

# India: Telemedicine's Great New Frontier

An indigenous technology effort is wiring up its healthcare system

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**C**hampions of telemedicine, the systematic application of information and telecommunications technology to the practice of healthcare, have been very patient. By the 1980s, pilot projects begun amid great hopes in the 1950s and 1960s had fizzled out for the most part. More recently, however, telemedicine has undergone something of a resurgence, as technology has begun catching up with aspirations. Perhaps nowhere is this renaissance so vitally needed as in India.

With their dependence on high-bandwidth real-time technologies, most telemedicine projects of the past decade have been ill suited to India. Now, though, new hopes are being engendered there by the confluence of low-bandwidth telemedicine with a growing middle class, an improving telecommunications infrastructure, a world-class software industry, and a medical community open to new ideas.

The facts on India's healthcare situation are sobering. With a ratio of one hospital bed for every 1333 citizens, the huge country is far behind even the Philippines, at 1:600, let alone the United States' 1:212. To get to a more reasonable 1:500 ratio would require the annual construction of 700 new 250-bed hospitals for years to come.

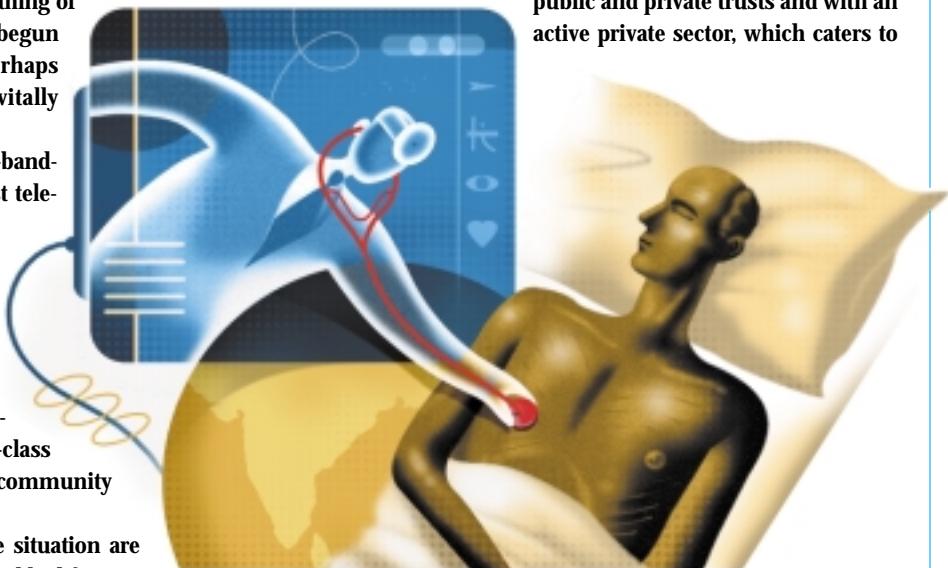
India has one doctor for every 15 500 people. But most doctors live in cities, whereas 70 percent of the subcontinent's population of just over 1 billion lives in rural areas.

Figures on the percentage covered by health insurance vary from 3 to 9 percent. For the hundreds of millions of poor Indians, healthcare is nominally a government responsibility. But spending on healthcare represents only 0.9 percent of gross domestic product, as against around 14 percent in the United States.

The basic unit of the public system is the Public Health Center, which is typically staffed by one or two general practitioners and 10 or so nurses. Each of the centers has a few beds for simple in-patient procedures and perhaps X-ray and lab facilities. There are only about 23 000 of these

for some 600 000 villages. Above them in the healthcare hierarchy are district hospitals and, in a few cities, multi-specialist hospitals. To get care, those who can afford it typically spend days traveling.

Another complicating factor is that India's government-run healthcare system must coexist with hospitals run by public and private trusts and with an active private sector, which caters to



middle- and upper-class Indians and can pay salaries around 10 times the public rate. Even the most prominent private group, Apollo Hospitals, manages only about 4000 beds throughout the country. There is no doubt that countless men, women, and children could all benefit enormously from telemedicine.

## Technical ministries take the lead

Two government institutions are leading the way. One is the Indian Space Research Organisation (ISRO). The other is the Ministry of Information Technology, which already has 200 sites used for telemedicine and other purposes. The sites are linked by 128-kb/s integrated-services digital networks (ISDNs) or by satellite and offer occasional videoconferencing for medical teleconsultation and education.

The Ministry of Information Technology's National Informatics Center plans this month to bring on-line a 384-kb/s ISDN linking three teaching institutions, the Sanjay Gandhi

Post Graduate Institute of Medical Sciences in Lucknow, the All-India Institute of Medical Sciences in New Delhi, and the Postgraduate Institute of Medical Sciences and Research in Chandigarh. The purpose of the network is collaborative medical education and research.

In addition, ISRO plans to launch the statewide Orissa Telemedicine Network to provide physicians in this impoverished state with teleconsultation and education programs. The agency is also launching telemedicine projects in several other areas that have been particularly underserved by healthcare professionals: the Andaman & Nicobar Islands, far to the east of India in the Bay of Bengal; Lakhshdeep Island, off the southwest coast; and the Leh Mountain areas in the Himalaya range in the state of Jammu and Kashmir.

ISRO has also provided access to its V-SAT (very small-aperture antenna) communications infrastructure. Apollo Hospitals' new, small hospital, based in the village of Aragonda, is one V-SAT user. The 40-bed hospital was newly built and equipped with modern computer tomography, ultrasound, echocardiography, automated laboratory equipment, incubators, and electrocardiogram equipment. A pediatrician and a general surgeon were made available in addition to generalists. Using both store-and-forward and real-time technologies such as videoconferencing, some 200 teleconsults have been provided to this village alone from specialists in Chennai, formerly Madras. Data is managed through a locally developed software package, Mediscope.

This last indicates a characteristic of Indian telemedicine—it is a largely indigenous affair. India's prodigious gift for information technology has produced world-leading software and systems, obviating the need for expensive imports. The range of systems developed is already wide, among them assorted mobile vans equipped with basic patient monitoring (like electrocardiographs) and short-range wireless communications equipment. It might even serve as the basis for an export industry, particularly to other countries with limited IT infrastructures.

### Successes on a large scale

Can telemedicine really make a difference in India? Two recent events suggest it can. The Gujarat earthquake on 27 January 2001 devastated the western city of Bhuj and left thousands dead and many more homeless. Within 24 hours the Online Telemedicine Research Institute (OTRI) in Ahmedabad, about 300 km from Bhuj, had established satellite telephone links between an emergency command center in neighboring Ghandhinagar and various facilities around Bhuj, including one housed in a tent.

In one month, the hookup transmitted to specialists in Ahmedabad approximately 750 sessions involving primarily X-rays and electrocardiographs of patients in the disaster area. After two days, the satellite phones gave way to the more economical V-SAT (which requires a 2-meter dish), with phone lines and ISDN being added as infrastructure was repaired. Much of the imaging and data transfer was mediated by Pentium 3-based PCs. Eventually, engineers

established a full-fledged telemedicine system supplying teleconsultation in pathology, radiology, and cardiology over ISDN lines between district hospitals near Bhuj and others in Ahmedabad.

The second encouraging project was carried out during the Kumbh Mela, a Hindu festival held every 12 years that last year drew 25 million pilgrims to the banks of the Ganges River. Here, the OTRI and the Sanjay Gandhi Post Graduate Institute established a station under the sponsorship of the Ministry of Information Technology to monitor levels of cholera-causing bacteria in the river water. Microscope images of samples of microorganisms from the river were transmitted to the Institute's experts in pathology and microbiology for identification and analysis. In addition, radiology and cardiology data was transferred to specialists for the total of 202 pilgrims who fell ill. The project ran for 45 days.

Interestingly, it is the engineers and technologists, not physicians, who have pushed hardest for telemedicine. "The Ministry of Health has not started any activity, not even R&D," noted professor Saroj Mishra, head of Endocrine Surgery at the Sanjay Gandhi Post Graduate Institute.

**In a monthlong hookup after an earthquake, telemedics transmitted data on 750 patients to specialists 300 km away**

Pathologists have been something of an exception. Just this past December, the Indian Association of Pathologists and Microbiologists organized a symposium on telepathology at their annual conference in Mumbai (formerly Bombay). Among other topics, the more than 500 participants heard a formal announcement of the establishment of a free consultancy, at telepathologyindia.com, providing second opinions on diagnoses from a range of Indian and international experts.

A number of other dot-coms are in the game, including DoctorAnywhere.com, a Web-based service through which more than 1000 physicians in private practice now consult with specialists. In April of last year the service was offered to the public health system at no cost, beginning with a pilot program at a Public Health Center in Wagholi, near Pune, in collaboration with the Tata Council for Community Initiatives, the humanitarian arm of the country's largest industrial group.

Perhaps the greatest lesson of India's recent telemedicine experiences, and one applicable to any developing country, is that a lack of physical infrastructure no longer precludes the development of an effective healthcare system. The West's resource-intensive specialty-care institutions, the cornerstone of Industrial Age medicine, are to a large extent obviated in the Information Age by telemedicine. India can be the template for a new kind of healthcare. ●

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