does not require too much of a stretch of imagination to realize that telemedicine will soon be just another way to see a health professional. Remote monitoring has the potential to make every minute count by gathering clinical data from many patients simultaneously. However, information may be lost due to a software glitch or hardware meltdown. Therefore, relying too heavily on a computer system to prevent errors in healthcare data may be problematic. There has to be a smart balance between total dependence on computer solutions and the use of human intelligence. Striking that balance may make all the difference in saving someone's life. In 2008, the potential of telemedicine, tele-health and e-health is still left to our imaginations. Time alone will tell that Telemedicine is a "forward step in a backward direction" or to paraphrase Neil Armstrong "one small step for IT but one giant leap for Healthcare".

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