# Improving Rural Health Care Services Using ICT: Telemedicine Facility In Kerala

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**Abstract:** The paper examines the links between Information and communication technology (ICT) and health system through the benchmark of telemedicine project. The paper assesses how far the use of ICT has resulted in strengthening rural health care services and the key issues being faced by its utilization are the major research questions addressed in this study. The quantitative data was collected from 20 rural beneficiaries who are availing the benefits of the telemedicine from various centres using a questionnaire and was analysed using statistical tools. The results of the research showed that majority of the telemedicine units (63 Percentage) are non-functional with respect to inadequate ICT equipments. Most of the TMUs were partially functioning or non- functioning due to outdated systems, damaged ICT resources, poor internet connectivity and other technical problems. Hence the utilization of ICTs for effective health care delivery in rural areas strongly relies upon the provision of viable ICT infrastructure. It brings a major shift in the conventional delivery system by expanding beneficiaries' access to various services by delimiting socio-economic, cultural and geographical barriers. Medical practitioners at rural areas get immediate access to wide range of medical specialists, saves money and time of patients, helps in updating information, documentation of electronic health record of patients, possibility of centralized digital patient data repository are its positive outcomes whereas the issues such as inadequate network connectivity, lack of funding, absence of permanent site administrator, indifferent attitude and incorporation of doctors are the major constraints at its implementation level. ICT will not prove to be much effective in the health sector unless there evolves a combined effort from officials, practitioners and technical administrators. Telemedicine has to be applied in the modern health system with a constructive planning and implementation to strengthen the system more effectively.

**Keywords:** ICT, Telemedicine centres, Health Care Services, Digital Divide, Rural Areas

## Introduction

The diffusion of Information and Communication Technology (ICT) reaches every nook and corner of the society. Its widespread usage has increased the number of internet and mobile users. Kerala is ahead of other states in e-matters and has high tele- density and internet penetration, with rapid increase in the usage of smart phones (TRAI Report, 2011). ICTs have the potential to improve health care services in remote areas by delimiting time – space separation. Provision of quality health care in rural areas remains as an enduring issue. The draft National Health Policy of Kerala Government also lays emphasis on improving the care delivery system. Provision of "health for all" and to have an affordable and accessible health system to each and every one are the guiding principles of the perspective plan 2030 (Economic review, 2015). With much ambiance and deliberateness, the telemedicine project has been implemented but to what extent its effectiveness and utilization has resulted in transforming the overall health system persists as a significant question.

Developments in telecommunication and information technologies have contributed to the growth of telemedicine. It is simply meant for the application of information and communication technologies in order to provide clinical health care at a distance. Most peculiar feature is that it helps eliminate distance barriers by improving access to medical services that would often not be consistently available in remote regions. It is extremely beneficial for people living in isolated communities as it saves lives in critical and emergency situations. This technology permits communication between patient and medical practitioners as well as the transmission of medical data (high resolution images, sounds and patient records) from one site to another, where expert opinion are available. (Mathur et al, 2017) & (Patnaik & Patnaik, 2015). Specialist can provide an accurate and complete examination. ICT provides a great deal of advantage in the delivery of health care, as it excel over the conventional system. Examples are teleconferencing, video-conferencing and Rural Health Management Information System.

Emergence of various disciplines in telemedicine, such as tele-ophthalmology, tele-radiology, tele-oncology, tele-cardiology and tele-stroke extended the scope of this programme. The usage of ICTs provides a platform for resource sharing, early detection, diagnosis, treatment and prevention of diseases, delivery of medical advice; reduce the expense of healthcare and travel (Nandakumar et al, 2008).Therefore, the widespread assistance of technology can thus be extended to rural areas for generating awareness, providing high quality consultation, early detection of chronic diseases, follow-up management, and eradication programs and for medical educational activities.

Telemedicine can also be used as a teaching tool. Technologies like interactive video, high speed internet facility, high resolution monitor and other peripheral facilitates effective and faster examination techniques. It is a two-way communication channel by which professionals in specialised fields can observe, show and instruct or give medical advice to the staff in another location within a fraction of time.

**Status of Telemedicine Centres**

Telemedicine has made far reaching changes during the last two years with the convergence of the tele-health and e-health initiatives. Strong foundation has been implemented at the policy level relating to the usage of ICTs in health sector, but the most challenging condition to implement telemedicine system is in establishing fast and secure network connectivity between the specialist and remote centre. Giving due representation to its implementation strategy, only a minute percent of telemedicine units (TMUs) are highly equipped with high end video conferencing equipments, LCD TV, Multimedia computers and other clinical digital devices for carrying interaction between the centres. This limited access restricts the provision of quality services.

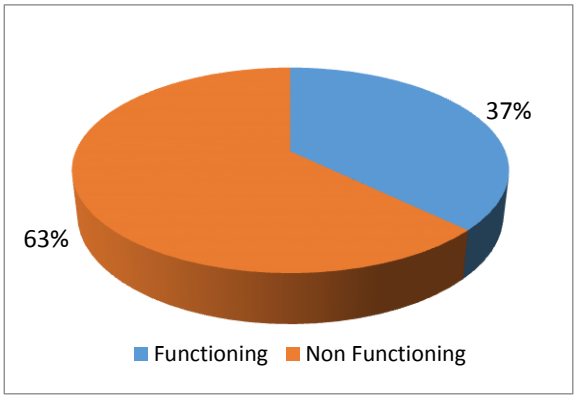


**Figure 1**: Working status of TMUs

**Source**: CDAC, 2011

There are more than 40 telemedicine units in Kerala under government departments and various medical Institutions; whereas it's full-fledged integration into the prevailing health system seems to be unattractive. The inadequacy of existing infrastructures limits its potential usage and effectiveness. Not all the units are completely functional at present. Most of them are non-functional with respect to minor problems such as non-working of computers, unavailability of funds, minute repairing works, absence of a permanent site administrators, etc.

This facility has a far reaching impact in several pilot projects within the state and throughout India but it is in a level of under-utilization. "Though there were large number of telemedicine centres, its full-length utilization were meaningfully carried out only in insignificant centres".

**Improving Rural Health Care System**

ICTs have the potential to reach wider audience which expands individual's opportunities to access various health services. It brings revolutionary changes in the conventional delivery mechanisms. Most of the populations in rural area are excluded from availing advanced health facilities due to geographical, economic, social and cultural barriers. Telemedicine has been instrumental in expanding its reach. Geographical isolation makes it more difficult to provide services anytime and anywhere (C-DAC, 2011). Thus, there is a need to improve access along with ensuring high quality delivery of health care to individuals in those remote regions. The major outcomes of telemedicine can generally be described as:

- The speedy transmission of patient data related to consultation and diagnosis from one place to another.
- Delivery of health care to individuals without limitations of time or distance.
- Helps in optimization of resources.
- Reduction of travel, time and expenses of the patients.
- Reduce patients overload at medical centres.
- Access to wide range of medical services within easy reach.
- Cost effective delivery of specialized services.
- Enables efficient health and emergency management systems.
- Accessibility to expert opinion and consultation of health – care professionals.

Tele-Education programs, Tele-Health Care, Tele-Consultations, Tele-Discussions, Tele-transmission are the emerging areas of telemedicine applications. Tele-consultation is one of the main areas of ICT integration in which it provides an opportunity to consult an expert at a speciality centre from a remote location. It offers a platform to share relevant clinical information of patient in electronic format which includes text such as patient history, examination, investigation reports, audio-video clippings in MP3 or MPEG format like voice, murmurs, heart beats, etc and also still images like ECG, CT or Ultra Sound Scan, X-Rays, etc. These electronic data is effective and meaningful for timely decision making as well as for better consultations. Advanced clinical devices help in speedy transmission of patient related information (Mishra, 2008). The video-conferencing system allows the communication between the specialist and the doctor at remote centres much easier and facilitates the delivery of right medical advice. Based on this appropriate treatment can be recommended to the patients.

Tele-education programmes are also gaining attention recently. It facilitates in creating awareness, early diagnosis of diseases, helps in information dissemination about risk factors in complicated cases etc. Doctors, staff nurses and students need not have to visit the main centres to attend workshops and classes. Case-presentations and case-discussions are two such activities. The two-way communication process enables the doctors to get clarifications regarding those patients having serious difficulties. Medical data's and demographic history of rare, peculiar and chronic cases along with blood records, X-ray, scan reports can also be normally transmitted and shared to the experienced professionals. It is much beneficial in order to find viable solution for unidentified conditions as well as enables early referrals for critical cases.

**Inter-operability**

As telemedicine combines the art of technology, it acts as a multidimensional platform which equally benefits the practitioners, patience and institutions thereby enhancing easy accessibility and availability of advanced medical care to all citizens. It is no doubt that the influence of ICTs in the health sector has resulted in steady improvements in healthcare. It rectifies several underpinnings in rural areas like inadequate infrastructure, lack of medical equipments, shortage of experienced doctors etc.

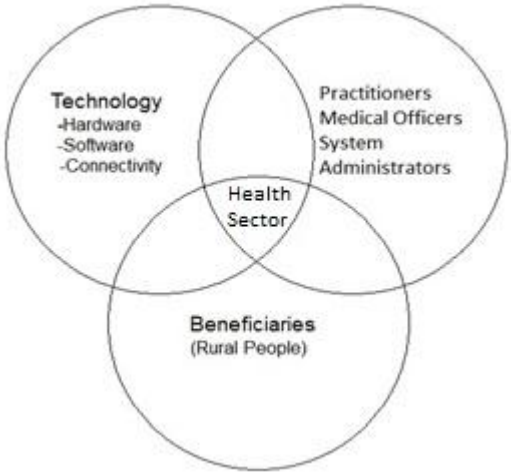


**Figure 2**: Application of ICT in Health Sector

**Source:** Author

**Problem statement**

The health scenario in Kerala has made significant gains in improving infrastructure and health care facilities. It is evident from its provision of universal accessibility and availability even to the poorer and deprived sections of the society. Though the state shows an overall positive achievement in raising the health status, it leapfrogs further to improve upon these achievements. Expert committee Report on Health for the 12$^{th}$ five year plan, states that in order to address the challenges faced by the health system, various strategies need to be adopted, of which improving the quality of health services is the most vital instrument in achieving this transitions. Rural health care delivery can be better upgraded with the help of Information and Communication technologies [2]. It is a platform based on computer applications including hardware and software components that assist in diagnosis of diseases and disseminate timely information upon health to the rural population.

Rural areas are characterised as information – poor and lags behind in providing basic amenities, necessary health infrastructure, trained professionals, adequate facilities etc as compared to their urban counterparts. ICTs can be used as a tool to mitigate the rural – urban disparity since it is unavailable, inaccessible and unaffordable to majority of rural people due to their poor social, economical and cultural barriers. Telemedicine enhances efficiency and effectiveness by bringing diagnosis at the doorsteps of rural population.

The issue of digital divide, absence of proper communication, negligence of healthcare and poor referral system are serious issues faced by the rural communities to have better access to health services. These alarming issues further results the rural areas to lag behind.

It has been noticed that there is a great deal of disparity in enabling quality and access to healthcare between urban and rural areas. Doctor distribution in rural settings also seems dismal due to limited facilities, poor condition and lack of accessibility. Introduction of telemedicine is a solution for understaffed rural and remote regions to receive the service of qualified consultants in urban centres. Thereby healthcare providers in rural locations feel less isolated and are willing to work in such places without much boredom and hesitations (Patnaik & Patnaik, 2015).

Though large scale improvements are repeatedly put forward, more than half of the population even today lacks access to good health care. The diffusion of Information and Communication Technology in health sector can create a viable pathway for improving referral system, reduce the barriers of access to medical services, helps in documentation of the cases, subject to expert consultation and reduce health – care expense. Results from earlier studies indicate a gap between rural-urban divide in the provision of

health services. Therefore it is pertinent to study the integration of ICT in rural health care system and its resultant transformations.

**Research Questions**

- Has ICT improved rural health care delivery?
- What are the limitations and key challenges in its effective implementation?

**Research Methods**

The study was conducted using qualitative and quantitative data. The qualitative data was collected from the participants who are associated with the telemedicine project. The sample comprises of medical practitioners, site administrators, state level nodal officers and healthcare professionals in specialised fields. Semi-structured interviews and focus group discussions including video conferencing techniques were conducted with doctors at medical centres for the purpose of data collection. The quantitative data was collected from 20 rural beneficiaries who are availing the benefits of the telemedicine from various centres. The data was collected using questionnaire and the analysis was done with the statistical measurements.

**Data Analysis and Discussion**

Benefits of Telemedicine Consultation

Wide range of benefits can be derived by patients from the usage of TM system. The major advantage is in terms of saving time and cost of travelling along by bringing high quality speciality diagnosis to the rural areas. Thus it is convenient for those patients who are too weak and unable to travel to the urban centres for availing treatments. Such patients get immediate medical care at their residence. Another peculiar feature is that highly specialised services from expert doctors are now affordable to the rural people without much delay. Maintenance of electronic medical records of patients helps to keep the data more secure, organized and easily retrievable. Majority of the patients who underwent telemedicine consultation are of the opinion that it assists in speedy diagnosis of their medical problems.

**Table 1**: Benefits of Telemedicine Consultation

| Benefits | Frequency (n = 20) | Percentage (%) |
|---|---|---|
| Cost Saving | 18 | 90 |
| Time saving | 19 | 95 |
| Reduce number of travelling to speciality centres | 15 | 75 |
| High quality diagnosis | 13 | 65 |
| Better health care facility | 14 | 70 |

**Source**: Primary data

Regarding the benefits of rural telemedicine project, majority of the respondents indicated that the telemedicine consultation is much better than the conventional OP system. The savings in cost, time and avoidance of long distance travel to the speciality hospitals were the major reasons indicated by the patients. 65 percent of the respondents were satisfied as they received high quality diagnosis. 70 percent of the respondents indicated that telemedicine provides better health care facility according to their convenience.

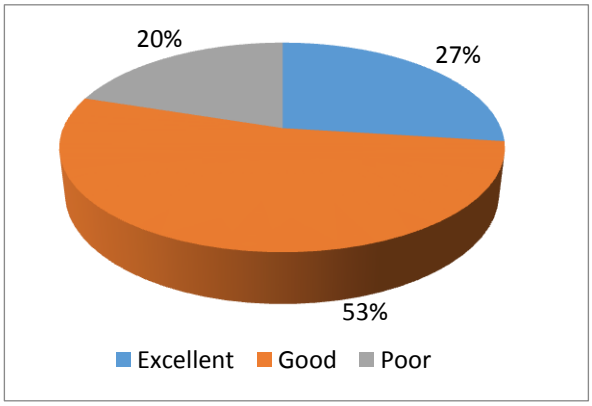


**Figure 3**: Effectiveness of TM System

**Source**: Primary data

As shown in figure 3, a total of 27 percent of the patients said that the services they received through this facility seem to be excellent. The vast majority (53 percent) indicated that the services offered was good, while only 20 percent of the patients opinion that it was poor due to the occurrence of some negative issues like distraction in connectivity problems, unavailability of doctors on time at the speciality centres since they were busy in consulting OP patients, etc.

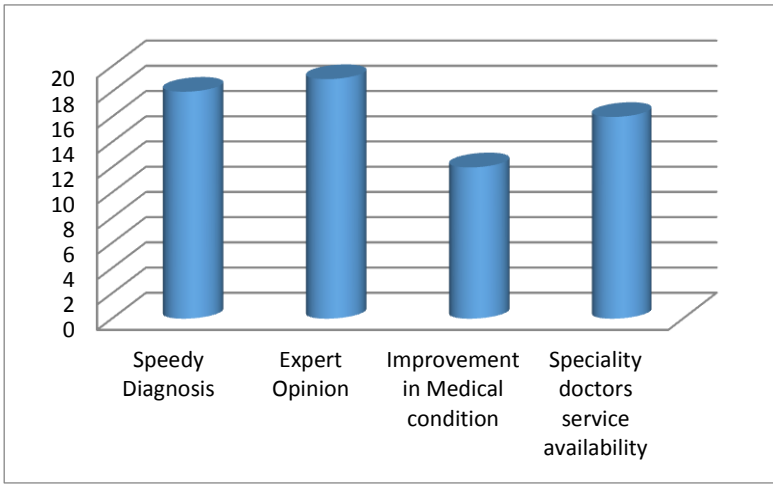

**Figure 4**: Effect of ICT on Rural health Care Delivery

An overwhelming majority of the respondents (95 percent) indicated that they received better consultation and opinion by expert medical practitioners from speciality TM centres. About 90 percent of the respondents mentioned that the speedy diagnosis results in early detection of the disease. 80 percent of the respondent's gets clarifications from the doctors specialized in various fields. They get awareness from experts about health problems, diseases, epidemics etc. Whereas less than 60 percent of the respondents indicated that they had improvements in their medical condition since they underwent telemedicine consultation. They find difficulty in getting follow up treatment from the expert professionals.

**Minimising Health Care Disparity**

Rural areas are often most digitally excluded from availing various healthcare services. Telemedicine is a potential tool that can give technical support to bridge the rural – urban disparity. ICT has become a catalyst for bringing many alternatives by tackling socio-economic challenges and healthcare disparities. It is an alternative low cost service that transforms the conventional delivery mechanisms.

Rural areas are denied of physical facilities and the gap between those who have access to technology and those who do not is widening. However the usage of smart phones altered the situation to a great extend by steady access to health – apps and medicals advices within their reach in a few seconds. The non-availability of adequate medical professionals in rural areas also makes a huge difference. More than three-fourth of the physician positions remains vacant in the rural healthcare services (Mathur et al, 2017). This shortage also negatively affects the reach of the specialised services to these underserved communities. The introduction of ICTs is a potential enabler for solving many of these obstacles of the geographically dispersed population.

**Enduring Issues: Challenges faced in Telemedicine**

Several contradictions still exist in the present health care system that precedes the adoption of telemedicine. ICT has had little impact on health care delivery mechanisms. A number of barriers ranging from lack of infrastructure to budget allocation, trained personnel to indifferent attitude of medical practitioners found to be ineffective in stipulating digital health.

**Telemedicine Platform**

Enabling a strong infrastructure is a prerequisite for the speedy transmission of electronic medical data which includes high resolution images, videos, audios and patient records. Availability of well-equipped speciality centres with communication network to establish fast and secure connectivity, enabling hardware infrastructure with the supporting elements such as desktop PC, laptop UPS, LCD TV, server, digital ECG machine, digital camera, ultra sound scanner and other appropriate clinical devices are fundamental underpinning to improve efficiency and effectiveness of telemedicine services.

Most appropriate, cost-effective and sustainable technology needs to be in place of outdated ones. *"Better and secured connectivity is required for the transfer of digital images like X-ray, ECG, Ultra Scan, etc."*

**Figure 5**: Lack of ICT peripherals in telemedicine centres

**Source**: Primary field data

Network problems remains as a serious hindrance for the transfer of electronic medical records. Hence it is difficult for sharing images with expert doctors. Disruptions in internet connectivity restrict the smooth functioning of the TMUs. Most of the clinical devices were either damaged or in under-repairment. Low – bandwidth fails to connect the main centres with its remote units. Apart from technical problems, the most serious deterrent was that there were no

appropriate rooms or buildings to house this technology service. TMUs require supporting infrastructures which includes provision of multimedia PC, digital TV, reliable connectivity, adequate technical and administrative support.

"*ICT equipments and computer rooms were non-functional as they are covered with dust particles and seem to be non-usable. Therefore ICT peripherals need to be repaired, replaced and renovated. Telemedicine rooms are to be spacious and need to be equipped with sufficient ICT equipments such as big monitors, adequate computers and video conferencing facilities for its efficient functioning."*

**Insufficient Site Administrators**

Majority of the TMUs were non-functional due to the absence of permanent site administrators. Only trained personnel's can efficiently handle the telemedicine services. At least one person should be appointed permanently to take care of it. In addition, they are working on contract basis with minimum wages. Thus they suddenly move on to other jobs when they get better opportunities. Therefore salary increment for the site administrators is at most essential in order to prevent slowing down of telemedicine program all over Kerala.

"*Lack of trained personnel to manage the program is a parameter for providing technical support*."

**Indifferent Attitude of practitioners**

Effective utilization of telemedicine was not determined by infrastructure alone. It is equally relied upon the skills and attitudes of the medical professionals to decide whether to use it or not. Medical practitioners are well ahead in e-skills and in using various digital gadgets. ICTs have opened up new platform for knowledge updating and sharing. Result shows that only an insignificant number of practitioners show positive attitude towards it. Patience over load and time constraints also matters greatly for their non-usage.

*"Doctors considered it as a burden and opinion that it is an extra duty for them which loss much of their time."* Site administrators only provide technical support indeed medical professionals has to take up this facility as a serious concern and consider it as part and parcel of their profession.*"In most centres telemedicine activities were restricted to mere awareness and training programs only."* Apart from this no other programs were carried out. Utilization of telemedicine programs were also found to be low, merely some activities were carried out once in a week or rarely in these TM units.

## Financial Constraints

The foremost barrier in enabling a strong infrastructure build-up is lack of appropriate funds. Though there is a progressive rise in health budgets, there is no plan fund allocation for telemedicine. None of the State or Central Governments takes serious efforts for its future prospective.

*"Government funds are not raised due to the inefficiency and poor functioning of telemedicine centres."* The practicability of this facility founds to be weak and hence it was not reached up to the expected standard.

## Conclusion

The findings suggest that successful integration of ICT is clearly related to actions taken at the policy levels combined along with the acquisition of infrastructure such as hardware, connectivity and having committed and trained personnel. Concordance of these interrelated factors is necessary condition for the successful implementation of telemedicine. This reinforces the fact that majority of the telemedicine units were not functioning properly due to lack of site administrators, connectivity issues, outdated computers and disinterest of doctors as well as officials. ICTs have great potential for knowledge dissemination and are a means for efficient healthcare services. The drawbacks of integrating ICTs into health care are enormous but its benefits can meet the challenges of the 21$^{st}$ century and brings enormous transformations in the rural health care services. Appropriate and necessary policy initiatives are to be strictly emphasised. Conducting training programs for empowering practitioners, extending grants for maintenance and solving technical issues, provision of reliable connectivity, proper documentation of telemedicine activities and appointment of permanent site administrators at all telemedicine units are the alternative solutions for its speedy dissemination and transition.

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