

Impact of telemedicine adoption on Healthcare Service Reach and Patient Satisfaction

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Abstract.

Affordable and quality healthcare services are need, essential requirement and right of every citizen. However, in rural areas and far flung interiors of India, it is a challenge to provide better healthcare. The study theoretically tries to analyse how quality healthcare services can be provided to remote locations by the help of digital and information technology platforms like telemedicine. The study further attempts at proposing avenues to increase the reach of healthcare services and thereby provide enhanced patient's satisfaction. The study based on literature review and theoretical model-based proposition development, explains and discusses in critical depth regarding the adoption of digital technology to enhance reach of quality care services and improvement of patient satisfaction for healthcare services, albeit within the constraints of providing care at an affordable price.

Keywords. A maximum of five words is allowed. Each keyword should be separated by a comma.

1. Introduction

In human culture, technology has always played a critical role. Some technology has improved living conditions and others have guaranteed experience. Technology has already contributed to human civilization by making less attempts and increasing its use. As the corporate presence with IT, acts to access and offer health insurance should also be minimised. In this study we centred on how telemedicine technology would improve the extent of healthcare and patient satisfaction through inclusion of IT and other emerging innovations and thereby add to the overall healthcare objective of the community. In the recent situation created through SARS-CoV2-Virus, also known as COVID-19, emerging technologies have largely proved its worth,; facilitating connection between Physicians and patients to

ensure provision of timely and quality healthcare services (Bhatt et al., 2020).

According to the statistics of the World Health Organisation (WHO), only 0.758 physicians per thousand people are available in India (WHO website). It means that the density of a doctor is very low. Thus, problems such as quality of treatment, accessibility of treatment and cost-effectiveness of care in India remain. Through its complementarity capabilities, technology will help to reduce the issue to a certain degree (Chakraborty and Bhatt, 2020).

Telemedicine is used to provide patient knowledge and resources using telecommunications technology (Sims, 2014). Telemedicine is a forum for the diagnosis and treatment in rural and indoor communities where healthcare facilities have limited physical access. Telemedicine technology can deliver healthcare facilities and spread them (Sasikala et al., 2018).

2. Literature Review

There is truly little literature available in hospitals and very few trials for new infrastructure implementation. Most literature indicates the path of technical acceptance through the SERVQUAL principle to customer satisfaction (Andaleeb, 2001). The purpose of healthcare should however be not just the recovery and the satisfaction of patients admitted to hospitals. The same should also be taken into consideration for patients living in rural areas, where it is impossible to provide quality healthcare facilities.

On the other hand, telemedicine literature does not include the convergence and coordination of health systems. The bulk of the research work conducted on the subject addresses the technical aspects, and a little management components. Study involves how telemedicine can work, how IT can incorporate telemedicine and what sort of illness and condition it can work for. But research does not dwell on how telemedicine achieves efficiency, affordability, and access to care?

As technology is effective, Keng and Cho (2017) have

ensured that it can be used for essential services such as healthcare. The Internet will still risk data protection. In terms of healthcare, the protection of records is important because the medical record of the patient is documentation that can only be given to the patient and doctors and unauthorized access is not tolerated. The solutions to security problems were offered by Kumar and Mallick (2018) and Moosavi et al.(2018). They claimed that security issues can be solved by using block-chain.

Censorship and technology transfer could be able to capture and transport data. Analytics in the context can execute dynamic permutations, making technology practical for health purposes. The elderly can be identified with technologies such as IoT (Yacchirema, 2018). Professional creativity and self-effectiveness can contribute to loyalty to the implementation of technology (Martinez-Carlo et al., 2018). The introduction of wireless IoT into mobile devices was given by Rashkosva and Trobec (2016) and telemedicine applications explained.

2.1. Telemedicine Advancement

In contrast to IT development (Lin et al., 2002), progression of telemedicine can be defined as the degree to which hospitals are using facilities in the far end. It tests the degree of proactive use and application of telemedicine technologies (Lin et al., 2002) to identify health options for indoor residents. With technical advances, hospitals can offer the right standard of quality healthcare in the interior and small villages where high quality healthcare and the conventional model are difficult to provide. (Tachakra et al . , 2003; Rajan and Phillipe, 2017; Gannpathy and Ravindra, 2009; Chakraborty et al., 2018) Innovations should be used to offer high quality and accessible healthcare.

In the other hand, the invention of telemedicine will allow medical experts to provide fast and effective care in a very short span of time and maximize treatment time (Rajan and Philipe, 2017; Navjit et al., 2017). This helps doctors to provide care to more patients concurrently, since they do not have to drive over long distances. (Chakraborty et al., 2020).

2.2. Digital Technology Adoption in Hospitals

Tech adoption can be described as using the latest technology not only for first use, but also for continued use by hospitals (Venkatesh and Devis, 2000). New technology is not required if it is from IT. For this research, however, we only adopted digital technology that can be described as using digital technology (IT) in their day-to-day operations by hospitals.

Hospitals can also produce an advantage from IT, like every other company, since IT demonstrates complementarity with current assets (Bhatt and Grover, 2005). With the good IT infrastructure hospitals, productivity for in-house operations can be improved. On the other hand, hospitals will also improve their productivity in delivering healthcare to the population, which is inexpensive, affordable but of higher quality. The introduction of IT allows hospitals to effectively control their conventional business model as IT encourages hospitals to use individual strategies and to achieve productivity. IT technologies in health care are diverse and telemedicine is just one of them (Bhatt et al., 2019).

Most hospitals have today followed the model for the provision of telemedicine services (Chakraborty et al., 2019). Hospitals in major cities or underground cities with commercial, budgetary, infrastructural, technical and medical knowledge facilities have embraced the hub and have become a model and source of medical care for nearby towns, including the interior areas (Chakraborty et al., 2020). In this model, an expert doctor will provide healthcare services to the indoor villagers through wireless frequencies. However, in order to offer reliable and high-quality clinical care, information concerning the medical status of patients must be passed to the doctors.

2.3. Care Delivery Alignment

Alignment of care management may be defined as supplying the healthcare needs and suppliers to the consumer. Wide hospitals need to open a little clinically-type infrastructure in the remote area (Chakraborty and Bhatt, 2018) with sufficient medical equipment, services, pharmaceuticals (not only medications, but also other products), internet connectivity and a patient compounding system.

Today several instruments (e visit) can be linked to a computer and display with sufficient protection the physiological conditions of patients on the Internet. A hospital physician specialist can assess the patient's condition and can identify and administer the medication. Thus, the need and supply gap can be met.

2.4. Healthcare Reach

Reach can be specified as the degree to which services can be rendered in relation to location (Bharadwaj, 2000). Healthcare enters here how far and where emergency services are to be offered. Health facilities are the main or essential facilities that all residents, including other factors, such as cost or places, require. With increase in reach of information technology devices, affordable healthcare services can be provided to the disadvantageous people of the society.

2.5. Patient Satisfaction

Customer satisfaction may be described as a feeling of pleasure for a client or customer with the services or goods offered. In other words, it is a test of how providers will meet the needs of consumers. In this scenario, the patient should be viewed as a consumer who wants health care. Thus, a patient's satisfaction is defined as a health care recipient's reaction to salient aspects of his or her service experience (Cleary and McNeil,1998). Superior efficiency and affordability health care will potentially improve the happiness of the customer as the patient's health care meets his needs. Healthcare services are no longer mere wants. They are now a basic need for any citizen. A citizen's right to take medication, which reduces suffering and allows the patient to survive even longer and healthier (Chakraborty et al., 2020).

3. Case Study

Telemedicine services for villagers living in remote areas have begun in a Chennai based hospital. In India as well as in nine other countries, hospitals developed 106 peripheral centres. All the appointed consultation uses the ICT tools and therefore all the protocols, Processes and medicines are

registered on a digital basis. In a consulting room only a patient and a teleconsultant is present, however, close relatives of patients are also permitted. Not all types of diseases and conditions are operated on the property, but basic health services are supplied seamlessly. The centre tackles skin and dermatology with a digital camera with a high definition, so derma scopes can be applied. Psychiatry services also provided, as services demand minimal ICT infrastructure (except video connectivity). The services also promote the installation of state-of-the-art instrumentation for internal drugs in the event of viral as well as bacterial infection. In order to decide on the type of the procedure, the report on the laboratory evaluation is discussed with the teleconsultant. In the backdrop of all the collected data, treatment research is performed in the Chennai data centre. The research encourages telemedicine advisors to adjust the method of procedure, medication, and other important things. The hospital used technologies and trained its own staff to maximize the usage potential optimally. The ultramodern, futuristic instruments used to build educational tools for all the primary care facilities also. This offers comprehensive evidence for integration and treatment research to help serve society's health needs. In order to track patient's health conditions, the hospital has effectively developed a link between technology and users through modern technology and novel medical devices.

4. Model Development

Digital healthcare technology adoptions will enhance the process of telemedicine further as the introduction of technologies can lead to greater productivity between the speech (Telemedicine Centre) and the center (metro-city hospital). In this respect, information penetration can be achieved, and health services can be delivered on time due to advanced technologies (Chakraborty et al., 2018). Due to the correct flow of information, accuracy in the diagnosis of the disease and medication can be achieved. For example, a medical specialist gets the right information on the internet, and the specialist may speak to the patient about advanced audiovisual technologies to help analyze the symptoms better for diagnosing and treating the disease (Bos et al., 2008).

On the other hand, low technical standards in the hospital would contribute to the asymmetry of information between the TV center and the hospital (Lin et al. 2002). In this situation, the right information flow is difficult to acquire and retain, leading to insufficient care and dire consequences. But things are managed with the aid of advanced and sophisticated tools and digital technology.

Proposition 1: Digital technology adoption in hospitals will lead towards telemedicine advancement.

Healthcare is required in remote areas also. The goal was to provide everyone with good health care with telemedicine technology. It is also consistent with the government's policy priorities. Healthcare can be provided in the inland villages almost in line with metro services (Chakraborty and Bhatt, 2018). The technology helps to coordinate healthcare

requirements and supplies and can help to effectively fill the gap between the two.

As a medical expert is based practically solely and not physically, the affordability of treatment improves with the same standard of services as patients have no huge charge to pay for consulting a physician (Chakraborty et al., 2018). On the other hand, the process will lead to the optimization of care times (Navjit et al., 2017), which can lead to economies of scale and scope, because a medical specialist is able to treat more patients simultaneously, because the requisite data can be generated in real time.

Proposition 2a: Telemedicine advancement can lead to care delivery alignment.

IT is something planned for alignment. In the sense of industry, several instances have shown the excellent alignment between two partners or the company or SBU through technology and IT implementation (Bhatt and Grover, 2005; Bharadwaj, 2000). Digital technology will build the complementarity that makes it easy to leverage resources.

Digital technology can also play an important role in health services because it can integrate data, speed of communication, accountability, and information quality (Chakraborty et al., 2018). Technology can improve communication between hospitals and telemedicine centres, which can reduce the effects of inappropriate harmonisation and can reduce the cost of delivering care over the long term and improve affordability.

Proposition 2b: Digital technology adoption in hospitals can lead to care delivery alignment.

If there is coordination between needs and availability, the field for delivering services would likely be expanded. In addition, the synchronisation of care delivery is accomplished by development of telemedicine through the use of interactive technologies and IT. IT can increase service reach. In today's age Internet access is not a challenge because of the growth of the telecommunications infrastructure; there is evidence that even the remote region is connected to Internet facilities. In addition, ISRO (Indian Space Research Organization) has transmitted certain satellites only for telemedicine to a better communication facility. And since IT uses communication technologies, it can hit the far end and health care can be delivered on an affordable scale.

Proposition 3a: Care Delivery Alignment will have a positive impact on Healthcare Service Reach.

IT will also increase the range, which can be described as a platform number that can be integrated and analysed simultaneously (Bharadwaj, 2000). In other words, it can also be defined as several processes on computational objects. IT has its enormous capabilities and is very quick to carry out tasks. The patient data, for example, is easily integrated and analysed; physiological data integration in real time can be accomplished. Due to the knowledge prevalence, safety, timeliness, incorporation in the real-time environment and

consistency, patients' standards of health services can be surpassed and fulfilled.

The patient can also buy from the telemedicine centre the medication and other related pharmaceuticals according to the medical specialist. The patient does not have to drive around for facilities and goods, but all health-related services are delivered from a single point of contact. This contributes to satisfaction of the patient.

Proposition 3b: Care delivery alignment will have a positive impact on patient satisfaction.

With the expanded reach of patients in the interior where the provision of healthcare is a challenge, due to the Internet, the

connectivity, the IT and telemedicine can feel safe, as they have access to accessible quality health care in cities. On the other side, due to care alignment, patients often decrease their efforts to get healthcare services as they do not have to travel the long way for treatment. Emergencies may also be treated to a certain degree. Superior service quality is then delivered at competitive rates and reduced patient effort. There is a high possibility that due to medical experience and arrangements, the expectations of the patient will easily be achieved.

Proposition 4: Healthcare Reach will have a positive impact on patient satisfaction.

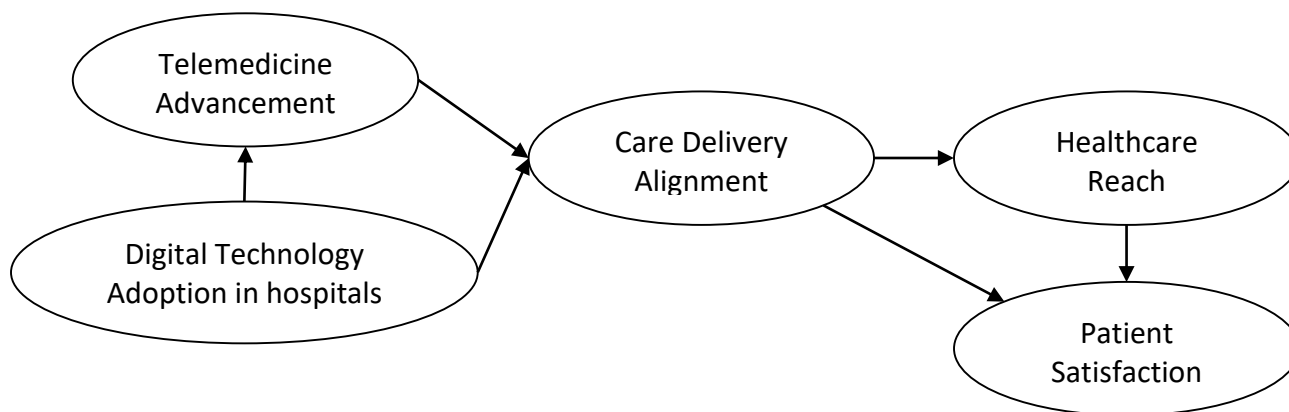


Figure 1: Theoretical Model

5. Future Scope

The study centered around building a theoretical model along with the literature support. The study also includes the real-life case study of a hospital which has already implemented telemedicine services and earning revenues by remote consultancy. However, study lacks an empirical investigation using data from administrator, patient and physician side. This study can further be developed empirically by developing measurement scales for each construct in the context of telemedicine and other digital technology adoption, and responses from the stakeholders can be taken using questionnaire, which empirically validates the claim of the theoretical support.

6. Conclusions

The aim of the study is to establish the theory. Extensive literature review and case study method is used for the purpose of theory construction. From the literature above, we can infer that the scope and satisfaction of the patient can be generated with the help of digital and information technology, and the study is one of the preliminary work, which studied digital technology adoption and telemedicine implementation by hospitals and increasing the reach of healthcare services to provide good health to the nation. There are, however, other factors that affect patient satisfaction which we did not study as it seems out of the scope of the study. On the other hand, there are so many different procedures that can be improved by IT, and not just telemedicine, but even productive business

operations can be carried out by IT in hospitals. However, the structures are not empirically validated but provided the theoretical model for further testing using large scale sample statistics.

References

- Andaleeb, Syed Saad. "Service quality perceptions and patient satisfaction: a study of hospitals in a developing country." *Social science & medicine* Vol 52, No 9, (2001), 1359-1370.
- Atzori, Luigi, Antonio Iera, and Giacomo Morabito. "The internet of things: A survey." *Computer networks* Vol, 54, No 15 (2010): 2787-2805.
- Bandyopadhyay, Soma, et al. "Role of middleware for internet of things: A study." *International Journal of Computer Science and Engineering Survey* Vol 2, No 3, (2011): 94-105.
- Bharadwaj, A. S. A resource-based perspective on information technology capability and firm performance: an empirical investigation. *MIS quarterly*, (2000), 169-196.
- Bhatt, Ganesh D., and Varun Grover. "Types of information technology capabilities and their role in competitive advantage: An empirical study." *Journal of management information systems* Vol 22, No 2, (2005): 253-277.
- Bhatt, Vaidik, P. Sashikala, and Samyadip Chakraborty. "The Impact of Information Technology and Analytics on the Performance of a Hospital: Scale Development in Indian Context." *International Journal of Recent Technology and Engineering*. Vol 8, No 3, (2019), 2861 – 2869.

- Bonomi, Flavio, et al. "Fog computing and its role in the internet of things." Proceedings of the first edition of the MCC workshop on Mobile cloud computing. 2012.
- Bos, L., Marsh, A., Carroll, D., Gupta, S., & Rees, M. (2008, July). Patient 2.0 Empowerment. In SWWS (pp. 164-168).
- Botta, Alessio, et al. "Integration of cloud computing and internet of things: a survey." Future generation computer systems Vol 56, (2016), 684-700.
- Chakraborty, Samyadip, and Vaidik Bhatt. "Enablers of telemedicine technology adoption: A case-based conceptualization in Indian context." Indian Journal of Public Health Research & Development Vol 9, No. 11 (2018): 116-120.
- Chakraborty, Samyadip, and Vaidik Bhatt. "Interactional Resource Adoption: A Bridging Solution to Healthcare Service Divide in India." Handbook of Research on Engineering Innovations and Technology Management in Organizations. IGI Global, 2020. 253-268.
- Chakraborty, Samyadip, Vaidik Bhatt, and Tulika Chakravorty. "Importance of Digitech Adoption for Providing Efficient Healthcare Services during COVID-19." International Journal of Emerging Technologies. Volume 11, No. 3 (2020), 2673-2681.
- Chakraborty, Samyadip, Vaidik Bhatt, and Tulika Chakravorty. "Impact of Digital Technology Adoption on Care Service Orchestration, Agility and Responsiveness." International Journal of Scientific and Technology Research. Volume 9, No. 3 (2020), 2581-2586.
- Chakraborty, Samyadip, Vaidik Bhatt, and Tulika Chakravorty. "Impact of IoT adoption on agility and flexibility of healthcare organization." International Journal of Innovative Technology and Exploring Engineering. Vol 8, No 11. (2019), 2673-2681.
- Chakraborty, Samyadip, Vaidik Bhatt, and Tulika Chakravorty. "Is telemedicine best alternative to reaching last mile: Investigation in the context of rural India." Indian Journal of Public Health Research & Development Vol 9, No 10, (2018): 202-206.
- Cleary, Paul D., and Barbara J. McNeil. "Patient satisfaction as an indicator of quality care." Inquiry (1988): 25-36.
- Dullet, Navjit W., et al. "Impact of a university-based outpatient telemedicine program on time savings, travel costs, and environmental pollutants." Value in Health Vol 20, No 4, (2017), 542-546.
- Gubbi, Jayavardhana, et al. "Internet of Things (IoT): A vision, architectural elements, and future directions." Future generation computer systems Vol 29, No 7, (2013), 1645-1660.
- <https://evisit.com/resources/telemedicine-telehealth-equipment/>
- Koppel, Ross, et al. "Role of computerized physician order entry systems in facilitating medication errors." Jama Vol 239, No 10, (2005), 1197-1203.
- Krishnan, Ganapathy, and Ravindra Aditi. "Telemedicine in India: the Apollo story." Telemedicine and E-health Vol 15, No 6, (2009), 576-585.
- Lin, Fu-ren, Sheng-hsiu Huang, and Sheng-cheng Lin. "Effects of information sharing on supply chain performance in electronic commerce." IEEE Transactions on engineering management Vol 49, No 3 (2002), 258-268.
- Parajuli, Rajan, and Philippe Doneys. "Exploring the role of telemedicine in improving access to healthcare services by women and girls in rural Nepal." Telematics and Informatics Vol 34, No 7, (2017) 1166-1176.
- Sasikala, S., K. Indhira, and V. M. Chandrasekaran. "Performance prediction of interactive telemedicine." Informatics in Medicine Unlocked Vol 11, (2018), 87-94.
- Sims, Julian M. "Communities of practice: Telemedicine and online medical communities." Technological Forecasting and Social Change Vol 126, (2018), 53-63.
- Tachakra, Sapal, et al. "Mobile e-health: the unwired evolution of telemedicine." Telemedicine Journal and E-health Vol 9, No 3, (2003), 247-257.
- Venkatesh, V., & Davis, F. D. A theoretical extension of the technology acceptance model: Four longitudinal field studies. Management science, Vol 46, No 2, (2000), 186-204.
- WHO data (http://www.who.int/gho/health_workforce/physicians_density/en/)