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## Telemedicine in Health Care Service.

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### ABSTRACT

E-health is healthcare practice which utilizes electronic processes and processes and communication. It is an umbrella term which comprises a range of services like electronic health records, telemedicine, consumer informatics, virtual healthcare, healthcare information systems. Telemedicine has been a technological takeaway for the developed countries. In developing countries like India, it is being viewed as a tool for improving care and enhancing access to healthcare. In India majority of the population lives in rural areas, where healthcare facilities are inefficient and inadequate, tools like telemedicine bridges the gap between the demand and supply.

**Keywords:** Telemedicine, Teleconferencing, Teleconsultation, Sanjeevani

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## INTRODUCTION

Telemedicine is the delivery of healthcare services by healthcare professionals using information and communications technologies for the exchange of valid information for diagnosis, treatment and prevention of disease and injuries. The aim of telemedicine is to provide expert-based health care to understaffed remote medical sites and to provide advanced emergency care through modern telecommunication and information technologies. There are many disciplines in telemedicine such as teleradiology, telepathology, teleconsultation, teleconferencing and telepsychiatry.

## TELEMEDICINE MODELS

### Real-Time

This is quite common used in Telemedicine. For an example, video conferencing where live video allows the provider, patient and specialist to communicate together to achieve the best outcome for the patient.

### Store and Forward (asynchronous)

It is used when both health providers are not available at the same time. The provider's voice or text dictations on the patient's history, current affliction including pictures, radiology images, etc., are attached for diagnosis. This record is either emailed or placed on a server for the specialist's access. The specialist then follows up with his diagnosis and treatment plan.

## ROLE OF TELEMEDICINE IN INDIA:

### Need for Telemedicine:

India is a vast country with a high population growth rate, high rural percentage of population, high rates of illiteracy, poverty and unemployment. Factors that block efficient delivery of healthcare services include inadequate health infrastructure, clinical services, and outflow of doctors to the developed world and lack of training facilities. It is noted that over 80% of India's main healthcare centres are located in the cities that host only 30% of the population and it reflects that country's 20% quality healthcare facilities cater to almost 70% of the population. India's rural population is thus more vulnerable than its urban population. Thus rural health care is characterized by lack of qualified doctors, non-availability of specialists and patients being serviced by unqualified practitioners, late discovery of ailment and delay in treatment.

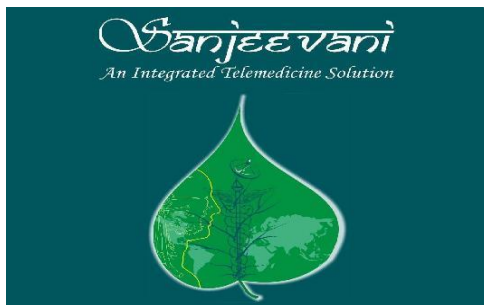
- Inadequate infrastructure in rural hospitals
- Large number of patients requires referral for specialty care
- Low-availability of Health Experts in remote hospitals
- A significant proportion of patients in remote locations could be successfully managed with some advice and guidance from specialists and super-specialists in the cities and towns
- Telemedicine has the potential to assist in electronic delivery of diagnostic and healthcare services to remote rural population thus can create a platform to network India

### Sanjeevani

The availability of an efficient and modern broadband telecommunications infrastructure emphasize the growth of real-time telemedicine applications. Due to limited infrastructural capacities, developing countries focus on store and forward concept of telemedicine. Sanjeevani is an integrated telemedicine solution utilizing computers and communication technologies for the purpose of medical diagnosis, patient care, expert consultation and medical education. Sanjeevani is one of the rare applications of telemedicine developed in India. It was developed as part of telemedicine project sponsored by Department of Information Technology. It is a hybrid model of telemedicine that uses the store and forward as well as real time concept. An integrated video conferencing application enables real-time telemedicine.

**Two features of Sanjeevani namely:**

1. Capability to adapt to different types of communications links (Plain Old Telephone System and Integrated Services Digital Network) and
2. Inherent flexibility to be used with low cost medical peripherals promise widespread adoption of telemedicine in healthcare setups in smaller cities as well.

**Fig 1: Sanjeevani****Specialties of Sanjeevani**

**Telediagnosis:** Transfer of Patient data, images, report and investigations from one site to another location for expert opinions.

**Tele-education (Distance Learning):** Use of information technology to provide education by linking educators with geographically separated medical students.

**Teleconsultations:** Consultation between two or more geographically separated physicians connected through the use of information technology.

**Special Features of Sanjeevani:**

- GUI: Sanjeevani supports GUI, which makes the application easy to use and interactive.
- Clinical Reports : Sanjeevani will support the transmission of the pathological reports like Urine, Stool, Hematology and Biochemistry
- EPR: A comprehensive Electronic Patient Record with demographics such as Name, Age, Sex, Address etc. The database of a patient stores the physiological parameters like BP, Heart rate, and Temperature. It stores, Family History, Personal history of the patient. The Patient records can be sorted with respect to the patient ID, name, sex and date.
- Image Enhancer : The non-DICOM digitized images can be viewed and enhanced by the user for their brightness, contrast, zoom, region of interest annotation etc, to enhance the images captured or received from the far end.
- HL7: Sanjeevani supports HL7 version 2.3.1 standard (HL7), which provides standards for the exchange, management and integration of data that supports clinical patient care and the management, delivery and evaluation of healthcare services. Specifically, to create flexible, cost effective approaches, standards, guidelines, methodologies, and related services for interoperability between healthcare information systems.
- DICOM Support: Sanjeevani supports the Digital Imaging and Communications in Medicine (DICOM). It is a Standard, a set of rules that allows exchange of images and associated information between imaging machines, computers & hospitals.
- Peripherals: The medical peripherals like Electronic Stethoscope, Spirometer, and Ophthalmoscope can be integrated into the application.
- Communications: It will work both on LAN (10/100 Mbps) and ISDN (Integrated Services Digital network) 128 Kbps.
- Video Conferencing: It will support Video conferencing. It will also support standard MS Net-meeting.



- Security and Consistency: It will authenticate and verifies whether a connection is authorized to connect to the host Sanjeevani site. It uses encryption algorithms like SHA1 to secure medical data.
- Help: Users are provided with the help in case they find any difficulty in using the system.
- Online Store and Forward: When both the sender and receiver is active, it can send and receive online patient data.
- Secured Environment through Encryption and VPN (Virtual Private Networks).

#### **TELEMEDICINE NETWORK:**

In 2001 ISRO developed a telemedicine project, pilot which created a telemedicine network in India and treated more than 25,000 patients. This network stretches to around 100 hospitals all over the country with 78 remote/rural/district hospitals/health centres connected to 22 specialty hospitals in major cities.

Many States have come forward to introduce telemedicine for regular operation and have planned to equip all the district hospitals with telemedicine facility both for ambulatory & intensive care treatment. Karnataka, Chattisgarh, Kerala and Jharkhand are some of the states which have initiated the establishment of Satellite Based Telemedicine Facility for all their district hospitals and a few trust hospitals.

As a result of ISRO's Telemedicine endeavor, remote areas like Kargil and Leh in the North, offshore islands of Andaman and Nicobar and Lakshadweep, as well as some of the interior parts of Orissa, Karnataka, Kerala, Chattisgarh, J&K, North-eastern states of India and some tribal districts in certain other states have access to specialty healthcare from some of the major specialty hospitals in the country today.

#### **Implementation of Telemedicine:**

A telemedicine system in a small healthcare centers consist of a personal computer with customized medical software connected to a few medical diagnostic instruments, such as an ECG or X-ray machine or an X-ray scanner. Digitized medical images and diagnostic details of patients are dispatched to specialist doctors through the satellite-based communication link. The specialist examines the reports, diagnose, interact with the patients along with local doctors, and suggest appropriate treatment through video-conferencing.

Connectivity for telemedicine software solution is a major concern as many of the remote sites in India covered do not have basic telephony services. To transmit quality video and voice/audio in videoconferencing across long distances, higher bandwidth is required. Centre for Development of Advanced Computing (CDAC) uses ISDN connectivity having bandwidth of up to 384 Kbps. It has been implemented in India over six locations:

1. PGIMER Chandigarh
2. AIIMS New Delhi
3. SGPGI Lucknow
4. IGMC Shimla
5. PGIMS Rohtak
6. SCB Medical College Cuttack.

#### **Benefits of Telemedicine**

Telemedicine can benefit isolated communities and areas where access to specialized care is difficult. To attain equal health care in remote and isolated areas, telemedicine software applications are of particular interest in several ways:

#### **Benefits to Patients**

- Access to specialized health care services by under-served rural, semi-urban and remote population
- Access to Specialists without physical referral
- Reduced physician's fees and cost of medicine
- Reduced visits to specialty hospitals

- Reduced travel expenses
- Early detection of disease
- Reduced burden of illness

**Benefits to Healthcare Professionals:**

- Continuing education and training
- Improved diagnosis and better treatment management
- Quick and timely follow-up of patients discharged after palliative care
- Access to computerized data of patients, both offline & real time

**Applications of Telemedicine**

**Continuing Medical Education:**

Continuing Medical Education (CME) efforts provide doctors at rural healthcare centres a chance to upgrade their medical knowledge and skills through interactions with experts at the specialty hospitals through satellite based tele-link. Such interactions indirectly result in significantly enhancing the quality of healthcare available to rural patients.

**Mobile Telemedicine:**

Mobile telemedicine unit comprises of medical equipment along with telemedicine hardware, software and VSAT system mounted in a bus/van can establish a mobile telemedicine centre at any place. The major area of mobile telemedicine applications are in the field of Tele-ophthalmology and community health.

**Village Resource Centres and Telemedicine:**

ISRO has also initiated pilot projects for integrating telemedicine with the resource information database as well as tele-Education facilities at the Village Resource Centres (VRC) to reach out to more rural areas of the country. The first of the pilot projects has been implemented in the state of Tamil Nadu where the nodal centre operated by an NGO agency at Chennai is connected to remote villages in three districts.

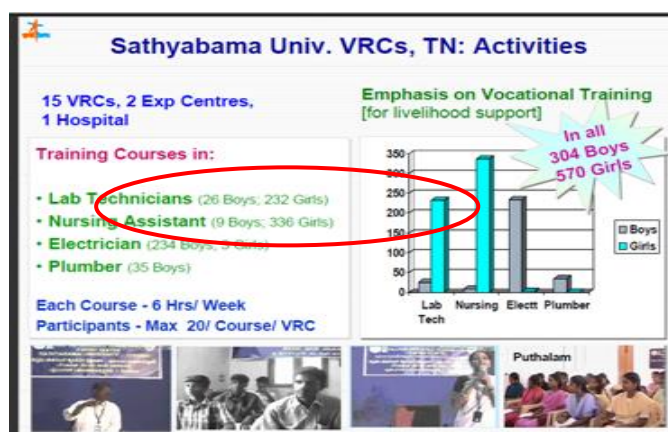


Fig 2: VRC activities by Sathyabama University

**CONCLUSION**

Telemedicine endeavor is expanding its outreach and has the potential to open up new frontiers for facilitating rural healthcare in India. ISRO has also envisioned the development of "HEALTHSAT", an exclusive satellite for meeting the healthcare and medical education needs of the country at large. This satellite, when deployed along with wireless and terrestrial communication links, can bring a large change in augmenting the present healthcare delivery system in the country. Due to the untiring efforts of various departments like the

Department of Space and the Department of Information Technology, State governments, NGOs and Private and corporate hospitals/agencies, the majority of the rural population all over the country will stand to benefit from telemedicine technology that can usher in a revolution for transforming the face of healthcare in India. Thus, Telemedicine can enlarge the gap between life and death and can extend quality healthcare to the needy and the under privileged rural, semi rural and urban population at large.

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