



OTTET

TELEMEDICINE

ANYWHERE-ANYTIME

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Acknowledgments

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Odisha Trust for Technical Education and Training (OTTET)'s Telemedicine network is a healthcare service delivery model that has been established as a need-based community-centric approach to promote and provide preventive healthcare and disease management services at the doorstep for the village communities of Odisha state. The services are provided at a nominal charge and connects them to the doctors and specialists through a virtual OPD using the modern ICT Platform and Network (Telemedicine) in Public Private Partnership with Government of Odisha.

Introduction

While India has made significant strides in economic growth in the last two decades, there has also been a steep growth in health expenditure alongside. This is largely due to a higher incidence and prevalence of diseases. It is also due to an increased awareness of health and therefore investments in health infrastructure. There is an acute shortage of physicians (1 per 1000 people) and nurses (0.8 per 1000 people) and care facilities (1 bed per 1000 people) [1] in the country. India needs to build at least 750 hospitals of 250 beds each, every year, to achieve the minimum national health standards stipulated by the World Health Organization. This involves incurring an annual expenditure of \$5 billion (USD). The spread of available workforce is also disproportionate across various regions, varying from 0.25 to 2.3 per 1000 people [1]. 70 percent of the population residing in rural areas has limited access to medical care. This is because 80 percent of the healthcare providers live in the urban & metropolitan areas. Growth rate of human resources and hospitals significantly lags the disease incidence rate, and hence the gap in demand versus supply is widening. It is not practically possible to arrest this widening gap only by building more hospitals and increasing human resources.

Adoption of Information and Communication Technologies (ICT) is the only way to accelerate bridging of this demand supply gap without physically shifting the resources.

Better utilization of available resources is possible if patients and healthcare workers in one region could consult experts in another region without having to travel physically. The gap can be reduced while increasing health awareness. Training of lesser skilled health workers to handle more complex jobs without the physical presence of an educator would help rapid upgradation of human resource quality. The effectiveness of such measures depends directly on timely exchange of relevant information between the demand and supply. Adoption of Information and Communication Technologies (ICT) is the only way to accelerate bridging of this demand supply gap without physically shifting the resources. It can also accelerate generation of additional resources in various levels of competency.

Background

Odisha Telemedicine Network

The State of Odisha is located on the east coast of India and has a population of almost 40 million people. Telemedicine activities were initiated in Odisha in the year 2001 with support from the Department of Information Technology, Government of India and Sanjay Gandhi Post Graduate Institute of Medical Sciences, Lucknow. Subsequently in the same year Indian Space Research Organization (ISRO), Department of Space, Government of India proposed to establish a Telemedicine Network in the state of Odisha. The government of Odisha accepted the offer and provided the necessary infrastructure and manpower support. Odisha Telemedicine Network was developed in three phases

Phase I: Odisha Telemedicine Network was established in 2003 that connected all the three Government Medical colleges of Odisha to Sanjay Gandhi Post Graduate Institute of Medical Sciences (SGPGIMS), Lucknow through Satellite-based VSAT connectivity. ISRO provided the hardware and software along with bandwidth free of charge. Later, on October 13 2003, the Hon'ble Chief Minister of Odisha inaugurated the network at Cuttack.

In 2004 the Department of Information and Technology, Ministry of Information and Communication Technology, Government of India and SGPGIMS, Lucknow together proposed to include SCB Medical College, Cuttack in yet another Telemedicine Project. The new project now linked all the three premier medical institutes i.e.; AIIMS, New Delhi; PGIMER, Chandigarh and SGPGIMS, Lucknow. Under this project SCB Medical College received superior

quality telemedicine equipment in 2005. The network worked on ISDN connectivity with Sanjeevani and Mercury Telemedicine software developed and installed by C-DAC (Center for Development of Advanced Computing) Mohali and Pune respectively.

Phase II: In the year 2007 with similar support from ISRO, the network expanded further to connect district hospitals of Koraput, Bhawanipatna, Baripada, Rayagada, Sundergarh, and Capital Hospital, Bhubaneswar to SCB Medical College and Hospital, Cuttack.

This enabled extension of specialty and super-specialty medical care to these districts from SCB Medical College & Hospital, Cuttack. Today the network works efficaciously with the full support from health professionals, administrators and policy makers of Odisha Government. In the meantime the facility has benefited many patients suffering from major illnesses through its Tele-Consultation and Tele-Follow-Up services offered by SGPGIMS Lucknow, AIIMS, New Delhi and PGIMER Chandigarh.

Phase III: The third phase of implementation started in 2009 with the provision of the telemedicine facility to the remaining 21 district hospitals of Odisha. The state of Odisha is the first in the country to have all its district hospitals linked to the medical colleges and super specialty hospitals under the Odisha Telemedicine Network (OTN). Phase-III has helped in taking specialty treatment and follow-up services to the doorstep for people in rural areas.

The Government of Odisha is striving to provide adequate healthcare for its population by catering to the health needs in rural areas, especially the poor and marginalized groups. In this regard, the Government of Odisha has been providing an amount of Rs. Ten Million (USD 225,000) every year from 2005-06 onwards for the establishment and/or expansion of telemedicine network in the state and any excess funds required are being arranged through National Rural Health Mission (NRHM). The government also plans to establish a state level Central Telemedicine Node within the premises of SCB Medical College & Hospital, Cuttack to monitor the activities of the network and to design, develop & implement new telemedicine projects in the state.

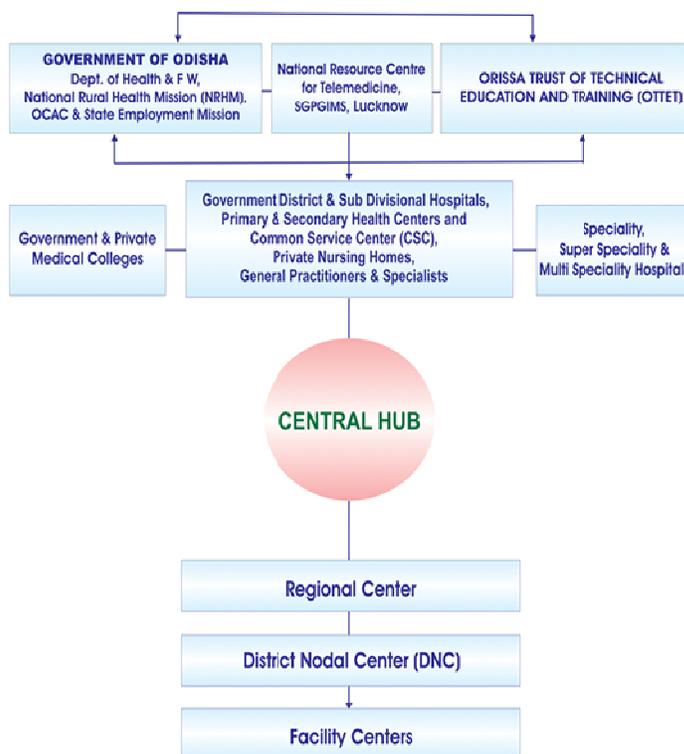
Odisha Trust for Technical Education and Training (OTTET)

The Odisha Trust of Technical Education and Training (OTTET) situated in Bhubaneswar was started in the year 1993 as a not-for-profit organization registered under Indian Trust Act. It is involved in education, training, healthcare services and poverty eradication programmes in the state of Odisha.

The Institute of Holistic Health Services (IHHS), a unit of OTTET provides healthcare education programs and healthcare services through the health centers of various agencies.

Odisha E-Health and Telemedicine Programme

The Odisha Telemedicine Network proposes to link the Community Health Centers (CHCs) and Primary Health Centres (PHCs) to the district hospitals and specialty hubs through a telemedicine system that can provide better healthcare services at the village level. However, the state Government does not think it is viable as it lacks a proper model to take these services to the grassroots level. However, the Government has proposed an alternative strategy to extend healthcare services through the telemedicine program and to meet the public health goal through a Public Private Partnership (PPP). It has time and again articulated the need for collaborating with NGOs and private agencies to provide and facilitate the use of health service delivery in hard-to-reach and underserved areas. At the state level there were



few service providers acquainted with telemedicine practices, to help the Government to take this telemedicine project to the grassroots level or village level. In this situation OTTET, with its experience in the area of education and healthcare at the grassroots level, together with SGPGIMS, Lucknow approached the Government of Odisha as a lead partner to implement the

Fig:1 Framework of Odisha e-health and Telemedicine Programme

rural telemedicine project on a PPP mode.

OTTET, with technical help from SGPGIMS, Lucknow has designed a network to implement the telemedicine project in Odisha at the grassroots level. SGPGIMS, Lucknow, as a knowledge partner has taken the role of training and developing a group of rural entrepreneurs who are capable and semi-skilled.

The programme is managed at the central level by the Government of Odisha, National Resource center for Telemedicine, SGPGIMS and OTTET. The main role of the Government of Odisha is to anchor the partnership and be actively involved throughout the project as a facilitator and an enabler. The National Resource Center for Telemedicine acts as a monitoring body to evaluate the service quality and effectiveness of the programme and as a statutory body to prevent any irregularities such as data security, protocol adherence etc. The role of SGPGIMS, Lucknow is primarily that of technical assistance and training, and work along with OTTET the lead implementer of the project. OTTET's role is to identify, establish, network and operate the telemedicine facility centers to provide healthcare services. . Additionally, SGPGIMS will be part of the network by extending specialist consultations to provide quality healthcare services along with other public and private partner hospitals, covering the entire state that comprise 51,000 villages.

The unique features of the project are:

- It is the first of its kind Telehealth enterprise PPP model of this scale in the country that connects all the levels of public and private health system.
- The project intends to deliver healthcare services through telemedicine at the doorstep for the rural population.
- The project aims to address the issue of access to affordable and quality healthcare in rural Odisha.
- The project uses the existing public health system infrastructure and deploys technology to network between providers and the patients.

- The project by connecting various levels of public health system through telemedicine has aided in establishing a strong referral network.
- The telemedicine project is completely technology enabled thereby by alleviating any space for manual errors (e.g.; data errors, prescription errors etc).
- Consultation is done through video and audio conferencing with physicians having access to patients' vitals to establish diagnosis and provide treatment in real time.
- It has involved the government partners in design, planning architecture of network and service model and the implementation process with strict monitoring guidelines.
- The implementing agency was committed, experienced & enthusiastic.
- The project is the first in exploring the possibility of employment of unemployed rural youth, school drop- outs, and women of the society.
- The project provided the potential to create a mass of semi-skilled productive workers from among unskilled young unproductive population reducing the burden on society.

OTTET, through this project envisages establishment of 200 telemedicine centres to deliver healthcare services through the virtual OPD. The Project proposes to cover the 51,000 villages of Odisha in the next three years.

In this direction and as part of the Memorandum of Understanding (MoU) with OTTET, the Health and Family Welfare Department, Government of Odisha has issued an order to the Chief District Medical Officers requesting them to:

- Provide space for setting up the telemedicine specialty centers in the district hospitals.
- Advice concerned authorities of the sub-divisional hospitals and primary and community health centres to set up Telemedicine facilities
- Instruct the doctors at the district hospitals to extend professional service on reimbursement of professional fees

OTTET TELEMEDICINE

The Odisha Trust for Technical Education and Training was the main implementing partner of the OTTET telemedicine network. OTTET, an integrated health care service delivery model was established as a need based community-centric approach to promote and provide preventive health care and disease management services at the door steps for people living in 51,000 villages of Odisha

The OTTET Telemedicine model strives to strike a balance between curative and preventive services by utilizing the existing infrastructure of the public sector and the private sector to provide much needed health services and products in poverty stricken rural areas. The network of facility centers created by OTTET addresses these needs with resources available locally and appropriate technology. Village health workers known as accredited Village e-Health Assistants (VHA) use the technology to provide healthcare in the village. The Telemedicine model uses an incentive-based system to motivate the VHAs to deliver less lucrative preventive services. The VHAs act as facilitators that connect rural communities with formally qualified doctors in the Public as well as the private system.

Objectives

The key objectives of the OTTET Telemedicine network are:

- Creation of e-infrastructure at the village level to facilitate knowledge delivery and provide promotive and preventive healthcare to the villagers at their doorstep
- Design, develop and deploy the rural telehealth network
- Impart training in tele-health technology to the local unemployed youth to create self-employment through entrepreneurship, and act as ancillary unit of OTTET
- Create a technical pool of skilled healthcare ICT human resources for the state government to handle the health ICT infrastructure of the state, thereby generating employment opportunity from which economic connectivity is going to emanate.

OTTET currently runs a network of 35 centers and is planning to increase the number of facility centers to 200 by 2013.

Selection of beneficiaries for the network

OTTET's Network identifies unemployed youth with college level education and nurtures them through a three-fold division of care

- Personal care: Identifying the beneficiary
- Professional care: Providing skill-based training to the beneficiary in various fields of tele health
- Socio care: Creating wage-employment/self-employment for the beneficiary by making them an entrepreneur in his/her respective village.

The selected youth are trained as Accredited Village E-health assistants to monitor the village facility centers and provide healthcare services through Telemedicine. The village facility center (Telemedicine Consultation Center) is the key component of the telemedicine network.

The training of the Village e-health assistants is done by the School of Telemedicine-SGPGIMS Lucknow. Presently approximately 500 unemployed youth identified by OTTET have undergone this training and the training costs are borne by the Trust.

Operating Model

The OTTET Telemedicine model is India's first community-centric program that provides preventive healthcare and disease management via telemedicine. OTTET Telemedicine primarily comprises of the Central Hub which acts as a control point and links patients to the network of hospitals (Government and private medical colleges, Government District and sub-divisional hospitals, private clinics and specialty hospitals) through the use of the facility centers. In addition, the hub manages the complete operations of the network including data management.

The OTTET Telemedicine Network works as a three-tier unit, with a regional center each at the four regions of the state, the district nodal center at the district level and the facility centers at the village level.. The Telemedicine facility centers, the most important component

of the referral chain provide Virtual OPD consultation for a cluster of villages. The other levels of the network are for marketing, co-ordination and administrative purposes.

Each facility center is managed by an Accredited Village e-Health assistant whose primary role is the facilitation of tele-consultation for patients using the Virtual Medical Consultation Platform (VMC) and to carry out basic medical tests in a simple and efficient manner 24X7. Based on the doctor's advice, appropriate referrals are made to OTTET approved hospitals/clinics for further management or review and dispensing of drugs. The doctors practice in various partner medical facilities across the state of Odisha. OTTET has partnered with doctors from both the private sector as well as the public sector.

The facility centres bridge the gap between the rural areas, where the clients reside and urban areas where the required quality healthcare is available. Using the latest communication technologies, reliable power backup and customized software available at the central hub, the facility centres enable remote diagnosis and audio-visual communication between rural, patients and qualified doctors. Each facility centre is established by the OTTET Telemedicine Network in partnership with eWaveMD, an Israel based manufacturing leader in telemedicine solutions. eWaveMD deploys the advanced Remote Technical Kiosk (ARTEK) that works on the Virtual Medical Consultation Platform (VMC).

The cost of establishing a facility centre with the telecommunication devices, diagnostic tools, power back-up facilities and software is approximately INR 160,000 (USD 3500). For the pilot project, OTTET has negotiated with eWaveMD to deploy the complete solution based on return-on-investment and recover the costs through the revenue generated by each facility center. The manufacturing company also stands to benefit from the sale of its products on a large scale. A direct return-on-investment from the manufacturer ensures a high stake in the provision of care as well as the quality and maintenance of the equipment. In addition, consultation, diagnostics, and payments are computerized eliminating any chance of mismanagement. All consultation procedures are recorded, monitored and managed by OTTET from the central hub.

In addition OTTET provides the village e-health assistant with training on counseling, demand generation, telemedicine system operations, marketing materials, and technological support.

The criteria for establishing a facility centre are -

Population – Each Telemedicine facility centre can cater to a population of about 20,000 to 30,000 people.

Location - Usually an area that is centrally located.

Availability of electricity and internet.

Facilities Available at the Centre:

eWaveMD Virtual Medical Consultation Platform (VMC): This telemedicine system, comprising software and hardware components, enables the facilitator to record heart sounds, temperature, blood pressure, pulse rate, SpO₂, Blood glucose, ECG etc. The telemedicine operator only needs to be able to carry out simple procedures such as attach probes, blood pressure cuff to measure blood pressure and then navigate the simple software. Results are sent to a qualified physician at the medical facility to read, diagnose and prescribe.

VMC brings modern healthcare services to places where it was not previously available, at a fraction of the cost of the traditional face-to-face medical encounter model. VMC can be utilized in rural clinics to provide patients with direct access to primary care physicians. Furthermore, nursing homes and small hospitals have access to specialists to assist the local care providers.

Central Hub

The Central Hub houses a panel of experienced technicians who monitor and facilitate the complete consultation process remotely between the qualified physicians and the patients visiting the facility centres. The consulting specialist doctors not only provide medical consultations to patients but also train and educate the local physicians. This system benefits rural patients but also doctors and specialists in providing long-distance healthcare consultancy in their spare time and earn additional revenue. The facility is based in Cuttack and is currently located in the SCB Medical College. The service has been extended to doctors in other cities who can provide consultations virtually. The only pre-requisite is an access to a computer with eWaveMD software, a webcam and a headset.

The Sociality consultation centers are staffed with e-health assistants who are the first point-of-contact for the telemedicine operator based at the facility center. They note down the history of the patient and feed it into the computer. Once all the relevant details are entered into the computer, they connect the patient to the doctor, who is then able to view the history online. OTTET is currently in the process of adding specialists to its panel of doctors and is experimenting with an appointment-based system.

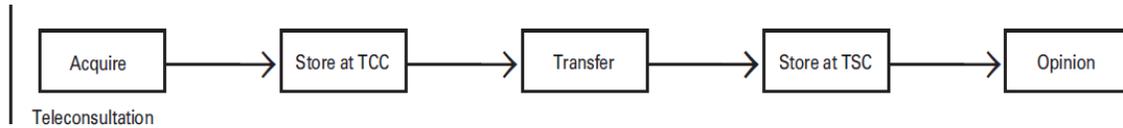
Virtual OPD Consultation Workflow

OTTET and eWaveMD jointly developed a new eHealth platform called the Virtual Medical Consultation^(TM) (VMC). VMC is a unique combination of cloud-based software, a comprehensive electronic health record (EHR) a dedicated hardware and medical devices. It deploys innovative medical technologies to transmit medical information from remote locations to central clinics and hospitals. The platform enables medical consultation between caregivers and patients located in rural areas. This is carried out using available telecommunication infrastructures.

The facility center at the village level and the consulting specialty center at different levels are linked to each other through a single point to multi-node ISDN (Integrated Services Digital Network). OTTET shares an ISDN Network of 128- 256 kbps (kilobytes per second) line of BSNL that provides reliable bandwidth and good connectivity when compared to the VSAT bandwidth. This is due to the fact that it is a shared bandwidth network ranging from 28 Kbps to 56 Kbps. VSAT being more expensive is not preferred when compared to ISDN.

The OTTET Telemedicine network has an Operators end (at the facility center) and a Physicians end (at the specialty center). The operators end utilizes a Canno-1 laptop with a printer and scanner. The facility center is equipped with biomedical devices such as Heartwave, an 8lead and 12 lead ECG equipment, a Wrist Clinic Unit to measure pulse rate, blood pressure, body temperature and oxygen saturation in the blood and a Glucometer to check the blood glucose. These devices are connected to the laptop that transfers the data of the patient to the physicians end through the e-Wave minigate which connects through Bluetooth technology eliminating the need for any wires and cords.

Once the patient arrives at the facility center through the Advanced Remote Technical Kiosk (ARTEK) a Unique Health registration Number (UHRN) is generated. The operator at the facility end captures and stores the patient's demographic details, his history and complaints.



Using a patient's UHRN number his consultation details are entered into the eWaveMD Virtual Consultation Platform at the facility center. All essential information like name, age, ailments, symptoms, diagnosis- so- far etc. is entered. The software provides information on the availability of specialist doctors at different specialty consulting centres of the OTTET Telemedicine Partner Network. The operator then initiates video conferencing for virtual consultation.

At the specialty consultation center the physician end software comprises two parts; the Call Accept/Reject page and the Post Consultation page. Depending on whether the requested doctor is available, the tele-consultation call is accepted, rejected, cancelled or kept pending. The consultation details are sent to the speciality consultation center using the eWaveMD . The last phase involves personnel at the speciality consultation center viewing the page to check the status of the patient details. The center can either request the facility center operator to collect the patient's detailed history to accept the virtual consultation and the captured patient details are retrieved at the physicians end using the same UHRN to go ahead with the consultation process,. After the consultation takes place, the doctor gives his opinion on the case and instructions for the patient through a post consultation page. This post consultation information which includes conference details, diagnosis and treatment plan is viewed at the facility center. All patient information is stored on a centralized database maintained by OTTET.

The whole consultation session usually lasts for approximately 15-20 minutes per patient. After the physician's initial interaction with the patient, he conducts a thorough examination of the patient by following a prescribed protocol based on the ICD-10¹ classification of

¹ The ICD (International Classification of Diseases) is the international standard diagnostic classification for all general epidemiological, many health management purposes and clinical use. It is used to classify diseases and other health problems recorded on many types of health and vital records including death certificates and health records. In addition to enabling the storage and retrieval of diagnostic information for clinical, epidemiological and quality purposes, these records also provide the basis for the compilation of national mortality and morbidity statistics by WHO Member States.

diseases. During the process the physician also instructs the operator at the facility end to conduct basic tests such as chest auscultation, blood pressure, temperature, pulse rate, spo2 etc. If required an ECG is also advised. The physician can access the patient’s basic diagnostics data in real-time as the operator connects the device to the patient enabling the physician to study the patient’s condition, diagnose the problem and prescribe the required treatment.

The diagnosis of the problem and the prescription of treatment advised by the physician can be retrieved by the operator at the Facility Center in real-time. A printout of the summary report and the physician’s prescription that has been digitally signed by the physician is handed over to the patient.

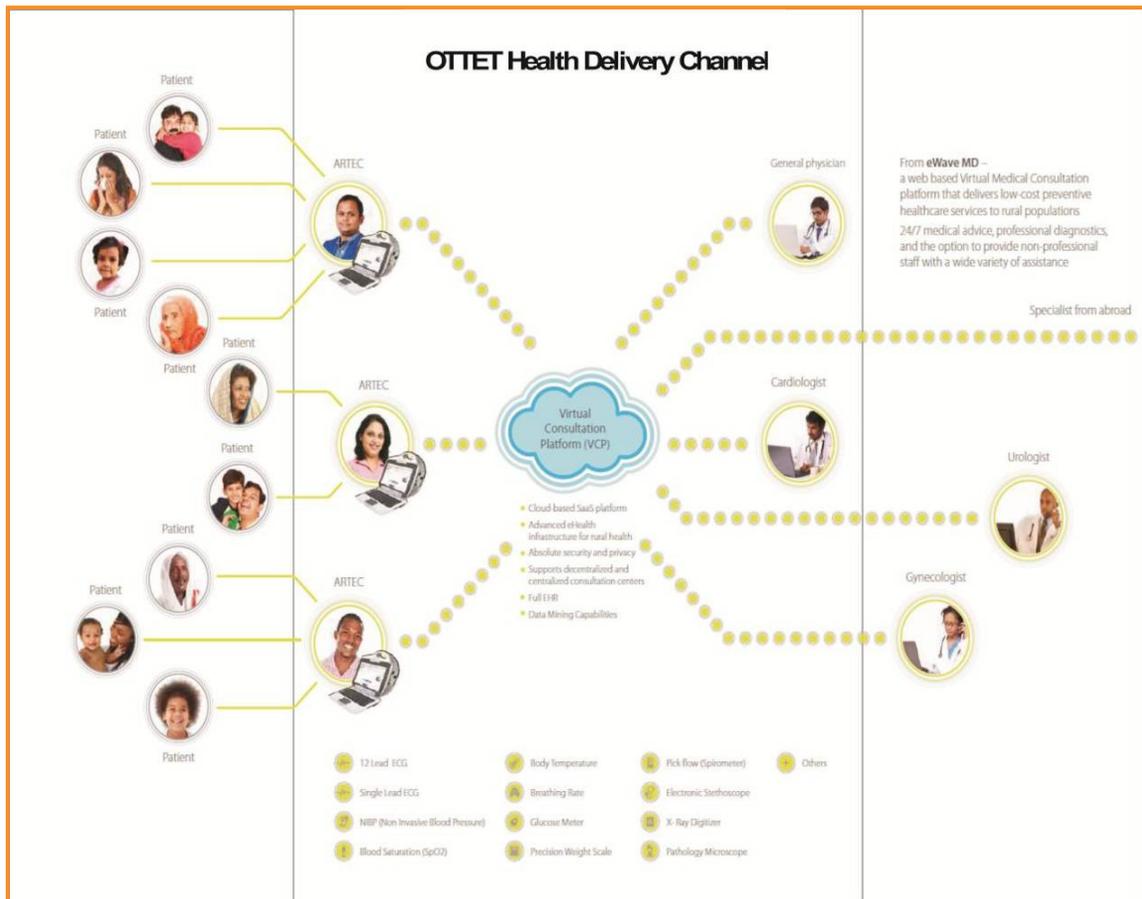


Fig:2 OTTET Health Delivery Channel workflow

On an average the OTTET Telemedicine facility centers provide Virtual OPD consultation to between eight and twenty patients a day. The patients' health records are stored electronically in the eWaveMD software and can be retrieved by the facility center and the central hub during the patient's subsequent visit using the URHN that was generated during his/her first consultation.

Patients records are saved on a centralized server at the central hub on the basis of the URHN. Patient records are updated using the same number and thus data consistency is maintained.

Pricing

In the initial phase OTTET applied a fixed price strategy for a consultation with varying charges for the basic diagnostics depending on the type of diagnostic procedure done (usually INR 20-50). Thus, the facility center charges INR 100 (USD 2) per consultation for patients above poverty line and INR 50 (USD 1) for patients below the poverty line. The revenue generated from the consultation fee is shared between OTTET Telemedicine and the consulting physician in a 50:50 ratio. The revenue generated from the diagnostics is added-in separately and this takes care of the cost of equipment and technology deployed by eWaveMD. The out-of-pocket expenditure for the patients is significantly reduced as specialist consultations are available at the Telemedicine facility centre. Travel time for specialty consultations is also reduced significantly.

Financing Model

The business model of OTTET is highly incentive-based. In the initial phase, the consultation fee of INR 100 is shared by OTTET (50 percent) and consulting physician (50 percent). The VHA based at the facility center and the operator at the speciality center are paid a fixed salary by OTTET. The revenue generated from the diagnostic procedures is paid to eWaveMD for the technology that is provided..

OTTET believes that the model has achieved break-even since its inception as there are no direct investments by the trust or the government. Once the manufacturer is reimbursed for his cost of equipment and technology investments, the facility centre is handed over to the VHA who has managed successfully thereby encouraging his growth as an entrepreneur. The operator at the speciality center will be enrolled under the respective hospitals payroll.

During the initial selection of the unemployed youth for the VHA training, OTTET had clearly discussed with them the growth plan so as to keep them motivated. They were also given incentives for good performance and successfully running the facility center. Continuous value-adding and revenue-generating services are also being explored along with the telemedicine services at the facility center

Growth Plans

OTTET Telemedicine Network currently operates 35 facility centers across 2 districts in Northern Odisha, and has partnered with two private specialty hospitals namely Apollo Hospital and the Kalinga Institute of Medical Centers. As the number of Telemedicine facility centers increase, OTTET plans to partner with more hospitals to provide consultation services and timely referrals for its clients through telemedicine.

The Trust plans to expand the network to 200 facility centers by the end of 2013. To achieve this goal a pool of 2000 trained VHAs would be required. Currently OTTET has 500 trained VHA's.

A Telemedicine Box Kit developed by the School of Biometrics and Telemedicine at the SGPGIMS-Lucknow is being tested in Uttar Pradesh. Based on the results of the pilot project, OTTET plans to introduce a Motor Bike Telemedicine Technician who will be on the move and go to the homes of the patients to provide virtual OPD treatment that that would then be linked to the facility centers.

OTTET Telemedicine network plans to extend this healthcare service delivery model to the states of Gujarat and Himachal Pradesh. The respective state governments have initiated a discussion in this regard.

The OTTET Telemedicine Network also plans to introduce a pharmacy to sell low cost drugs to their patients at their facility centers thereby making its services more comprehensive. Currently talks are underway with the National Rural Health Mission and the Government of Odisha to take this further.

Challenges

The pilot project has shown that there is a need for more attention in some areas such as legal, cultural and technology to make the project more effective.

Cultural Issues

Identification of the right people to teach technical skills to and convincing the government has been the biggest challenge for OTTET. This has been overcome by assuring the village unemployed youth a job within their community and a subsequent career growth plan if they join and support OTTET's effort through an incentive based mechanism. During the pilot phase, OTTET along with SGPGIMS have spent their own resources and shown their ability to develop and operate the telemedicine model that takes healthcare to the grassroots level. This effort and dedication shown in the pilot phase has convinced the government to choose OTTET as the lead implementer.

Despite OTTET's effort to create awareness about the telemedicine concept through its specialists (doctors), marketing team, health camps and other forms of mass communication, doctors at rural centers still find resistance to teleconsultation. It is the doctor at the consultation center who plays a major role in explaining the concept and making the patient comfortable with this form of virtual consultation.

Legal and Safety Issue

Confidentiality in the transfer of electronic health record is of prime concern in Telemedicine programmes done on such a large scale. The adequacy and accuracy of electronically transmitted data to establish correct diagnosis is often in question. If patient data does not get transferred correctly due to some technical malfunction such as image degradation in an

echocardiogram or in a histopathology slide, it will alter the diagnosis. Such inaccuracies could be charged to the attending physician hospital, the manufacturer or distributor of the equipment or even the telecommunication department. To address this issue OTTET has customized the software to capture post consultancy details thereby maintaining the authenticity of the data through e-signature of the doctor. It plans to adopt Hippa² standards, which are guidelines for transferring confidential information between two hospitals.

Technology Issues

Standardization and guidelines for practice of Telemedicine has not been enforced by the government that could lead to technical and compatibility difficulties for the telemedicine providers. Standardization would ensure inter-operability, with each centre operating on a particular system and communicating with other centers that operate on other systems.

Conclusion

Telemedicine has immense potential to influence the delivery of healthcare services at the primary level. If optimally utilized, telemedicine can effectively lead to better healthcare services even at the tertiary level. The employment of telemedicine at the primary and grassroots level can have a cascading effect on the healthcare system as a whole since the patients who do not require specialist services can be referred back at the primary level itself and the consulting time of the specialists can be optimally dedicated to the deserving patients.

Telemedicine assists in providing us with multiple delivery options and is technically a feasible concept, but it needs substantial investments. There are only two ways in which it could be

² The Health Insurance Portability and Accountability Act (HIPAA) of 1996 (P.L.104-191) [HIPAA] was enacted by the U.S. Congress and signed by President Bill Clinton in 1996. It was originally sponsored by Sen. Edward Kennedy (D-Mass.) and Sen. Nancy Kassebaum (R-Kan.). Title I of HIPAA protects health insurance coverage for workers and their families when they change or lose their jobs. Title II of HIPAA, known as the Administrative Simplification (AS) provisions, requires the establishment of national standards for electronic health care transactions and national identifiers for providers, health insurance plans, and employers.

made economically viable; obtaining government support for the infrastructure or by providing a bundle of shared services using the existing infrastructure.

OTTET has been successful in obtaining the government support and also in harnessing the energy and enthusiasm of the unemployed village youth to train and develop an army of technical human resource that could be utilized not only for the state of Odisha but for the entire nation in the future.

Probably, OTTET's success lay in its bottom-up approach that involves strengthening health delivery from the grassroots level through the use of technology so as to utilize the other levels of care in a cost-effective and appropriate manner.

The success of telemedicine depends on connectivity and volume of transactions. The volume of transactions is likely to be critical to its success. Hence OTTET strategy must create more sustainable transactions in the long term.

The OTTET Telemedicine Network has implemented the Odisha e-health and telemedicine program with the Government of Odisha as an anchorage through a PPP.. It has proved that low cost service delivery models can be created through partnerships and utilization of the public health system infrastructure. Building reputation and trust are the critical success factors for any ICT enabled delivery model. Providing medical consultation take the forefront along with reliability of the platform to provide the critical service that OTTET has achieved by partnering with the government.

This analysis of the OTTET Telemedicine Model indicate four critical success factors for sustaining telemedicine network :

Partnerships (Government support)

Low cost (economic sustainability)

Connectivity (technological efficiency) and

Trust (behavioral acceptability)

Developing countries like India need to evolve low-cost service delivery options, as healthcare services are moving from public realm to private realm, To overcome this barrier and address the emerging need of health, new forms of action and partnership are a clear need to

breakthrough traditional boundaries within government sectors, between governmental and non-governmental organizations, and between the public and private sectors by operationalization of a public-private partnerships.

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The case study has been compiled after primary and secondary research on the organization and published with their approval. The case has been compiled after field visits to the organization in March 2011. The author of the case or ACCESS Health International is not obliged or responsible for incorporating any changes that may have occurred in the organization thereafter. The case study has been developed with a specific focus to highlight some key practices/interventions of the organization and does not cover the organization in its entirety.

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