A case study on Telemedicine practices implemented with respect to Apollo Hospitals

Dr. P Uma Rani1, Dr. A. Devendran2, Dr J Sridevi3
1Professor, Faculty of Management Studies, Dr M.G.R Educational & Research Institute
Chennai – INDIA.
umapurusothaman@yahoo.co.in
2,3Associate Professor, Faculty of Management Studies, Dr M.G.R Educational & Research Institute
Chennai – INDIA
Devendran.alagarsamy@gmail.com

Abstract—Telemedicine is the use of information communication technology platform to provide clinical health care for patients located at a distance place. This technique helps to avoid distance barriers and helps to access medical services for people living in distant rural areas. Telecommunication saves life in critical and emergency situations. This article focuses to analyse the best practices and challenges faced at Apollo Hospitals by introducing telemedicine in the Indian setting.

In 1997, the Apollo Group Hospital decided to extend their services to suburban and rural India using telemedicine. Now the Apollo hospitals have 10,000 beds, 44 hospitals, and 4,000 consultants in 50 specialties, considered as one of the largest healthcare provider in Asia. They have the largest multispecialty telemedicine network in South Asia. Apollo Telemedicine Networking Foundation (ATNF) was developed. The success of ATNF boosted other hospitals to join the bandwagon and made telemedicine in India a reality. Patients from a distance of 120 to 4,500 miles are treated under telemedicine. The successful services from 2000 to 2001 by Apollo, has made the Indian Space Research Organization (ISRO) to realize telemedicine as one of the thrust area. The significant role played by ATNF in the growth and development of telemedicine is analyzed.

In olden days telemedicine was done through telephone and radio which is now supplemented with video telephony, advanced diagnostic methods supported by distributed client/server applications, and with telemedical devices to support in-home care. ATNF utilizes appropriate hardware, software, and peripheral medical devices, to examine, investigate, monitor, and treat the patient located in different places. Using Broadband Internet, ISDN lines or Very Small Aperture Terminal (VSAT), audio files, text data, images, and video can be transmitted.

Keywords—Apollo Telemedicine networking, telemedicine in India, VSAT, ISDN, information communication technology

Introduction:
Health care sector is one of the largest sectors in terms of revenue and employment. Now this sector is projected to grow to 40 billion dollars. Private hospital doctors are highly qualified, with good infrastructure and patient’s care. 90% of patients do not require surgery; hence the doctor need not be in direct contact with the patient. Telemedicine helps under such circumstances as the patient can be treated from different location. Apollo hospital was incorporated as Public limited company in 1979. They have treated around 7.4 million patients and 315000 health checkups. Their success rate is 98.5%.

India is considered as one of the most wanted global health tourism destination, due to the world class centers of excellence. As most of the doctors prefer to practice in cities, 70% of the populations in rural areas have limited access to medical care. Dr. Prathap C. Reddy, the founder of Apollo Hospitals is a visionary, who translated this vision into a reality. Dr. Reddy was fascinated by the words of St. Francis of Assisi who remarked, “Start by doing what is necessary,
then what is possible, and suddenly you are doing the impossible.

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ATNF has 106 peripheral centers in India and 9 overseas in Colombo, Dhaka, Yemen, Sudan Lahore, Lagos, Maldives, Muscat, and Kazakhstan. Apollo hospitals have centers in Andaman and Nicobar Islands, Mizoram in North Eastern India. The telemedicine referral centers are located at Ahmadabad, Bangalore, Chennai, Delhi, Hyderabad, Kolkatta and Madurai. More than 57,000 tele consultations have been provided through ATNF as of March 2009.

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Review of literature:

According to the 2011 Indian Census (Mehta 2013), sixty-nine percent of India’s population lives in rural areas; meaning, the majority of India functions with substantial barriers to education attainment and social mobility, and work in an unorganized, casual labor market which yields very little income. The rural population is at an inherent disadvantage in India as they lack the pre-requisites to participating in their country’s economic growth in the tertiary, modern services sector. The rural populations are mainly capable of working in the primary and secondary sectors, which largely consists of agriculture and manufacturing.

Mathur and Ambani (2005) and Tiwari (2008) discuss the Gyandoot project which was launched on November 29th, 1999 to take ICT into rural areas of India. This project has been largely successful in providing services in rural populations’ native languages, overcoming the language barrier and aiding rural citizens in reducing transaction and transportation costs. Mathur and Ambani also cite technologies specifically created for rural users at a lower cost and softwares made for use in local languages.

Teledmedicine:

60% of the Indian population lives in villages, but 80% of the health care facilities available in urban areas. Rural Indian Population depends upon a Primary Health Center (PHC) which is not fully equipped to handle complicated services. India Telemedicine was initially started in Pune along with the Tata Council for Community Initiative (TCCI). The main aim of telemedicine systems in India is to provide the service at an affordable cost through telecommunications infrastructure. It is felt that telemedicine is the solution to bridge the gap in health services between the rich and the poor. Today, there are 550 telemedicine units located in suburban and rural India offering telemedicine consultation from specialists from 70 tertiary care hospitals. 500,000 teleconsults, has helped to identify many technological issues for which corrective measures were taken. Apollo established its Telemedicine Centers at Tirunelveli, Kovilpatti, Pudukottai, Thiruvannamalai and Tuticorin.

Research Methodology:

Analytical research used in the field of telemedicine with specific reference to Apollo’s Telemedicine project. Doctors were interviewed for getting the first hand experience of managing this project. Questionnaires used to collect data regarding challenges faced and satisfaction of patients who availed telemedicine facility at Thiruvannamalai.
Objectives of the study:

- To study the mode of operation of telemedicine
- To analyse the best practices and challenges faced at Apollo Hospitals due to telemedicine
- To offer suggestions for improvement in their practices

History of Apollo hospitals:
Apollo Group Hospitals in Chennai was started in 1983. Dr Prathap .C Reddy’s dream is to make India the health care destination of the world. It is one of the best hospitals that attracts patients from several parts of India, as well as from abroad. The hospital has specialized internationally trained doctors in different areas of medicine. Apollo has set up 85 Telemedicine centers across different locations in India, Pakistan, Sri Lanka, and Middle East. Apollo has worked with large corporate hospitals and Government hospitals to small clinics and Information Centers.

Mode of operation of Telemedicine:
Apollo Telemedicine Networking Foundation (ATNF) has 45 centers across the country and works in conjunction with the ISRO, to provide specialty medical access to rural communities. Through this network, services in cardiology, dermatology, radiology, nephrology, general consultation and others are provided. In the last 9 years 57,000 teleconsultations have taken place through telemedicine centers set up by ATNF. ATNF has Web-based software, used to transmit electrocardiograms, images CT scans, ultrasound pictures, MRI and other reports. The videoconferencing camera is focused on illuminated x-ray lobby. The images are viewed by the consultant at the tertiary center. The office assistant checks the list of scheduled teleconsultations on a white board, according to the appointments given. The consultations take place between 1:00 PM and 5:00 PM and for review teleconsultations, the medical case records are obtained from the Medical Records Department. When Web-based software cannot be used, prescriptions are sent through e-mail or fax to the remote end, where a printout is handed over to the patient. Using computer aided transmission of audiovisual data, a doctor can diagnose the case of a patient in a distant location using an identified specialist from any location. Telemedicine provides tertiary health care to people at remote areas through a virtual reduction in distance. Text, sounds, pictures and videos are being merged and interconnected in completely new way. For e.g. use of live video to examine patients, electronic transmission of patients records and x rays, recording of ECG data and transmission over telephone, is possible and this is termed digital convergence.

Doctors in rural areas get access to experts through telemedicine and provide guidance on complex conditions. When a patient is present with a complex condition, the Clinical Officer creates a patient file with examination notes and photos and uploads it to the cloud. A doctor in the UK then reviews the file and offers diagnostic and treatment advice. A Telemedicine operation is a non-profit entity, providing free telemedicine consultations. A patient in need of specialist consultation in a 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.

In the telemedicine project the usage of software can be divided into three stages. First the data is transferred from the consultation center, secondly accepting the patient record and fixing up a teleconsultations and lastly viewing post consultation details. Patient details called EMR (electronic medical records) are transferred from consultancy center to the specialty center through a desktop version of software called Emedscope developed by GEMSIT (General Electric Medical Software Information Technology). This is a software which is available in the market and can be used by any doctor and not specific to Apollo. In this software each patient’s records are identified and retrieved by a UHID (unique health identification number) given to every patient who uses the Apollo hospital.
services. Each patient’s records are saved on a centralized UHID server on the basis of a UHID number. Fresh records of the patient are updated using the same number and thus data consistency is maintained.

To maintain privacy, only the teleconsultant is present but at times the relatives and the telemedicine administrator are present to facilitate translation into English. The telemedicine center at Chennai is equipped with a backup power supply, but not possible at the remote end. Due to power issues, consultations are postponed, and cause temporary loss of connectivity. The necessity for punctuality has been realized by the telemedicine administrators and 95% of the teleconsultations take place as per schedule.

Challenges in Telemedicine:

- Apollo hospitals find very difficult to relocate doctors to rural areas and willing to devote their time to treat rural patients. As telemedicine increases in scale, this challenge is becoming more difficult.
- As patients are slow to adapt to telemedicine process that is new and different, it limits the short term financial viability of the hospital.
- Indian government has financial resources to provide medical care to the rural poor, but their spending has been unfocused. The government can support private hospitals like Apollo to improve their infrastructure.
- As startups in telemedicine Apollo hospitals did not generate enough money, hence there was shortage of funds for modification or a change to the business model.
- India is a country with many languages which are more common in rural areas. It becomes difficult to find a physician with knowledge of different languages to communicate with patients.
- Though the hospital has invested huge amount for R&D it is not sufficient for telemedicine activities.
- As telemedicine involves two or more parties it becomes complicated to know who is liable when something goes wrong.
- ISRO has expanded the number of hospitals with satellite connections for telemedicine to over 100 institutions, still large rural areas are not connected to major cities, because satellite connections are too expensive, and the areas do not have a strong broadband network.

Table 1

<table>
<thead>
<tr>
<th>Type of hospitals</th>
<th>Relocation of Doctors</th>
<th>Government funding</th>
<th>Financial viability</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Government hospitals</td>
<td>200</td>
<td>150</td>
<td>50</td>
<td>400</td>
</tr>
<tr>
<td>Private hospitals</td>
<td>250</td>
<td>300</td>
<td>50</td>
<td>600</td>
</tr>
<tr>
<td>Total</td>
<td></td>
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<td>1000</td>
</tr>
</tbody>
</table>

H₀: Type of hospitals and telemedicine challenges are independent.
H₀: Type of hospitals and telemedicine challenges are not independent.

Since the P-value (0.0003) is less than the significance level (0.05), we cannot accept the null hypothesis. Thus, we conclude that there is a relationship between Type of hospitals and telemedicine challenges.

Findings:

- 60% rural population said telemedicine is beneficial to them as remote regions, who can receive care from doctors or specialists far away without the patient having to travel to visit them.
- 70% of patients said that it reduces the overall cost of medical care for rural masses.
- Apollo hospitals were able to promote telemedicine and distant medical facilities to 40% remote areas and to provide communication amongst medical community by dissemination of specialized medical knowledge through a technologically advanced network.
- Apollo hospitals electronically maintain information, records and systems thereby developing a network amongst the doctors, hospitals and patients.
- They conduct teleconferences, peer to peer reviews through the integration of medical and surgical expertise of specialist medical consultants with the Doctors or patients in the remote areas through the use of computer, satellite and networking technology for diagnosis, treatment, consultation and continuing education.
- Apollo hospitals maintain the software, computer systems and related hardware, peripherals, communication equipments and other accessories for the use of Networking Technology for providing the telemedicine and healthcare management.
- They have collaborated with Indian and Foreign universities, research organizations, other Foundations in telemedicine areas.
- There is a relationship between Type of hospitals (Private or Government) and telemedicine challenges faced.
- They provide scholarships, stipends, awards and rewards for persons engaged in research in the field of Telemedicine.

- Apollo hospitals entered into Joint research with other Research Centers, in Public and Private Sectors, Corporations, Government Agencies, Statutory bodies on mutually agreed terms on the basis that the fruits of such research shall be shared between the Company and the person or authority that sponsors such research.

Suggestions:

- It is necessary that highly customized services must be offered to provide holistic solutions for rural patients.
- Rural areas may have different norms, languages, perceptions and needs that require different model to adapt for different geographic areas.
- As the level of costs and revenues that clinic owners operate with in rural areas, satellite terminals through ISRO are too expensive, government must support these hospitals to be financially viable.
- Telemedicine models can be successful when a large number of rural patients avail this facility.
- More training must be offered to informal providers to satisfy the rural patients.
- Rural masses must be made aware to have involvement in their health.

Conclusion:

Apollo hospitals are doing lot of good work in reaching out to the rural masses. They take up this telemedicine services as a way to show their corporate social responsibilities. These hospitals are 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. In virtual medical treatment the human interaction is less between medical professionals and patients, that leads to increased risk of error in medical services in the absence of a registered professional, and protected health information may will be compromised through electronic storage and transmission. Due to unclear legal regulation for telemedical practices there is difficulty in claiming reimbursement from insurers or government programs in some fields. Hospitals involved in telemedicine is unable to start treatment immediately.
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