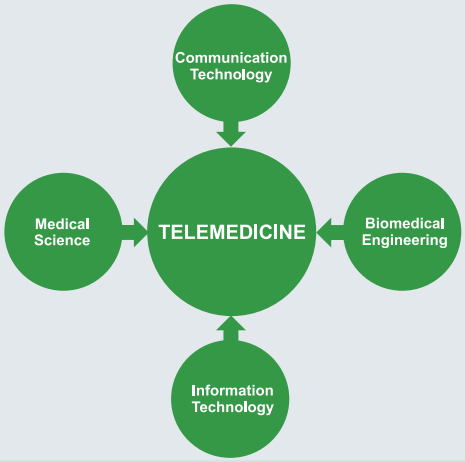
What is Telemedicine?

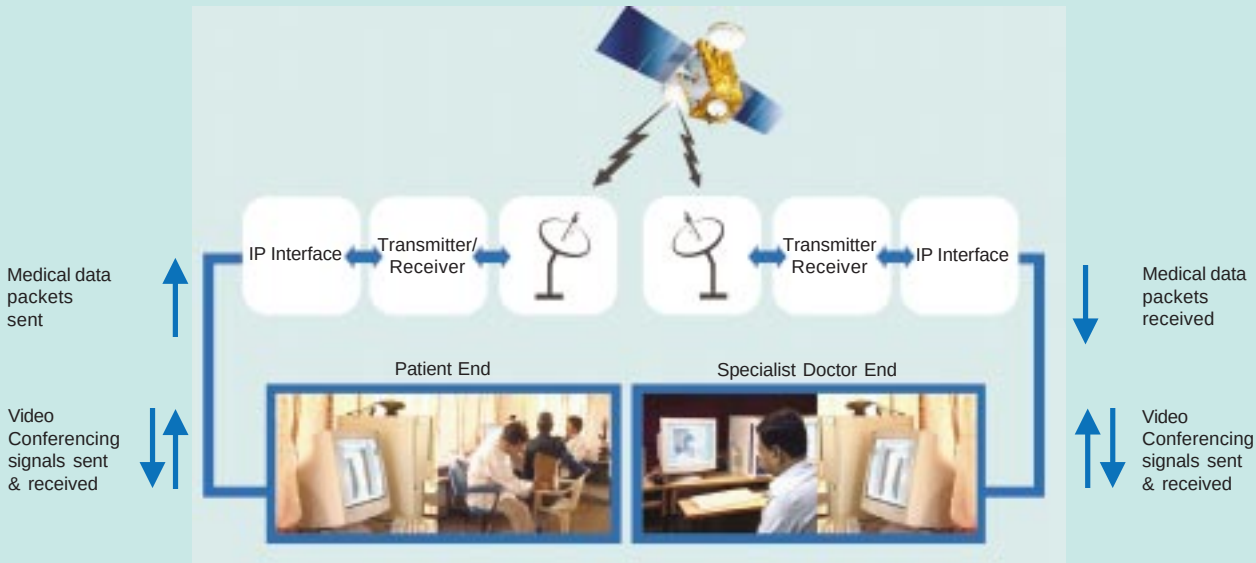
"The delivery of healthcare services, where distance is a critical factor, by all healthcare professionals using information and communication technologies for the exchange of valid information for diagnosis, treatment and prevention of disease and injuries, research and evaluation, and for the continuing education of healthcare providers, all in the interests of advancing the health of individuals and their communities"



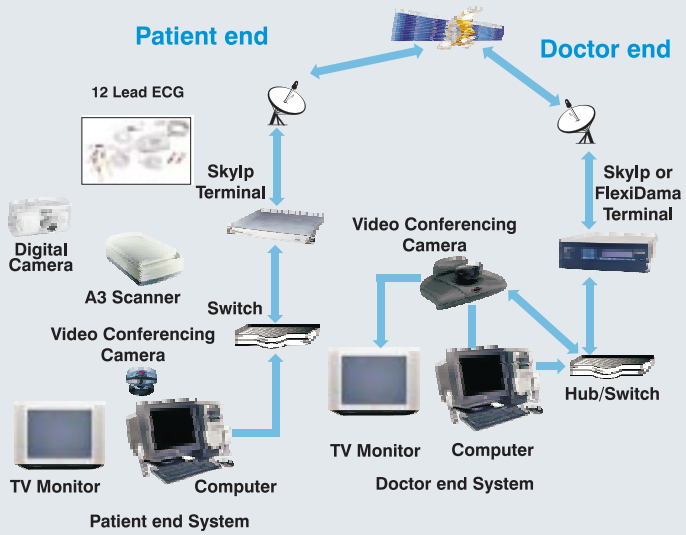
Technology of Telemedicine

Telemedicine is a confluence of Communication Technology, Information Technology, Biomedical Engineering and Medical Science. The Telemedicine system consists of customised hardware and software at both the Patient and Specialist doctor ends with some of the Diagnostic Equipments like ECG, X-ray and pathology Microscope/Camera provided at the patient end. They are connected through a Very Small Aperture Terminal (VSAT) system and controlled by the Network Hub Station of ISRO. Through a Telemedicine system consisting of simple computer with communication systems, the medical images and other information pertaining to the patients can be sent to the specialist doctors, either in advance or on a real time basis through the satellite link in the form of Digital Data Packets. These packets are received at the specialist centre, the images and other information is reconstructed so that the specialist doctor can study the data, perform diagnosis, interact with the patient and suggest the appropriate treatment during a Video Conference with the patient end. Telemedicine facility thus enables the specialist doctor and the patient separated by thousands of kilometers to see visually and talk to each other. This enables the specialist doctor to assess the physical and psychological state of the patient and suggest treatment. This remote tele-consultation and treatment is much more valuable in case of post operation (Post Surgery) follow up since the patient is not required to travel unnecessarily and hence saving money and time. In this way, the systematic application of Information and Communication Technologies to the practice of healthcare rapidly expands the outreach of the healthcare system.

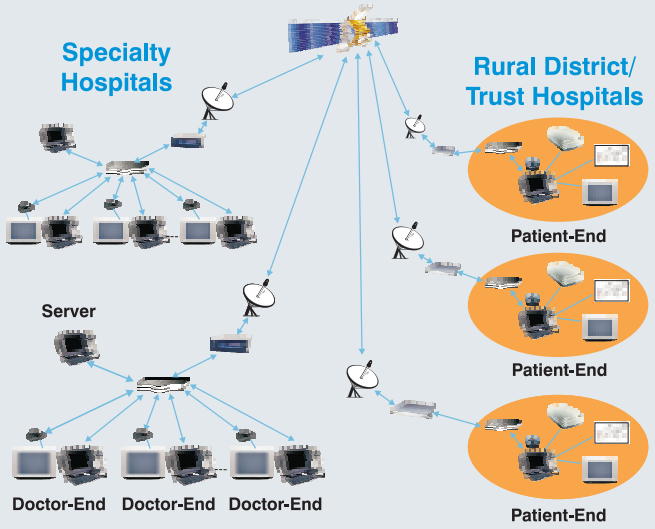
SATCOM BASED TELEMEDICINE CONNECTIVITY



POINT TO POINT SYSTEM



MULTIPOINT-TO-MULTIPOINT SYSTEM



Telemedicine Technology – Evolution

- Point to Point System - One patient end connect to One Specialist Doctor within the hospital
- Point to Multi Point System - One patient end at a time connect to any of the specialist Doctors' end within the hospital
- Multi Point to Multi Point System - Several patients' end simultaneously connect to different Doctors' end at different hospitals at different geographical locations

Major areas of Telemedicine Technology Adopted...

- Tele-consultation
- Tele-diagnosis
- Tele-treatment

} The patient with the local doctor consults the specialist, obtains the line of treatment

- Tele-education
- Tele-training

} For Continuing Medical Education, Training for doctors & paramedics from a higher level Hospital/Institution

- Tele-monitoring – Regular monitoring for intensive care & emergency care
- Tele-support – Support during disaster management

ISRO's Telemedicine Program – Thrust Areas Providing Technology and Connectivity

- Remote/Rural Hospitals and Specialty Hospitals
- Continuing Medical Education (CME)
- Mobile Telemedicine Units
- Disaster Management Support (DMS)

Telemedicine Initiatives

Beginning with ISRO's Telemedicine pilot project of 2001, the Telemedicine Network in India has treated more than 25,000 patients. Presently, ISRO's Telemedicine Network stretches to around 100 Hospitals all over the country with 78 Remote/Rural/District Hospitals/Health Centres connected to 22 Specialty Hospitals located in the major cities.

Many States have come forward to introduce Telemedicine on a regular operational basis and have planned to equip all the District Hospitals with Telemedicine facility both for ambulatory & Intensive care treatment. Karnataka, Chattisgarh, Kerala and Jarkand 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. This will soon be followed by other States too.

As a result of ISRO's Telemedicine endeavour, remote areas like Kargil and Leh in the North, offshore islands of Andaman and Nicobar and Lakshwadeep, 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.

Continuing Medical Education

Under ISRO's Telemedicine programme, 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. The Continuing Medical Education programme has been integrated with the tele-education programme by linking some of the Medical Institutions with the Specialty Hospitals and Research Centres.

Mobile Telemedicine

Mobile Telemedicine Unit consisting 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 Opthalmology and Community Health. Under Mobile Tele Opthalmology, Rural Eye Camps

can be conducted and the Rural Population can undergo eye screening for Cataract, Glaucoma and Diabetic Retinopathy. Under Community Health Program, Mobile Telemedicine units are very useful not only for Disease Prevention but also for Health Promotion in terms of running awareness camps & teaching hygienic practices.

Village Resource Centres and Telemedicine

Recently, ISRO has also initiated pilot projects for integrating Telemedicine/Tele-health with the Resource Information database as well as Tele-Education facilities at the Village Resource Centres/Community 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 wherein the nodal centre operated by an NGO agency at Chennai is connected to remote villages in three districts and more are to come in the future.

One of the major advantages of Telemedicine technology has been the saving of cost and effort to the rural patients as they are not required to travel long distances for obtaining consultation and treatment. A study conducted by an

independent agency on one thousand patients in the Chamarajanagar district hospital in Karnataka has revealed that there was a cost saving of 81% to the patient. That is, the patients who availed the telemedicine consultation and treatment spent only 19% of the money which they would have otherwise spent if they had to travel to the nearest cities for a similar treatment. In the case of remote off-shore islands, this is much more significant both to the patient and the Government administration. In such cases, not only the patients have the cost saving but can be provided with quick and timely medical aid.

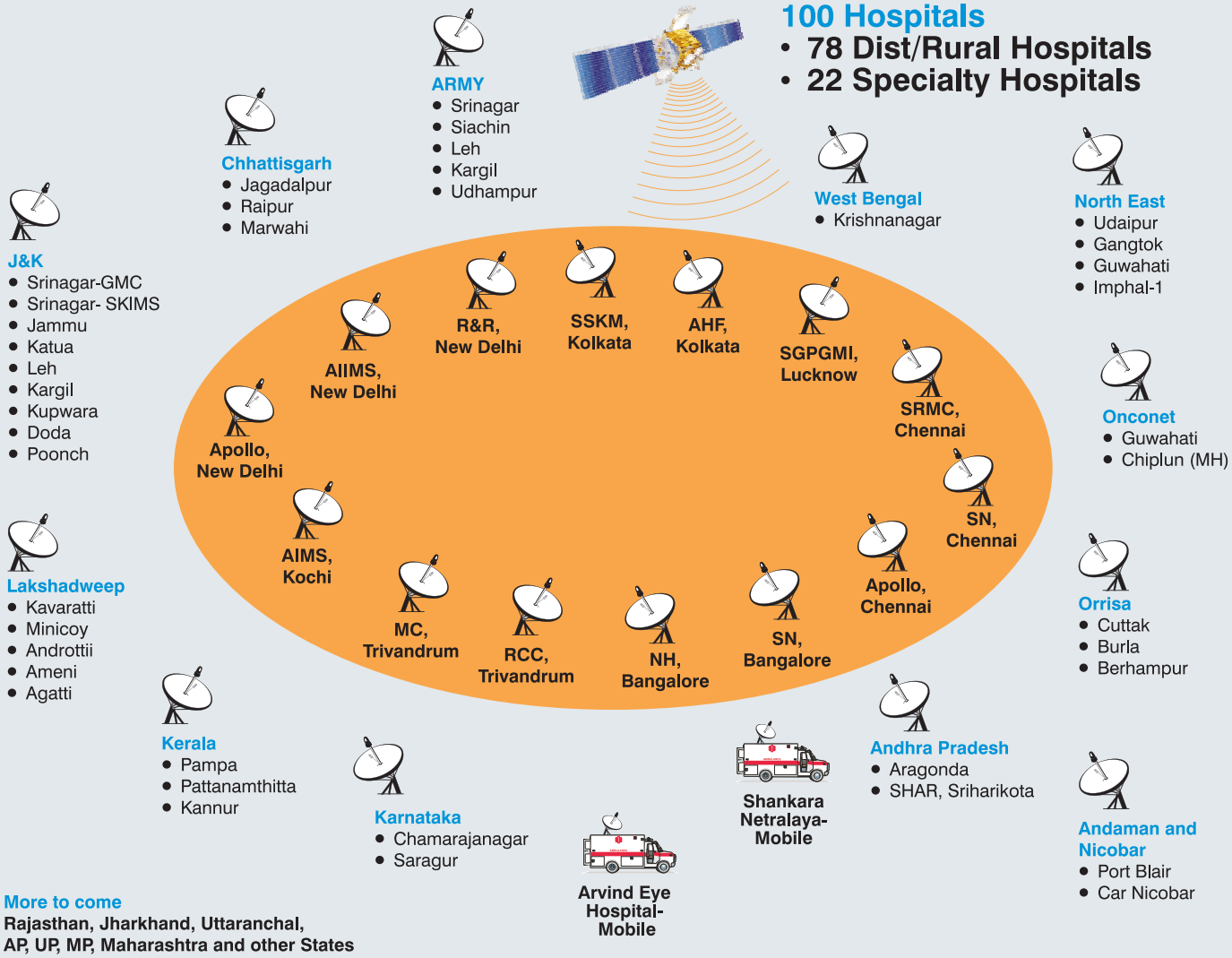
Telemedicine for Special Situations

Telemedicine connectivity has been provided every year since 2002 at Pampa, at the foothills of Sabarimala shrine in Kerala where lakhs of pilgrims visit the shrine. Here the Telemedicine connectivity is provided between the Temple Board Hospital at Pampa and Amrutha Institute of Medical Sciences, Kochi and Trivandvam Medical College Hospital. Several pilgrims availed the facility and some lives were saved. Similar efforts will be made for other places also.

Telemedicine during Tsunami

The ISRO's Telemedicine facilities at three Hospitals – GB Pant Hospital, INHS Dhanvantari at Port Blair, Andaman Island and Bishop Richardson Hospital at Car Nicobar along with ISRO Gramasat Network at 8 Islands was effectively used during post Tsunami disaster relief work for the benefit of the remote population of Andaman and Nicobar Islands. More such Telemedicine centres are being planned at the primary health centres of various islands of Andaman and Nicobar.

ISRO'S TELEMEDICINE NETWORK



The Future

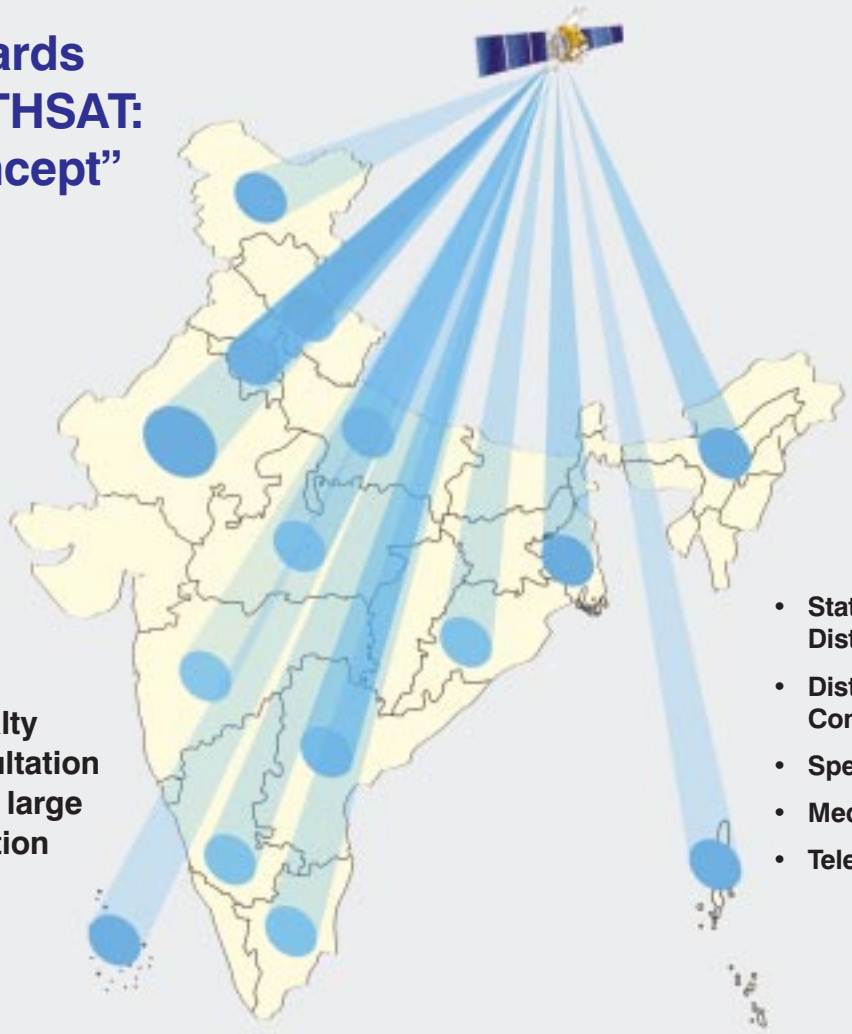
ISRO's Telemedicine endeavour is expanding its outreach and has the potential to open up new frontiers for facilitating rural healthcare in India.

Encouraged by the steady growth of its Telemedicine programme, 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.

Towards "HEALTHSAT: A Concept"



Specialty Tele-Consultation access to large Population

- **State Networks Connecting District Hospitals**
- **District Networks Connecting PHCs**
- **Specialty Hospitals Pool**
- **Medical Institutions Network**
- **Telemedicine Call Centres**

INDIAN SPACE RESEARCH ORGANISATION

Published by : Publications and Public Relations Unit, ISRO Headquarters, Bangalore - 560 094

Designed by Imagic Creatives and Printed at Brilliant Printers Pvt. Ltd., Bangalore - 94.

February 2005