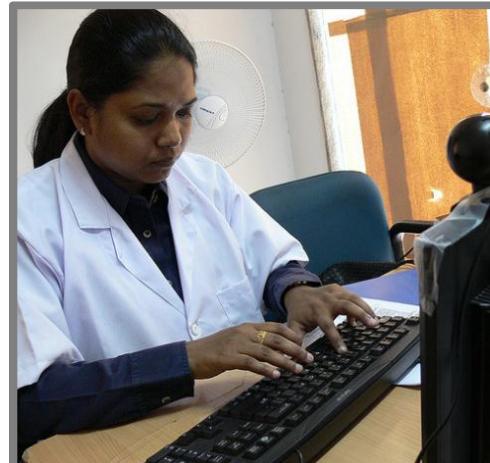


GIM India 2012

Telemedicine in Rural India: Opportunities and Challenges for the Private Sector



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Photographs taken from (starting at top, working clockwise) Neurosynaptic website, eHealthPoint photo stream, World Health Partners photo stream

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Executive Summary

Telemedicine has generated strong excitement and anticipation within developed and emerging economies. The excitement stems from the fact that telemedicine is a technology initiative that has the potential to revolutionize healthcare especially in areas like rural India. In theory, a fully deployed telemedicine ecosystem would increase the quality of healthcare services by increasing access to constrained resources like doctors while reducing costs through greater utilization of assets such as doctors and hospitals.

In the course of this paper we explore telemedicine beyond the parameters of cost, quality, and access to healthcare itself. Rather we focus on the ecosystem required to create a sustainable telemedicine infrastructure within India and the profitability of participating firms required within the system. Our initial hypothesis going into this project was that a distinct opportunity existed for companies and entrepreneurs to enter the telemedicine ecosystem despite challenges and barriers to creating a profitable business.

This hypothesis stemmed from the high value proposition that telemedicine provides to both Indian citizens and government officials. India is a strong emerging economy with high demand for healthcare and constrained resources to provide this vital service. To merge rising demand with technology that provides the opportunity to take a doctor to areas where doctors are non-existent and to leverage diagnosis from a distance is a spectacular opportunity.

However, during the course of our research we learned that while the opportunity is large the ecosystem required is not yet present. India, like most other countries, including the United States, continues to flirt with telemedicine initiatives but has not devoted the resources to facilitate mainstream adoption. With this knowledge in hand, our hypothesis that the rural telemedicine market offers immediate profit potential was nullified. We then refocused our research to understanding the roadblocks to firms interested in entering and creating a sustainable telemedicine ecosystem within India and examined the long term potential of the market. Of note, is that hospital groups such as Apollo have made great strides in leading the deployment of telemedicine as has the Indian government via the Indian Space Research Organization (ISRO). Nonetheless, through secondary and primary research we uncovered several reasons why telemedicine has not yet been able to transform rural healthcare in India on a large scale: 1) professional buy-in, 2) patient buy-in, 3) limited government support, 4) slow

infrastructure growth, 5) language barriers, 6) limited profit opportunity, 7) risky pilots and 8) underinvestment in R&D.

To address these eight issues that currently pose roadblocks to profitability within the telemedicine ecosystem, we recommend the following strategies for incumbent businesses tackling the challenge of providing health care to rural patient or to businesses who are considering entering the space:

- 1)** Before entering a new rural market, take the time and energy to understand both the local medical system process and perspectives of the local patient base.
- 2)** Collaborate with other telemedicine providers to lobby government for support in expanding broadband infrastructure.
- 3)** Recognize the key component of a successful profitable business model in rural India is scalability
- 4)** Plan for profit sustainability, alternative profit streams
- 5)** Consider alternative business models beyond just clinics and devices
- 6)** Enter the market according to the benefits you provide. Telemedicine in rural India is still in a pilot stage, so only those companies looking to create new business models should consider the space attractive. However, given demand for medical services and the US as a benchmark, there may be attractive opportunities for a broader range of businesses within the decade.

Background: Indian Healthcare System

As India's economy develops, the healthcare system is becoming more privatized. From pre-colonial times until the mid-1970s, the state was the main provider of hospital care. In the 1970's, there was a shift in medical education in India toward post-graduate studies and areas of specialization, leading to medical specialists opening up private nursing homes and clinics and corporations entering the hospital sector. In the 1980's the government started decreasing its investments in the hospital sector while there was a continued increase in health care privatization. Today the for-profit health care model is dominant.

Cost

Healthcare in India is paid by both the private sector and by the public sector; however the majority of health care expenditures are paid privately, mostly as out of pocket expenses. The estimate of private versus public health care users and the amount each group spent in 2004-05 is documented in Table 1.

Table 1: Estimated users and payer of the Indian health care system in 2004-2005

Source	Estimated users in millions	Expenditure (Rs billion)
Public sector	290	310
Private sector	790	1650
<i>Private insurance</i>	12	12
<i>Out of pocket</i>	778	1638

Source: Duggal 2007

India ranks among the top 20 healthcare markets in private spending on health care; approximately 86% of the private spending is personal out of pocket expense, employers pay 9% of spending on private care, and health insurance share is less than 10%. As much as the bottom three quintiles of the Indian population live at or below the poverty line; therefore paying out of pocket for healthcare can be a

major burden. According to Duggal, 40% of Indian households report having borrowed or sold assets to pay for hospitalization expenditure.

India's public healthcare sector, consisting of facilities run by central and state government, provides free or subsidized healthcare to low income Indians in rural and urban areas. Public spending on healthcare is among the lowest in the world. Both Public and private expenditure on healthcare increased from 1975 – 2005. However, the percent of GDP for public expenditure slightly decreased while during the same period the percentage of GDP for private expenditure increased. Given the high percentage of impoverished families, especially in rural areas, and the shift of the government paying a smaller rather than greater share of total medical expenses, affordability of healthcare will be important when devising a telemedicine strategy that can feasibly be sustained.

Access

The Indian healthcare system is broadly comprised of allopathic medicine (conventional medicine), ayush medicine (traditional), and nonregistered medical practitioners with no formal medical training. Qualified medical practitioners running their own clinics or nursing homes provide access to allopathic medicine in urban and semi-urban areas within India. Multi-specialty corporate hospitals are found in big cities and metropolitan areas, but in general are only accessible to medical tourists or the wealthiest Indians. Practitioners of the Ayush system, who have some basic medical training, specialize in areas such as Ayurveda, Yoga, Unani, Saidhha and homeopathy and offer an alternative to allopathic medicine in India. Figure 2 illustrates the percentage of allopathic and Ayush registered practitioners available to the Indian population. A third category of "medical provider" practicing in India is the unregistered medical practitioner with no formal training or qualifications, called "Jhola Chhaps", who can mostly be found in slums and rural areas. Determining what types of providers and facilities are accessible to the Indian population, is also important when formulating a telemedicine plan. For example, including the Ayush system in education initiatives for preventing diabetes makes India unique from other countries.

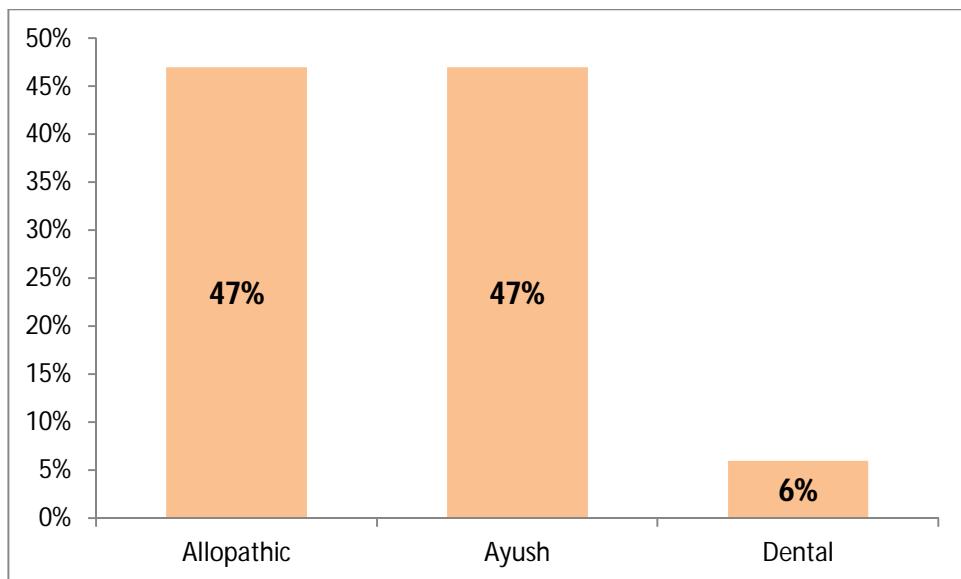


Figure 2: Breakdown of Indian healthcare providers by category¹

At present, even informal providers are not as dispersed as widely across India as would be required to meet customer demand. Patients often have to travel long distance (often with family members) to reach medical advice, including informal providers, and even further distances to reach hospitals for more serious procedures. Patients face a tradeoff between receiving medical services and the lost wages and opportunity cost from seeking them. In this way, access and cost are tightly correlated.

Quality

Quality can vary throughout India depending on type of institution or ability to pay. While multi-specialty corporate hospitals are unregulated and operate without much standardization, they are considered high quality in India. The shortage of qualified trained healthcare workers creates a market for unqualified medical practitioners to “practice” medicine, and provide poor health services for a large part of India’s population. Most of these unqualified medical practitioners provide services for the lower income groups and underserved areas. Additionally, the Indian health system is currently set up, similar to other emerging economies, with a primary objective of managing communicable diseases and support maternal and child health. The majority of the system is not set up to provide preventive services or much of the required primary and secondary care for chronic diseases such as diabetes.

¹ Source: http://mospi.nic.in/mospi_new/site/India_Statistics.aspx?status=1&menu_id=14

Identifying India's healthcare system's strengths and weaknesses will help determine where to best allocate resources when implementing a telemedicine plan in India.

Public Health in India

Until recently, public health efforts in India have been mostly focused on communicable diseases, especially HIV/AIDS, and population and nutrition concerns. However, as the burden of non-communicable diseases such as cancer and heart disease has become better measured and reported, efforts have started to expand. The oldest such program is the National Cancer Control Program, which began in 1975 and was dedicated to increasing the availability of cancer treatment and medications throughout India. The program's scope was recently expanded to include supporting NGOs conducting cancer awareness and advocacy campaigns. These efforts were coupled with the creation of a cancer registry which can now provide robust data about cancer incidence and trends. More recently in 2007, a pilot program called the National Program for Prevention and Control of Cancer, Diabetes, Cardiovascular Diseases, and Stroke was launched in 10 Indian states. The program focuses on training healthcare professionals to provide preventive services such as risk assessments and screening through the primary healthcare system, in addition to promoting general population health through public outreach. Public programs such as these offer confidence that preventive programs can be successfully implemented in India.

Background: Emergence of Telemedicine Clinics

Given the strong demand for medical services in the often neglected rural areas, limitations in access among rural patients, the expansion of the communications infrastructure, and high concentration of educated health care professionals in urban areas, telemedicine has arisen as a solution to the development needs of the country.

The growth and diffusion of telemedicine across India has enabled the delivery of specialized, advanced care to the roughly 70% of India's population that lives in rural areas and would otherwise not have access to these services. Telemedicine is the delivery of healthcare services, in which non-specialized health care providers in rural areas utilize customized technology to transmit patient information, medical images, and other critical data to a specialist physician in another (usually urban) area. The specialist, upon receiving the packet of information, can study the data, make a diagnosis, suggest treatment and train the rural physical over video conferencing. By linking rural doctors and patients

with specialized physicians using satellite technology, telemedicine results in (modified from Kannoju, 2011):

- Minimal patient displacement for quality treatment (reducing lost time and wages)
- Decrease in the relocation of medical specialists to reach the patient
- More efficient and effective use of medical and technological resources
- Cost effective method of health care delivery
- Enhanced diagnostic and therapeutic quality of care
- New possibilities for continuing education or training for isolated or rural health practitioner

India's demographics provide the optimal environment to reap the full range of benefits of telemedicine. While 70% of the population lives in rural areas, a 2009 study by the Indian Medical Society found that 75% of qualified consulting doctors reside in urban areas, 23% in semi-urban areas, and 2% in rural areas.

From a cost-efficiency standpoint, these trends are not surprising given that the potential patient pool is much more spread out in rural areas. However, telemedicine clinics can leverage the great distance between qualified physicians and patients and allow doctors in urban areas to efficiently allocate time and services to the formerly unreacheds.

Creating the infrastructure to facilitate the introduction of telemedicine required the joint efforts of public and private entities. Telemedicine' s existence in India began with a partnership between ISRO and Apollo Telemedicine Networking Foundation (ATNF) - a part of the Apollo Hospitals Group - as they established the first pilot telemedicine clinic in Aragonda in 1999.

India Space and Research Organization (ISRO)

The ISRO is at the forefront of the infrastructure, development, and distribution of telemedicine in India. Employing its advanced network of communication and remote sensing satellites, the ISRO provides the critical technological link between patients and specialist doctors.

Through telemedicine pilot projects, begun in 1999, the ISRO introduces telemedicine to new clinics, providing the training and experience to introduce the telecommunication in full operational mode. In these Pilot Programs, ISRO partners with existing rural and specialty hospitals, leveraging their technology and experience to rural and specialty hospitals by providing the necessary in, and has built and currently has 100 hospitals in their network.

In addition to providing telemedicine connectivity between rural and specialist hospitals, the ISRO is also involved in providing technology and connectivity for continuing medical education between Medical Colleges & Post Graduate Medical Institutions/Hospitals, mobile telemedicine units for rural health camps especially in the areas of ophthalmology and community health, and for service during disasters like Flood, Cyclone, and Earthquake, etc.

While medical centers have to pay a substantial up-front cost (roughly 600,000 INR) to build an ISRO terminal, once built, the ISRO network is provided as a free service for hospitals that link to rural telemedicine centers and allow for-profit and non-profit operations to more affordably provide specialized care to rural areas. However, the high initial cost of establishing an ISRO terminal is a prohibitive factor for many NGO organizations and has greatly constrained ISRO's impact on the diffusion of telemedicine centers across the country.

The Department of Information Technology

The Indian Department of Information Technology (DIT) has also provided necessary standards and processes to increase the efficiency of telemedicine delivery. With the rapid growth, the DIT recognized the need for standardization, and worked to create a manual of standards, best practices, and procedures to govern the delivery of healthcare. In addition, it has funded the development of various software systems to support its network of clinics. This has led to increased efficiency, quicker learning, and greater benefits for patients and physicians

Apollo Telemedicine

Apollo Hospitals is a pioneer of telemedicine in India, having founded the first telemedicine clinic in Aragonda in 1999, and expanded its network to become today the largest telemedicine provider in India. Apollo Telemedicine Networking Foundation (ATNF), non-profit, has built 45 centers across the country. Apollo works in conjunction with the ISRO, and other private partners in order to provide specialty medical access to rural communities. Their network of clinics extends across South, East, and North India including public and private hospitals, outpatient clinics, and military bases. Through this network, services in cardiology, dermatology, radiology, nephrology, general consultation and others are provided. It has also utilized partnerships with private corporations like Cisco in order to further lower costs and increase the distribution of its telemedicine services.

eHealth Post-1999

Since 1999, several major hospitals have followed ATNF's lead and have launched telemedicine initiatives providing mostly secondary and tertiary procedure support to rural hospitals. Currently 22 urban hospitals are connected through the ISRO's network to over 100 regional hospitals and clinics. Different hospitals may offer different services based on relative specialties. Narayana Hrudayalaya provides rural hospitals with support in examining ECGs while Aravind provides support for patients with potential eye conditions.

In recent years, new business models have emerged to provide health care to the rural poor. Mobile health clinics, such as those created by Apollo Hospitals, Philips, ISRO and the Dhan Foundation as part of the Distance Healthcare Advancement Project (DISHA) project, enable access to medical care for individuals who are even more remote than existing clinics can handle. With the decreasing cost of mobile plans, and increased use of mobile phones, the health hotline (e.g. MeraDoctor) has emerged as an alternative solution for customers who don't want to travel long distances to clinics for relatively minor health questions. Customers can purchase subscription plans to health hotline services which allow them access to licensed physicians on an as-needed basis, at a relatively affordable price.

What Does Telemedicine Look Like?

While multiple businesses are focused on the telemedicine market and the need to serve the medical needs of rural India, there are multiple business models being used in the industry.

Specialty to District Hospital Model

The first telemedicine models (like those pioneered by ATNF) provide secondary or tertiary care to rural areas through connections to smaller hospitals, medical centers and clinics. In this model, doctors outside of urban centers get access to experts who can read ECGs, provide guidance on complex conditions or provide training for complicated procedures. Other large hospital chains offering similar specialty services include Narayana Hrudayalaya, Asia Heart Foundation and Aravind Eye Care. Even if hospitals are for-profit organizations, most set up telemedicine operations as a non-profit entity, providing telemedicine consultations or readings as a free service. While these models may provide some financial returns in referrals back to the hospital for major complications, these services are primarily as charity and are not a viable stand-alone profitable business model. This infrastructure of the network is shown in the diagram below. Computers at a specialty hospital connect to a common

terminal, which links, via satellite to rural district hospitals and clinics that have ISRO connectivity in place.

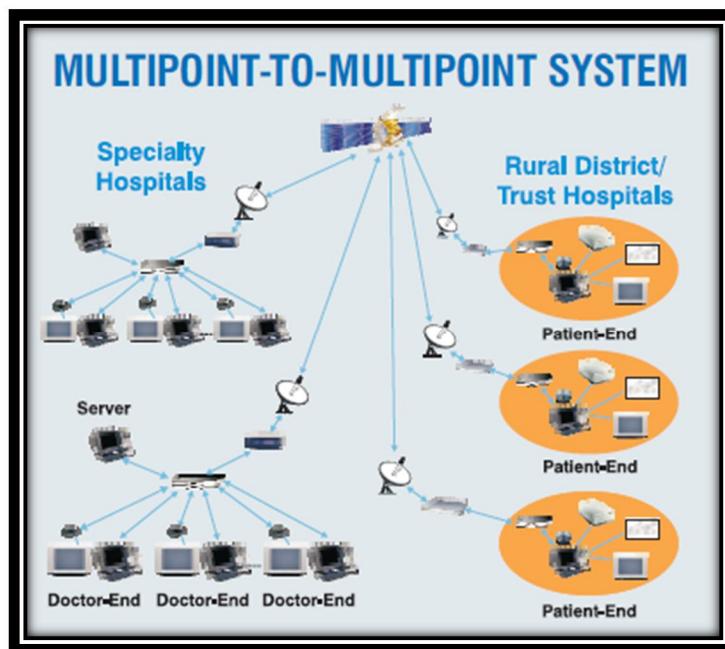


Figure 3: Multipoint-to-multipoint system – ISRO model

Primary Care Telemedicine

A second model for telemedicine clinics has been introduced in recent years that provides primary care services where no licensed doctors are present. Primary care models use a combination of telemedicine and informal providers to connect patients in rural centers to more basic services such as diagnostic testing and prescriptions. These sorts of organizations tend to provide care in more rural areas than the hospitals in the ISRO network. In the World Health Partners model (one of the pioneers of this model) patients typically pay a small fee (roughly \$1) per doctor visit, and even lower if they are below the poverty line. The fee remains constant no matter what particular services and tests the patient is likely to need. In order to give patients access to all of the necessary components of care, most models, such as those implemented by World Health Partners and eHealthPoint, also involve creating and integrating labs and pharmacies within the same or a nearby facility. World Health Partners even sells its own line of generic drugs and has built a low cost supply chain to distribute these products. Pharmaceutical sales provide a supporting profit stream that is split among the stakeholders.

While larger hospitals are able to take advantage of ISRO through purchasing VSAT terminals, rural providers in this model are smaller and cannot afford the roughly 600,000 INR charge for a satellite terminal, as these cost roughly 8-times the upfront cost an entrepreneur might pay for a rural clinic. Instead, these rural clinics rely on local broadband (or mobile) services to provide telemedicine services, and this network has not fully reached the rural areas where telemedicine could provide value.

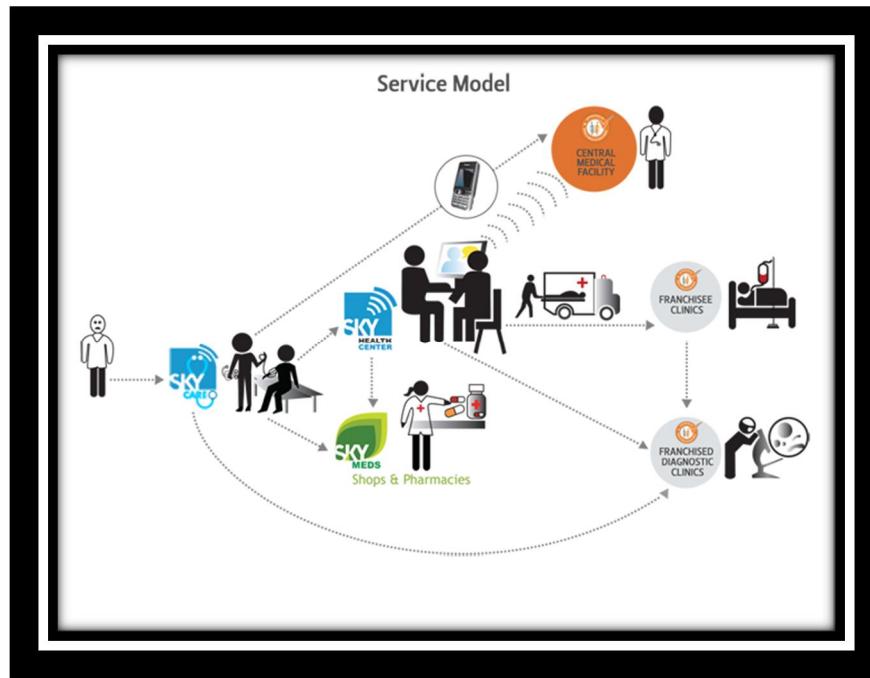


Figure 4: Delivery Network – World Health Partners Model

Future Outlook for Telemedicine Clinics

According to Rajendra Gupta, Executive Council Member of the Telemedicine Society of India (TSI), until about 4 years ago, the industry focus on telemedicine was still on the pilots launched by major hospitals like Apollo through partnerships with ISRO. During this time, ISRO continued to expand the range of hospitals with access to more rural hospitals and health centers while expanding broadband networks. Only in the last several years have major industry players outside of hospitals stepped into the space. Due to financial barriers for industry, the government has had to be the catalyst for growth in this space. The Indian government has partnered with large companies (like Cisco) to connect hospitals with a telecommunications network that the government is continuing to expand today. The model for infrastructure expansion has primarily become a public-private partnership model (PPP), since the

government controls the financial resources to make infrastructure expansion viable, but relies on industry for the solutions to bring telemedicine to rural areas. The Indian government has allocated roughly \$400MM for initiatives to improve rural health. However, one challenge, as identified by the founders of Neurosynaptic – a company that manufacturers low-cost devices for rural telemedicine - is that infrastructure has not been a top priority and growth has continued at a relatively slow pace. Industry players, such as Neurosynaptic have needed to push government entities to take a more active role in infrastructure growth, especially in broadband connections. Another challenge from a financial standpoint is the relative lack of appeal from a venture capital point of view. Though some telemedicine clinics, such as those created by eHealthPoint, have been able to generate modest profitability, the returns are still small, and on a further time horizon than would be appealing to most venture capital firms. With this in mind, venture capital firms with strong focus on social impact may still be a viable source of funding at this stage in the telemedicine lifecycle in India.

Through regular conversations with industry leaders, as well as government stakeholders, Mr. Gupta believes that India is approaching an inflection point where industry may be able to operate a profitable business without reliance on government support, though he cautions that that point in time may still be as far as 4 years away.

Case Study: Narayana Hrudayalaya – Telemedicine Service (NHTS)

Narayana Hrudayalaya's (NH) telemedicine service was implemented within the hospital in 2002 and was mostly focused on the rural Indian population. Through the ISRO network, it covers 332 hospitals – 299 remote/rural/district hospitals/health centers connected to 33 specialty hospitals located in major cities. Narayana Hrudayalaya has created a network of 4-5 Intensive Care Units and 20 telemedicine centers providing 24 hour support to patients. NHTS has treated over 53,000 patients over the past 10 years in countries such as Malaysia, Tanzania, Nigeria, Burundi, Zambia, and Bangladesh. Over 550 CME programs conducted in the past 5 years with most of the cases referred through telemedicine being cardiac ones. ECG reports, Audio/Visual data, CT scans, X-rays, MRIs and their analysis are exchanged via the telephone line, broadband connection or satellite provided by ISRO. The hospital uses a telemedicine ECG machine manufactured by Schiller India, a Germany-based company and with software that is internally developed. The telemedicine services provided by the hospital are free and more than 21,000 cases have been referred using this service. Narayana Hrudayalaya is also a part of "The Karnataka Telemedicine Project" which was inaugurated on April 8, 2002 and links two rural

hospitals in Saragur, Karnataka viz. the Chamarajnagar District Hospital and the Vivekananda Memorial Hospital with the Narayana Hrudayalaya. Some of the services offered are:

Tele-Consultation: A patient requiring specialist consultation in any remote center can interact directly with the specialists through video conferencing. The videoconferencing facility allows two or more individuals to interact at two different locations by using audio and video support through a digital communications link as well as to transfer medical records.

Narayana Hrudayalaya treats over 30,000 patients, making it the world's largest telemedicine network running the world's largest tele-cardiology program.

TT ECG – There are 308 centers - not only in India, but from all parts of the world – in Narayana Hrudayalaya's TT ECG network. The organization has started an innovative venture by developing indigenous software to transmit ECGs with the help of Trans Telephonic ECG Machines. These TT ECG machines are distributed free of cost to General Practitioners. GPs who find difficulty in assessing ECGs utilize the service free of cost by transferring the ECG to the hub hospitals in Bangalore and Kolkata.

CME – Tele-Education: Narayana Hrudayalaya has used the telemedicine facility to conduct academic teaching / training sessions. The same facilities and infrastructure used to support providers with procedures remotely are used to conduct teaching programs.

Hrudayalaya Post - All the District Head Post offices in the Indian state of Karnataka (25 in number) have been connected to Narayana Hrudayalaya through internet and software applications. A patient with a medical report could walk in any District head PO with his or her medical report (paper documents, an ECG, or an angiogram), and hand it over to the postal staff for uploading. NH can receive and review the reports within 24 hours which would then be sent back to the patient for over-the-counter in the same location as the drop-off or delivered to their doorstep. The services charges of the Postal Department vary from Rs.100 to Rs.125 depending on the number of documents.

Analysis of Narayana Hrudayalaya Model

Though a lot of good work is being done by hospitals in reaching out to the rural masses and the efforts put in by hospitals like Narayana Hrudayalaya and Apollo is commendable, as a business, the benefit of such a rural focus has been in brand-building. Similarly, other bodies in the corporate sector have also looked at telemedicine initiatives as a way to address their corporate social responsibilities.

In order to provide telemedicine services at minimal or zero cost, however, conversion is critical. Profitability, based on the number of patients being consulted at these hospitals, remains an important underlying driver for these initiatives. With medical tourism gaining popularity in India, private hospitals are setting up a number of consultation facilities abroad which connect to telemedicine facilities in India and serve as a profit generator when referrals are achieved

Telemedicine clinics in major hospitals have also been able to generate additional scale and revenue by addressing the need of the corporate. With high-ranking professionals unable to make time to meet specialists, especially with travel involved, telemedicine is a potential solution, since only the most serious ailments require a professional's attention in-person. As a result, the corporate sector could be viewed as a tremendous source of revenue for private institutions.

In summary, while major hospitals like NH provide a good example for startup organizations as to the importance of scale and creating public-private partnerships, they don't provide a good example of how to drive profits directly from the rural Indian market. These hospitals have been able to achieve scale by drawing in a population that is interested in telemedicine services, but by providing services for free, their revenue stream must come from other sources such as patients who value their CSR activities or secondary markets that use the existing telemedicine network. In order to be sustainable, a business model in rural India will need to find a way for steady profit growth, most likely from the patients themselves.

Case Study: World Health Partners

World Health Partners (WHP) was founded in 2008 in order to address the large unmet need for quality health care in rural areas. Its founder, Gopi Gopalakrishnan and much of the membership team had previous experience with the Janani Program, which operated a similar model, but for more focused services. WHP applied the strategy of the Janani Program, but with the aim to provide a larger array of health care services. Since its founding, World Health Partners has been operating in Uttar Pradesh and Bihar and has consulted over 46,000 patients.

Service Model

WHP's service model aims to divide healthcare delivery needs and in order to match with skills close to the patient, referring the patient only when needed to a more skilled provider through a telemedicine network. At the foundation of the WHP network are the SkyCare and SkyHealth rural clinics, which are

managed and operated by local entrepreneurs, with the SkyCare centers being most rural and basic level of care. If a patient requires more specialized care, the SkyHealth and SkyCare centers utilize WHP's network in order to access partner doctors in Central Medical Facilities (urban hospitals), Franchisee Clinics, or Franchised Diagnosis Clinics through satellite and broadband communication.

SkyCare centers are at the bottom level of the service delivery structure. They are owned by local women and their husbands to provide access to over the counter medications (vitamins, condoms, etc.) and run simple diagnostic tests, rapid pregnancy tests, and provide referral to more specialized clinics. Patients do not pay for consultations and referrals, while the owner receives a referral fee for their service.

SkyHealth Centers operate at the next line of care. Run by local entrepreneurs, these centers house telemedical communications equipment. The patient is charged a referral fee from 50-200 rupees, or if in possession of a government poverty ID, the referral fee is subsidized by WHP. At SkyHealth centers, patients create an electronic medical record, are tested using ReMeDi, a Neurosynaptic product, then linked with a doctor in a Central Medical facility through satellite and broadband. Doctors at the urban hospitals include those who are moonlighting, before or after shifts, and several who work full time in a WHP facility in Mumbai. These doctors are volunteers or receive minimal pay for their time.

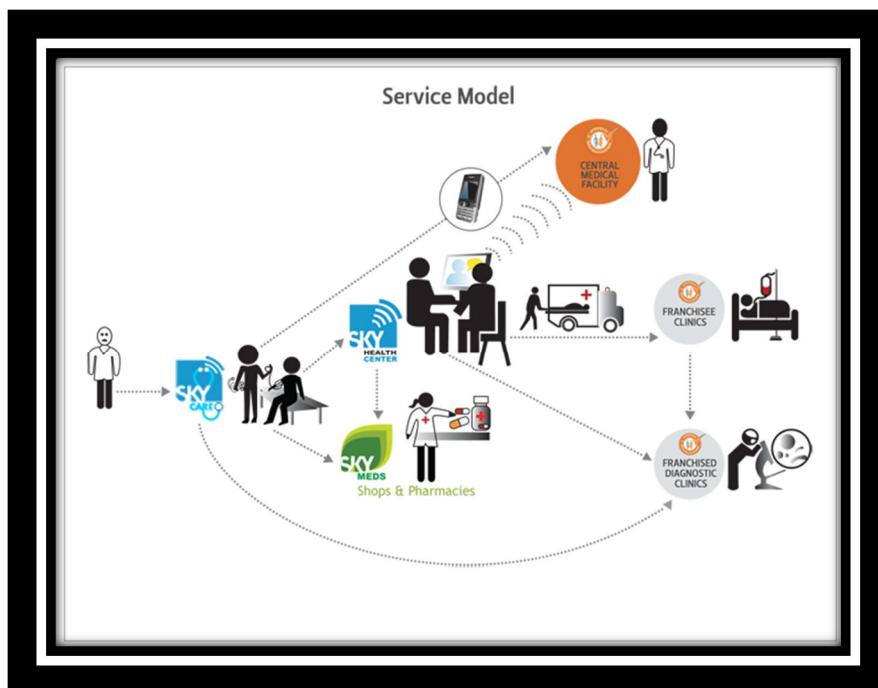


Figure 4 (repeated): Delivery Network – World Health Partners Model

Franchise Service Model

WHP operates uniquely as a social franchise, employing a highly innovative service model that provides entrepreneurs the training, brand, network and incentives required to operate high quality, cost effective telemedicine networks. Rather than owning and operating its own network of telemedicine clinics, WHP coordinates a network of entrepreneurs' independent clinics. WHP requires a \$1,400 upfront investment from its franchisees to fund the necessary equipment for a SkyHealth Clinic. After the franchisee gains approval, WHP provides the training, advertising, brand, and scalability.

Franchisees are typically not medical professionals. Early in its founding, WHP franchised to individuals without medical experience, but found that it was most effective to partner with members of the villages who while not professionally trained, were informal health care providers. It was important that the franchisees understood the healthcare needs and dynamics of treating patients. In order to ensure an appropriate standard of quality of care, WHP invests heavily in stringently monitoring franchise clinics, employing regular assessments, complaint hotline, and unexpected audits. WHP also incentivizes its franchises, both monetarily and operationally. As WHP depends on the well-functioning network of providers, it is essential to WHP's value proposition that franchises see the value of being part of the network and are aligned operationally.

By putting the ownership of SkyHealth centers in the hands of local entrepreneurs, WHP is able to leverage the franchisees' understanding of the dynamics, needs and issues specific to their village, and the market forces that lead to efficient, productive service delivery.

Financials

WHP receives revenue from several of its service streams. However, it is highly dependent upon grant money, including a sizeable award by the Gates foundation, in order to operate under its current business model. While startup costs of SkyHealth centers are provided by entrepreneurs, the substantial operating expenses, overhead, communications, and supply chain expenses are funded through grant money. Since most of these costs are fixed, the projected costs of the centers will decrease overtime. After 3-years of implementation, revenue streams will account for 60% of project costs. WHP does receive revenue from various components in its network. SkyHealth centers charge 50-200 rupees per visit, of which WHP takes 20%. Franchise clinics pay a franchise fee and WHP also receives a proportion of their fees.

Key Opportunities

The WHP model thrives in the most rural areas. By working with the informal providers and leveraging the casual network health care in rural communities, WHP maximizes its impact by leveraging existing resources, rather than inventing anything new, even the most remote areas can be serviced. With successes in Uttar Pradesh and Bihar, India, WHP looks to expand its health service offerings into maternal care and expand into Africa.

Key Challenges

In developing its successful network, WHP has been burdened by connectivity, comprehensive care, scale, and quality assurance challenges. First relying upon satellite communications, WHP could no longer support the high costs required, which could not be passed along to clinic owners. Broadband networks are often not yet readily available in all areas, so a combination of mobile phones and satellites are used to keep costs down. Maintaining reliable connectivity represents a large financial and human capital strain on the program. In addition, the business model is dependent upon scale, due to the high fixed costs. In order to efficiently operate the supply chain and service network, scale is required, therefore building and maintaining the appropriate scale is critical to the program's long term success. Quality control is a central challenge. Monitoring such a large network is not only a large financial and personnel investment, it is also difficult to ensure quality control. Entrepreneurs and service providers are operating under the WHP brand so it is critical that they subscribe to the standard practices and metrics, or else risk harming both the patients and the reputation of the WHP brand.

Case Study: Neurosynaptic Communications

Neurosynaptic Communications is a privately held for-profit company that was incorporated in 2002 by Sameer Sawarkar and Rajeev Kumar with the aim to deliver communications based products to help serve the health care needs of the rural population. The company focuses at the primary or "family" level of health care delivery rather than at the secondary or tertiary levels. The ReMeDi MDAU (Remote Medical Diagnostics Medical Data Acquisition Unit) is a comprehensive tool that facilitates all components of the delivery of telemedicine. The kit measures diagnostics such as ECG, blood pressure, heart and lung sounds, oxygen levels, enables video conferencing, and most importantly is designed to accommodate rural conditions such as low power and connectivity. The device has succeeded in drastically decreasing the cost per consultation and exams down to 30-100 rupees per visit. ReMeDi is at the forefront of telemedicine delivery and is utilized by World Health Partners, Cisco, and many other private and public service providers. To date, Neurosynaptic has sold and installed over 400 ReMeDi

units and has 400 additional units in the pipeline. Its products are accessible by over 6 million people around the world (Bollineni, 2011).

Development

The development of the ReMeDi product was the result of a research and development by the founders. As this R&D required a substantial amount of capital, the founders sought out funding from both private and public investors. However, due to the long term horizon of returns, venture capital funding was difficult to secure. Neurosynaptic partnered with the TeNeT IIT-Madras Incubation Center and also relied upon investments from private fund Ventureast and the Technology Development Board, Government of India. Through several R&D cycles, the group worked closely with the rural medical community in order to understand the basic medical needs that the product should address, as well as the specific requirements of rural service providers. Neurosynaptic also spoke with other startups in order to understand the technological problems that can arise when working within limited communications and electricity infrastructure.

The ReMeDi product was initially deployed in an 18 month field study under a shared platform with n-Logue communications, a company that operated telemedicine kiosks, but lacked the capability of recording basic medical records, which ReMeDi provided. While there was an initial spike in visitors, the number dropped significantly over the course of the study. Neurosynaptic faulted the kiosk operator's lack of appropriate servicing, poor identification and marketing of the service, as well as lack of availability of prescribed drugs as the key indicators of poor performance.

Realizing the necessity of partners' understanding the local healthcare needs at the primary care level, in its next pilot, Neurosynaptic distributed through World Health Partners, generating positive outcomes through the appropriateness of the product with WHP's delivery model, the operational accessibility of the product for unskilled providers, and the low cost of the solution. Additionally, the product did not require any behavioral shifts from the population. Villagers could go see a familiar health care provider in a normal setting, while able to access greater medical technology.

Business Model

The ReMeDi product is sold to various NGO's and government institutions that deliver telemedicine services. Neurosynaptic does not employ marketing, but rather relies on referrals for all sales. The initial manufacturing was outsourced, but the company aims to bring manufacturing in-house once a volume threshold is met. Currently Neurosynaptic performs the final assembly and quality control while

other components are outsourced. The company also provides product and software training to new operators. Neurosynaptic developed individualized pricing arrangements with each of its partners, relying upon revenue sharing, leasing, and fee based models. As of the last fiscal period, the company is generating positive net income.

Key Drivers of Success

Founders Mr. Sawarkar and Mr. Kumar identify the key drivers for success to be their superior product and understanding of the ecosystem. The ReMeDi product was developed from a significant amount of R&D, understanding the medical, cultural and technological needs of the rural population - both patients and service providers. The low bandwidth and power requirements paired with the product design that fits into the current ecosystem contribute to make the ReMeDi both accessible and effective. The cost of internet for providers, as well as the maintenance of health center "uptime" is key to its continued success.

Looking into the future, in order to stay competitive and innovative, Neurosynaptic aims to adapt from a pure technological play to become a more integrative model. By developing close partnerships and innovations, the company hopes to maintain a long term competitive advantage.

Case Study: Role of the Multinational – Deployment of Cisco's HealthPresence

In 2010, Cisco deployed its 'HealthPresence' solution which is an advanced, care-at-a-distance technology platform that allows patients to connect with doctors and clinicians for healthcare consultations. Unlike traditional telemedicine solutions, which focus solely on access to medical care HealthPresence addresses:

1. **Capacity** issues surrounding both the scarcity and productivity of clinical expertise
2. **Collaboration** between patients, clinicians, and providers
3. **Information Exchange** in assisting participants to share and view vital health information
4. **Personalization** to engage patients to be more active in consultations

In its initial 2010 launch, HealthPresence was available only within the United States and Canada. By November 2011, Cisco had formalized collaboration with the Government of Madhya Pradesh in Sehore to deploy its healthcare solution as a functional part of its Inclusive Growth vision of improving access to healthcare, education, and public services to the mainstream economy. This formal collaboration was preceded by an introduction of HealthPresence at Telrad RxRx, a multi-specialty hospital in Bangalore,

using the solution to provide medical care to patients living in Raichur, located in North Karnataka in India. Within its space, Telrad, Cisco's partner in distributing the solution, describes HealthPresence as a telemedicine product providing good video quality while working in low bandwidth operations.

In addition to its work with Telrad RxRx, Cisco worked on a joint initiative with Apollo Hospitals to deploy Cisco's technology, develop an open healthcare IT standard, and deploy solutions across Asia. Through this investment into the Indian healthcare system, Cisco is building a foundational infrastructure to position itself well anticipating a strong increase in telemedicine use throughout the country. According to Susheela Venkataraman, Internet Business Solutions Group at Cisco, "Unless remote telemedicine is incorporated into the overall process, it will be treated separately from a mainstream hospital". Through Public Private Partnerships (PPP) within India, Cisco is ensuring that their vision of major hospitals like Apollo and Narayana Hrudayalaya streamlining telemedicine into their everyday operations occurs. With Cisco's early investment into the Indian healthcare system, they are wisely positioning themselves to take advantage of a longer term growth opportunity within the Indian healthcare IT market.

US Market Benchmarking

During our IPG meeting with Infosys we learned that the Indian IT giant was focusing 100% of its telemedicine division's time on the developed world. This knowledge inspired us to want to learn more about what factors make the US market appealing and what the future of telemedicine in a more developed healthcare market might look like.

As early as 2006, the primary objective of most telemedicine programs within the United States was to improve access to medical services within rural areas. Research conducted at The Geisel School of Medicine at Dartmouth during this year highlighted four key programs within the United States: Maine Telemedicine Services, Tennessee Telehealth Network, Georgia Statewide Telemedicine, and Arizona Telemedicine Program. A key insight identified in this research is that while many clinical telemedicine programs were created to improve access in rural and underserved areas, there was a growing interest in using telemedicine in well-served areas to decrease the current high cost of healthcare while continuing to provide quality health services. The seed for this insight can be seen in the delivery of telemedicine in Arizona.

Arizona is one of four programs evaluated by the Geisler School of Medicine. What was most interesting is that in 2006, 3 of the 4 programs explicated stated that the mission of their programs was to increase access to underserved rural areas. The exception to this mission statement was Arizona's mission statement which reads, "Increase access to healthcare to all residents in Arizona using telemedicine technologies".

Arizona separated itself from the other 3 programs in both its administrative and revenue models. While the other programs partnered with non-profits and government support, Arizona chose a "centralized" model where it owned the telecommunication lines used for medical consultations and the training facility for sites participating in the program. Arizona described itself as a "virtual corporation" that connects 55 different healthcare organizations. In this fashion, Arizona positioned itself as a platform in the delivery of telemedicine in the state where it received revenues from healthcare organizations that wished to use its system to deliver health services. This is known as an Application Service Provider (ASP) approach. In this method, a telemedicine site pays the state of Arizona a network membership fee. In this case, the fee is \$5000/site with multi-sites receiving discounts. The membership fee is paid annually and in exchange the telemedicine site gets access to specialty care, network management, training, and continuing education credits. In this method, Arizona isolated itself from solely depending on government revenues for its survival and has expanded its revenue sources to include providers outside of the typical Medicare, Medicaid, and private payer programs.

Based on this ample funding model intermixed with government support from Senator Robert Burns who initiated the legislation that created the Arizona Telemedicine Program, Arizona was able to provide the most advanced services to its users including accepting calls from rural areas asking for telemedicine services, specialty consultations, and tertiary care services such as Radiology, Dermatology, and Behavioral Health.

Since 2009, after the Senate passed the Patient Protection and Affordable Care Act (PPACA), Congress has called on the Center for Medicare and Medicaid Innovation to find inventive ways to get telemedicine services in use around the nation. This added demand, plus steady growth in demand for medical services globally has caused increased interest in telemedicine both in the US and worldwide with BCC Research forecasting that the worldwide telemedicine market would reach \$27.3B in 2016 up from \$9.8B in 2012 (BCC Research, 2012) as countries around the world seek to use technology to reduce healthcare gaps while lowering treatment costs.

In an interview we led in Bangalore with Virendra Paliwal, Associate Vice President of Innovation at Infosys, Mr. Paliwal stated that Infosys was highly interested in the growing presence for telemedicine within developed economies and specifically the US. While Mr. Paliwal did not see the rural Indian market as profitable for large scale telemedicine, he sees high opportunity in expanding the telemedicine presence in the US and other markets facing high rising medical costs. The scale produced in these economies will help cement penetration first into urban India. Competitors to Infosys in this space are as large as General Electric and as small as a flurry of startups like American Well. This year GE and Intel announced their joint product called Care Innovations which uses internet and wireless technologies to advance healthcare for the elderly. GE sees this to be \$7.7B business for remote-patient monitoring while developing ways for patients to live independently (Fast Company Profile, 2012). Other large providers like 3M recently launched a cardiology-grade stethoscope to alleviate the issue of decreased audio quality when stethoscopes are used in telemedicine. The startup providers within this space, similar to their counterparts in India, have focused and small scale offerings. Given the desire to reduced costs, this may be an advantage to them in this space.



Figure 5: Philips Electronics Tele-ICU enables healthcare systems to transform critical care.

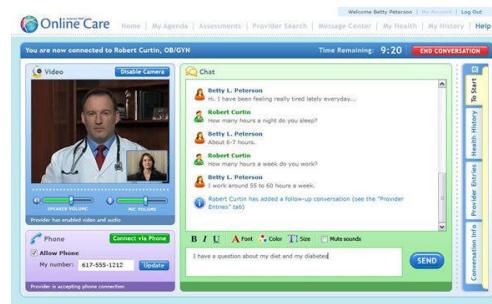


Figure 6: American Well provides telemedicine services to connect patients and doctors remotely

As India develops and incomes increase in rural areas, the opportunity for profit opportunity in telemedicine will be significantly greater than it is today. As the forecasts provided by BCC Research and GE show, even in the US telemedicine use is limited, the perceived market size is quite high. Given that India does not have the legacy systems or customs of the US, the opportunity and scale potential for telemedicine may actually be larger in India than in the US, and as the Arizona model shows, it may be possible to take successful models from rural areas and apply them on a broader scale. However, by examining the investment behavior of global medical technology firms like GE, Philips, and 3M, we see that this opportunity is not perceived in the short term. It is interesting to note that one of India's

largest tech firms, Infosys, has no plans for investment in the short term. Overall it appears that while there may be significant long term benefits from being a first mover in this market, the opportunity will not begin to be recognized for several years.

Conclusions and Recommendations

Evaluation of Initial Hypothesis and Lessons from IPG Meetings

Our initial hypothesis going into our in-country research was that given the strong need for medical care, increased government attention to the medical sector, and expansion of technology through ISRO that now would be an ideal time for companies to begin plans for entering or expanding the presence of telemedicine in the rural market, despite challenges in funding and drawing patient/provider interest in the model. However, our research revealed that there are two levels of development in rural India.

Rural hospitals – which are in larger rural cities – have access to ISRO satellite network and are supported by Apollo Telemedicine, Narayana Hrudayalaya, and other major hospitals. In even more rural areas, where individuals live far from hospitals, infrastructure is much more limited, large scale providers are not present, and funding is more difficult to find. These, and other barriers, cause telemedicine in rural regions without hospitals to still be in a development phase.

Further, by examining the trajectory that both Neurosynaptic and World Health Partners have followed in this space, we can identify important lessons for how to evaluate potential new businesses. Both learned how important initial pilots were to designing a successful business model. The current design and partnerships of each business have been adapted based on learnings from the field. For Neurosynaptic, the key lesson was that ReMeDi could not be sold solely as a plug and play solution for providers to adapt into their existing systems. Instead, Neurosynaptic has evolved to position ReMeDi in overall model that incorporates training with the machines and connects patients with additional necessary resources like a lab and pharmacy. Meanwhile, World Health Partners learned from their local partners, the need to adapt to support informal provider-entrepreneurs who seek to take on a more active role in treating their patients than relying purely on telemedicine. Both examples show the need for highly customized products to rural markets that provide holistic solutions for patients as well as the importance of truly understanding the motivations of all stakeholders involved. These companies serve as valuable benchmarks for the process that any business will face when trying to build a market through a telemedicine product in rural India.

The rest of this section will review the barriers that make operating a business in telemedicine in rural India a challenge, especially for startups, and secondly what recommendations we have to make such businesses successful.

Barriers to Success

Through primary and secondary research, we identified several factors that hinder the potential for for-profit companies to develop successful business models in rural telemedicine:

- 1) **Professional Buy-In:** While encouraging doctors to relocate to rural areas is a significant challenge, finding doctors willing to devote part or all of their time to treat or support treatment of rural patients is not necessarily an easy task. As telemedicine increases in scale, this challenge may become more difficult. As in most Western health care systems, Indian doctors are also slow to implement new technologies. Physicians may be slow to adopt new technologies that are provided on an opt-in basis.
- 2) **Patient Buy-In:** Telemedicine models are relatively new and often rely on large volumes of patients for financial viability. Patients may be slow to adopt a process of healthcare that is new and different from what they are used to, limiting the short term financial viability.
- 3) **Limited Government Support:** While the Indian government has financial resources available to help provide medical care to the rural poor, spending has been unfocused and infrequently goes to projects that are provide an indirect benefit, such as improving infrastructure to enable private enterprise to participate in the space.
- 4) **Slow Infrastructure Growth:** While ISRO has expanded the number of hospitals with satellite connections for telemedicine to over 100 institutions, there remain large rural areas that are not connected to major cities, because satellite connections are too expensive, and/or the areas do not yet have a strong broadband network.
- 5) **Language Diversity:** In primary care telemedicine clinics, the remotely-based physician often speaks directly with the patient through a webcam. Pilots have been launched in locations where communication difficulties have been limited. However, India is a country with 22 official languages and hundreds of additional regional languages which are more common in rural areas. Finding a broad range of physicians with knowledge of different languages or other methods to overcome the language barrier may pose a significant challenge.

- 6) **Limited Profits in Early Stages & Risk-Reward Tradeoff in Investment:** Most players in the for-profit rural telemedicine are start-ups who are willing to work with relatively small returns given the social impact they are creating. However, these entrepreneurs are often new, with little capital of their own. Low returns may limit interest from venture capital, and NGO/government investment is often less frequent and tied to specific initiatives at a given point in time.

There are several additional challenges, faced especially by startups and public-private partnerships, as identified by Rajendra Gupta, from the Telemedicine Society of India (TSI):

- 7) **Failed Pilots:** Cash-strapped startups often don't generate enough money to prepare for more than one pilot. One a pilot fails; startups often don't have the funds available for a product modification or a change to the business model/product market. Such failures can derail or kill a nearly viable concept.
- 8) **Underinvestment in R&D:** Even after a successful pilot has been completed, many startups lack the data to show their accomplishments to other potential customers. Rajendra Gupta recommends that startups take a more active role tracking outcomes and benefits generated by a pilot in order to provide a more convincing story to doctors or NGOs.
- 9) **Complicated Contracts:** Telemedicine projects typically involve two or more parties (devices, parent companies, franchised clinics, pharmacy, infrastructure provider, etc.). Since multiple parties are involved in the delivery of care, it can become complicated to know who is liable when something goes wrong. This challenge can result in poor contracts for startups or prevent contracts from being signed in the first place.

Recommendations

Recommendation #1: Before entering a new rural market, take the time and energy to understand both the local medical system process and perspectives of the local patient base.

- A firm entering a rural market cannot simply take an urban-based model and apply it in a rural Indian context without first accounting for specific needs and perceptions among the local population. Further, different rural areas may have different norms, languages, and needs that require adapting the model for different geographic areas.

- This understanding extends to multiple aspects of how medicine is provided in rural areas, including the role of informal providers versus healers versus Western medicine, the locations patients typically go for treatment today, the skill level of potential technology operators, etc.
- Pilots are a critical step in the business to give time to adapt and tweak a business model. Potential entrants should prepare for not only a pilot, but also the need to make revisions to the model after an initial trial.

Recommendation #2: Collaborate with other telemedicine providers to lobby government for support in expanding broadband infrastructure.

- At the level of costs and revenues that clinic owners operate with in rural areas, satellite terminals through ISRO are too expensive to be financially viable. Instead, clinics rely on other forms of technology such as broadband (which has limited reach in rural areas) or mobile (which has limited bandwidth) to deliver information.
- While one company may be too small to inspire government response, coordinated industry lobbying towards an undertaking which is mutually beneficial for businesses and the government (in its goal of serving rural patients) might be necessary to expedite the speed in which broadband and telemedicine infrastructure reaches all rural areas.

Recommendation #3: Recognize the key component of a successful profitable business model in rural India is scalability

- In order to be low cost (and affordable to rural patients), telemedicine business models for rural India will likely have to run with low margins per patient. These models can only be successful when a large number of patients are served. Such a volume-based model is not common in the health care industry in India; it is the same principle that Narayana Hrudayalaya follows in their surgery business.
- Strategies that allow for business to achieve scale faster will be more successful.

Recommendation #4: Plan for profit sustainability, alternative profit streams

- For-profit businesses may require alternate revenue streams to achieve their goal of a sustainable healthcare model in rural India, at least initially while building scale.
- eHealthPoint uses sales of purified water as both a tool to increase volume at individual clinics as well as a tool to help subsidize its telemedicine business when patient volume is low.

Neurosynaptic has both integration (e.g. World Health Partners) and implementation partners (e.g. Cisco) who operate different types of business models using ReMeDi technology. A

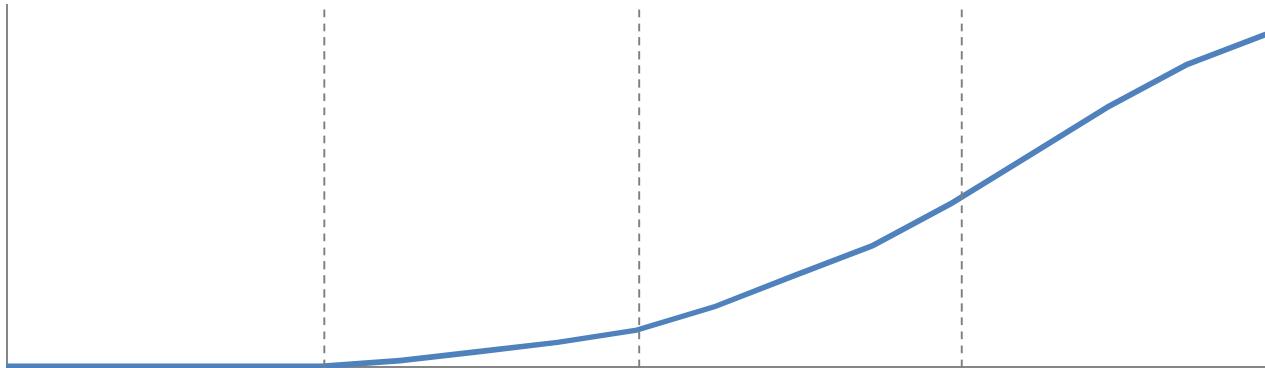
- Cross-subsidization through segments who have time or geographic restrictions, but higher willingness to pay, may be a viable alternative and supplemental revenue stream for businesses targeting rural India. (e.g. corporate executives who don't have time to visit hospital or normal checkups at a clinic).

Recommendation #5: Consider alternative business models beyond just clinics and devices

- Successful telemedicine models we have explored incorporate many components beyond the brick-and-mortar clinics and devices used to connect patients with providers, but require an entire package of infrastructure, knowledge and services to be viable.
- Earlier sections of this paper discussed challenges such as low education among providers, limited broadband infrastructure, and the need for patient buy-in. Business models do not need to focus on the provision of health care services, but might instead focus on tackling any one of these challenges such as training services for informal providers, alternate solutions for provision of telemedicine infrastructure, or new models for increasing patient involvement in their own care.

Recommendation #6: Timing of Entry - Who should invest? When?

Rural Telemedicine Market (\$) Over Time (Illustrative)



Phase	Pilot Phase (Now for clinics)	Growth Phase (≈ 3 yrs for clinics) (Now for hospitals)	Approaching Maturity (≈ 10 yrs)
Characterization	New models providing health care through Telemedicine	Successful business models building scale rapidly	Competitive markets for technology, products, patients
Competitive Structure	Integrated models w/ several players involved	Private-Public Partnerships	Plug & play, distinct provider and supplier entities. (e.g. USA)
Pros/Cons	<ul style="list-style-type: none"> ✓ Large market with limited competition ✓ Potential for first mover advantage ✗ Low margins ✗ Little familiarity with telemedicine model ✗ Requires several iterations of pilots 	<ul style="list-style-type: none"> ✓ Need for supporting industries (training, distribution, infrastructure, etc.) ✗ Need for high levels of coordination. ✗ Competition for scarce partnerships/ contracts 	<ul style="list-style-type: none"> ✓ Large market potential can be realized ✗ Challenge competing with companies with market experience ✗ Models need to be adapted to rural India
Who should invest?	<ul style="list-style-type: none"> ○ Entrepreneurs, VC, NGOs with objective for social impact ○ Government 	<ul style="list-style-type: none"> ○ Companies with experience partnering with Indian government ○ Infrastructure ○ Supporting industries 	<ul style="list-style-type: none"> ○ Companies with telemedicine experience in other countries ○ New models
Examples	eHealthPoint, World Health Partners, Neurosynaptic	Cisco	Philips, GE, 3M

Description of IPG Meetings

Meeting 1

Objective: Understand the current state of telemedicine within rural India by interviewing industry expert.

Organization: International Telemedicine Congress

Who: Rajendra Gupta

Interview Date: March 3, 2012

Where: Conference Call

Product: Non-profit organization. The International Telemedicine Congress discusses the role and future of Telemedicine in the country, hosts international telemedicine conference events. Features committee members from government, academic institutes, and non-profits.

Key Findings:

1. Gupta believes that larger players like Cisco and Intel are required over smaller players.
2. Learned of key Public Private Partnership initiatives between Cisco and the Indian government.
3. Understood that one of the hurdles for startups within the telemedicine space is that hospitals require several iterations of prototypes the cost of which is very high for starting companies.
4. Telemedicine is still in a pilot phase within the rural India. Partnership is key.

Actions Post- Meeting

1. Added Infosys as IPG meeting based on knowledge of their telemedicine practice.
2. Reviewed Cisco as best practice for multinational partnership within India.

Meeting 2

Objective: Use Neurosynaptic as best practice to confirm pilot phase of telemedicine in India and use as base for development of a for-profit framework.

Organization: Neurosynaptic: For-Profit Telemedicine Startup (NS)

Who: Co-Founders Rajeev Kumar and Sameer Sawarkar

Interview Date: March 19, 2012

Where: Bangalore

Product: ReMeDi product used to create telemedicine infrastructure between rural villages and urban health centers.

Key Findings:

1. NS developed from an incubator at IIT-Madras. Incubator community viewed as key for success of startup.
2. Customers include NGO's, Governments, and large-scale institutions rather than individual hospitals or local community centers.
 - NS does not engage in large scale marketing & sales effort
 - NS customers reach out to company via Word of Mouth

3. NS learned that to be a player in telemedicine they simply could not produce a product. Infrastructure support was required. Based on these needs the product had to meet:
 - a. Low connectivity threshold. Often little broadband or power available.
 - b. Limited skill sets of people.
 - c. Need for electronic records at Point of Use
4. There are few key players in the telemedicine space. NS is one of the few successful telemedicine-focused suppliers.
5. A framework for for-profit in telemedicine is not yet feasible.

Actions Post- Meeting

1. Added World Health Partners as an IPG meeting due to partnership within the community.
2. Changed the scope of the project to include a greater scope on case studies and best practices since the industry was at too early of a stage to support wide scope scale.

Meeting 3

Objective: Understand role of large Indian IT providers in telemedicine space. Are they competing with the Cisco's and GE's who are investing in the space?

Organization: Infosys

Who: Virendra Paliwal, Associate Vice President

Interview Date: March 20, 2012

Where: Bangalore

Product: Telemedicine products in US

Key Findings:

1. Infosys does not see the rural Indian market as profitable for large scale telemedicine.
2. Current focus is in developed countries.
3. Larger focus for rural India would be to focus on the causes of health issues such as water supply.
4. Research the US market to understand what factors are inspiring companies like Infosys to increase their investment into this space.

Actions Post-Meeting

1. Cease research into role of large Indian IT firms in current state of telemedicine. Focus efforts on multinationals like Cisco, GE, and/or Bosch.

Meeting 4

Objective: View a telemedicine operation in action and get a broader understanding of how the technology and the process of implementing a telemedicine primary facility works in reality.

Organization: Narayana Hrudayalaya (NH)

Who: Telemedicine Team & Brief Discussion with Dev Shetty, Founder

Interview Date: March 20, 2012

Where: Bangalore

Product: One of India's largest multi-specialty hospitals. Known for serving a poorer population with higher GM% than most US hospitals. Directs a telemedicine division serving rural India, Southeast Asia, and parts of Africa.

Key Findings:

1. There are not doctors assigned solely to the telemedicine practice. Telemedicine patients are added to a doctor's queue in the same fashion as any other patient.
2. NHs telemedicine practice attracts a variety of participants from throughout the world.
3. The turnaround-time on a tertiary care patient is < 15 minutes.
4. The service is free of cost BUT requires partner organizations to set up services.
5. A patient receives feedback in the same amount of time that he would in a face-to-face discussion.
6. NH has developed its own software rather than leveraging the software of an established partner.

Actions Post-Meeting

1. Understand the factors that could inspire NH to grow the telemedicine business and convert it to a for-profit center.

Meeting 5

Organization: World Health Partners

Who: Karen Pak Oppenheimer, Vice President

Interview Date: April 2, 2012

Where: Conference Call

Product: Innovative healthcare service delivery model leveraging the private sector and technologies to reach poor and rural populations in less developed countries.

Key Findings:

1. India is still in the pilot phase of telemedicine deployment.
2. The need is there but requires large investment in infrastructure and basic training.
3. Entrepreneurs who are interested in offering telemedicine clinics cannot afford satellite technology, but instead rely on other forms of communication.
4. Government follow-through on infrastructure improvements has not lived up to expectations
5. The incorporation of informal providers is critical to the success of a rural telemedicine model

Actions Post-Meeting

1. Recreate framework with Public Private Partnership as base.

Bibliography

Apollo Hospitals. Apollo Telemedicine: Mission. http://www.apollohospitals.com/initiatives_tele.php (accessed April 18, 2012)

Apollo Hospitals. DISHA - Distance Healthcare Advancement Project http://www.apollohospitals.com/initiatives_disha.php. (last accessed April 18, 2012)

Arora, Rahul. 2012. Telrad Tech to be MSP for Cisco's HealthPresence in India. April <http://www.healthtechzone.com/topics/healthcare/articles/2012/04/02/283160-telrad-tech-be-msp-ciscos-healthpresence-india.htm> (last accessed April 18, 2012)

Asian Tribune. Satellite to enable telemedicine in rural India. <http://www.asiantribune.com/news/2004/02/12/satellite-enable-telemedicine-rural-india-1> (last accessed April 18, 2012)

Baruah, Ayushman. 2011. Taking healthcare to the bottom of the pyramid. November 16. http://m.informationweek.in/Services/11-10-21/Taking_healthcare_to_the_bottom_of_the_pyramid.aspx?page=1 (last accessed April 18, 2012)

BCC Research. Global Market for Advanced Drug Delivery Systems to Grow to \$175.6 Billion by 2016. March 21 2012. <http://mhealthwatch.com/market-for-global-telemedicine-to-reach-27-3b-in-2016-up-from-11-6b-in-2011-19028/> (last accessed April 25, 2012)

Bhandari, Neelash. 2011. Cisco and government of Madhya Pradesh launch PPP pilot in remote healthcare. November 10. <http://drneelash.visibili.com/share/HXxDeW> (last accessed April 18, 2012)

Bhaskaranarayana A, Satyamurthy LS, Remilla ML. Indian Space Research Organization and telemedicine in India. *Telemedicine and eHealth*. 2009 Jul-Aug; pp. 586-91.

Bollineni, Raja. Neurosynaptic Communications ReMeDi Comprehensive Telemedicine Solutions ACCESS Health International Center for Emerging Market Solutions, Indian School of Business, Hyderabad, 2011.

Cerrato, Paul. 2012. Telemedicine Dilemma: Savings or healing hands more important? April 3. <http://www.informationweek.com/news/healthcare/mobile-wireless/232800145> (last accessed April 18, 2012)

Cisco Launches HealthPresence Telemedicine Solution, Providing Increased Access to Quality Medical Care Worldwide. http://worldhealthpartners.org/OurModel_ServiceModel.htm (last accessed April 18, 2012)

Cisco updates HealthPresence platform. <http://www.telecompaper.com/news/cisco-updates-healthpresence-platform> (last accessed April 18, 2012)

Duggal, Ravi. 2007. Healthcare in India: Changing the Financing Strategy. *Social Policy & Administration*. Vol. 41, No. 4, August 2007: pp. 386-394

Fast Company 2012 Top 10 Innovators in Biotech. <http://www.fastcompany.com/most-innovative-companies/2012/industry/biotech> (last accessed April 18, 2012)

Fast Company 2012 Top 10 Innovators in Healthcare. <http://www.fastcompany.com/most-innovative-companies/2012/industry/healthcare> (last accessed April 18, 2012)

Geisel School of Medicine. "Telehealth Practices in the United States". <http://geiselmed.dartmouth.edu/nhttp/pdf/telehealthpracticesreport.pdf> (last accessed April 18, 2012)

Indian Space Research Organization. Enabling Specialty Healthcare to the Rural and Remote Population of India.
<http://www.isro.org/publications/pdf/Telemedicine.pdf> (accessed April 18, 2012)

International Telemedicine Congress. <http://ehealth.eletsonline.com/2011/12/international-telemedicine-congress-2011/> (last accessed April 18, 2012)

Kannoju, Praveen Kumar; Sridhar, K.V.; Prasad, K.S.R .Design and Implementation of a Novel approach to implement Telemedicine In Rural India using advancements made in Communications and Information Technology. *Intelligent Systems, Modeling and Simulation (ISMS)*, 2011 International Conference.

Saxena, Anupam. Cisco partners with MP & Karnataka governments for remote healthcare.
<http://www.medianama.com/2011/11/223-cisco-partners-with-mp-karnataka-governments-for-remote-healthcare/> (last accessed April 18, 2012)

Saxena, Gunjan and Singh, Jagannath Prakash. E-medicine in India: - Hurdles and future prospects.
<http://www.themanager.org/resources/teemed.pdf> (last accessed April 18, 2012)

Valecha, Sarika. 2010. Apollo partners Cisco to offer cheaper telemedicine. Stock Watch, May 8.
<http://www.stockwatch.in/apollo-partners-cisco-offer-cheaper-telemedicine-25807> (accessed April 18, 2012)

Versel, Neil. 2012. VA division saves \$742,000 with Telehealth. February 8.
<http://www.informationweek.com/news/healthcare/mobile-wireless/232600447> (last accessed April 18, 2012)

World Health Partners. Service model. http://worldhealthpartners.org/OurModel_ServiceModel.htm (accessed April 18, 2012)