

Understanding Telemedicine Adoption Barriers in Rural Communities of India

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Abstract: *Telemedicine is a revolutionary technology that has the potential to transform the health care delivery system. Access to healthcare is a huge problem in rural communities of developing nations and telemedicine can be a perfect solution. However, the adoption and usage of telemedicine has been slower than expected in developing nations. This paper tries to investigate the reasons for poor adoption of telemedicine from a patient and healthcare provider perspective. The paper focuses on rural communities of India and provides a framework for future research. eHealth literacy is an important theoretical concept that can be used to understand the slow adoption of telemedicine in developing countries. The research framework suggested in the paper will be relevant to regulators, healthcare providers and technology companies. Even though this paper is focused on India, it can be applicable to other developing countries.*

Keywords: telemedicine, healthcare, adoption, rural communities, developing nations

1. Introduction and Background

Telemedicine is a revolutionary technology which can be defined by four key elements: provides clinical assistance, uses information and communication technologies, connects people from different locations and focuses on improving health outcomes [10]. It has the potential to transform the health care delivery system. During the Covid pandemic, the need to reduce face to face consultations without affecting the quality and access of essential health care services has revitalized the need for telemedicine. Telemedicine might become the future of healthcare delivery given the low costs and improved convenience benefits [4].

There are huge disparities in terms of health and healthcare delivery between urban and rural communities of developing countries. Rural communities are often characterized with lower life expectancy, obesity, chronic diseases, poor mental health, and unhealthy behaviors [13]. This presents a huge medical unmet need in developing countries (especially rural communities). Despite this need, challenges such as physician shortages, insufficient infrastructure and lack of health care facilities limit healthcare access in developing countries [7]. There has been rapid advancement in telemedicine through remote monitoring, sensor, and cloud - based technology. This has led to development of key medical applications for treatment, diagnosis, and disease surveillance. Telemedicine can be a perfect solution to solve health care access issues in developing countries.

Given the prospect of telemedicine in transforming healthcare delivery, its adoption and usage has been slower than expected in developing nations. Confidentiality issues, poor internet infrastructure and lack of required skills are some of the major barriers to telemedicine adoption in developing countries [5]. Most of the research on telemedicine adoption in developing countries has focused on identifying logistical and government policy level challenges. There is still considerable gap in understanding the poor adoption of telemedicine in developing countries (especially rural communities) from a patient and healthcare provider perspective.

The topic on telemedicine adoption lacks a validated theoretical framework that might work for developing

nations. Most of the studies conducted on this topic have been focused on developed nations such as United Kingdom, United States, Netherlands, and Europe [2]. Socio economic, geographic, and regulatory features of developing countries are completely different from developed countries. These differences warrant understanding of telemedicine adoption challenges from the lens of developing countries and more specifically end users of telemedicine (patients and healthcare providers). This paper will focus on challenges in implementing telemedicine solutions in developing countries from an end user (patient and healthcare provider) perspective.

2. Problem Statement

There is a growing demand of healthcare in rural communities of developing nations. India is facing major shortages in terms of qualified healthcare professionals, leading to poor access to healthcare. The doctor patient ratio in India is way below the World Health Organization guidelines. Apart from these issues, the medical facilities or infrastructure is present mostly in cities, serving only a quarter of the Indian population [2]. This lack of infrastructure in the rural settings leads to fewer qualified healthcare professionals practicing in rural communities.

Rural health is often characterized by lower life expectancy, obesity, chronic diseases, unhealthy behaviors, and poor mental health [13]. Despite this demand, there is huge divide in quality and access to healthcare between urban and rural communities. Rural areas have poor healthcare infrastructure, leading to fewer practicing healthcare professionals [3]. Telemedicine can be an effective solution to deliver affordable healthcare to communities of developing nations. As per Mckinsey report, adoption of telemedicine solutions in developing countries such as India can lead to billions of dollars in saving [2]. Telemedicine delivers healthcare through exchange of data and communication technology [5]. Despite the promise of telemedicine in improving healthcare access, its adoption has been poor in rural communities of developing nations. Poor internet infrastructure, confidentiality issues, and lack of required skills are some of the major barriers to telemedicine adoption [5].

Most of the research on telemedicine adoption in developing countries is restricted to identifying logistical and government policy level challenges. There is still considerable gap in understanding the poor adoption of telemedicine from a patient and health care provider perspective in rural settings. This paper will focus on a research framework to understand challenges in implementing telemedicine solutions in rural India from a patient perspective.

India is facing a huge unmet need of qualified health care providers in rural communities. Majority of health care facilities are in cities that serve a quarter of the Indian population. Telemedicine can be a great solution to bridge the rural urban health care access disparity. There has been a growing demand for improved healthcare access in India (especially in rural communities). Major reasons include large ageing population, healthcare provider shortage, increase in chronic diseases and increase in awareness among patients.

Telemedicine guidelines were proposed by the medical council of India to promote the adoption of telemedicine. The guidelines were meant only for registered medical practitioners. Exclusions included surgical or invasive procedures. The Government of India has developed a proper training program to help healthcare providers understand these guidelines and limitations related to telemedicine usage. Telemedicine applications can be classified by mode of communication, timing, purpose, and interaction between the individuals involved. Healthcare providers must take care of seven elements during telemedicine consultation. These include context, patient identification, mode of communication, patient consent, type of consultation, patient evaluation and patient management [1].

Despite efforts of Government of India to allow registered medical practitioners to provide health care using telemedicine, the adoption has been slow [2].

It is important to understand the barriers to slow adoption not just from a logistical perspective but also from an end user perspective. The purpose of this paper is to provide a quantitative research framework to analyze the different challenges impeding the implementation of telemedicine solutions in rural parts of India—While this study will be focused on understanding the challenges from a patient perspective, healthcare provider perspective will also be considered in the analysis.

3. Literature Review

Several studies have been done in the field of telemedicine to understand the adoption challenges. One of the telemedicine studies conducted tries to understand the satisfaction level and ongoing challenges of telemedicine adoption in rural communities [10]. The study looks at the urban and rural health care access divide despite the growing unmet need in rural communities. During COVID, there has been increased use of telemedicine and mental online programs in rural communities. Telemedicine satisfaction is positively associated with eHealth literacy. Lack of digital infrastructure is another important challenge faced by rural communities. This research focuses on rural communities and characterizes the major issues faced by them. eHealth literacy and its impact

on user satisfaction is an important concept introduced in this research. This concept can be used to analyze the challenges in implementing telemedicine solutions in rural communities of developing countries such as India.

Another study [3] tries to understand the current adoption of telemedicine in India and explores the relevance of telemedicine in remote areas of India. Through literature search, the study comes up with the challenges faced by developing nations in utilizing telemedicine in remote areas. The study identifies the need to standardize methods and techniques of using telemedicine for healthcare delivery and proposes international organizations such as World Bank and UNICEF to work together in successful implementation of telemedicine in developing nations. The study focuses on the telemedicine adoption challenges in rural communities of India by evaluating the ongoing government and non-government initiatives. The study uses a framework from World Health Organization to understand the different types of telemedicine based on mode of communication, timing of the information transmitted, interaction, and purpose. This framework can be used to understand the challenges faced by each type of telemedicine in remote areas.

A study [5] tries to investigate the potential barriers to telemedicine adoption in rural communities of Bangladesh. The article identifies patient satisfaction, lack of organizational effectiveness, health staff motivation and trustworthiness as significant barriers to telemedicine adoption in rural communities. Other factors such as internet infrastructure, quality of care and resources indirectly effect telemedicine adoption. The research focuses on rural communities in a developing country such as Bangladesh and quantitatively explores the barriers to telemedicine adoption. It looks at these barriers from a patient perspective, which will be highly relevant for this paper. Finally, it provides a theoretical framework and model that can be used in similar research.

Another study examines the challenges faced by different countries in implementing telemedicine solutions [12]. The article uses systematic literature review from databases such as Cumulative Index of Nursing and Allied Health Literature (CINAHL) and PubMed (MEDLINE) to understand trends related to telemedicine adoption barriers by type, country, organization, patient, medical staff, and programmers. Most literature reviews on telemedicine adoption barriers stem from USA, followed by Europe, Australia, Africa, the Middle East, and India. The major barriers to telemedicine adoption in USA include privacy, legal and technically challenged staff. Age, level of education and poor eHealth literacy were identified as the major barriers to telemedicine adoption in Europe. Technically challenged staff and resistance to change were the barriers to telemedicine adoption in Australia. Language barrier and patients not owning phone were the adoption barriers in Africa. In the Middle East, unawareness, technically challenged staff and poor design were the prime adoption barriers to telemedicine. Poor design, high expectation of users and technically challenged staff were the adoption barriers in India. The factors hindering adoption in organizations include cost, reimbursement, legal liability, privacy confidentiality and security of data. Age, level of education, eHealth literacy and internet bandwidth were the

major adoption barriers among patients. Technically challenged staff, resistance to change and licensing were the adoption barriers among healthcare providers and programmers. Overall, the article identified 33 barriers to telemedicine adoption based on occurrence in research databases. Technically challenged staff, followed by resistance to change, cost, age of patient, reimbursement, and level of education of patient were the main adoption barriers by frequency of occurrence in research databases. These barriers based on country can be good starting point in building the research framework. The barriers specific to India, patient and health care provider will help in building the survey instrument.

There are risks associated that impact the behavioral intention of healthcare providers, hindering the poor adoption of telemedicine in India [2]. Financial risk is one such risk associated with telemedicine. Telemedicine implementation in hospitals include not only purchase and maintenance of telemedicine equipment but also training of healthcare professionals. These added costs lead to slow adoption of telemedicine solutions. Social risk is another risk impacting the slow adoption of telemedicine in developing countries. The lack of trained staff to deploy telemedicine solutions in developing nations have led to the slow adoption of this technology. To successfully implement telemedicine solutions doctors, nurses and tech support professionals must be properly trained. Lack of proper training resources in developing nations is leading to slow adoption of telemedicine solutions. Logistical challenges in developing nations such as lack of electricity or stable internet connection drive poor adoption of telemedicine solutions. Other issues related to security, privacy and data confidentiality further hinder the adoption of telemedicine solutions among patient and healthcare providers. The risks discussed in the study will be helpful in building a framework and necessary hypothesis to understand the poor adoption of telemedicine solutions in developing countries.

After thorough review of above articles and other secondary literature, it is clear that several studies have been done to understand telemedicine adoption in rural communities of both developed and developing nations. However, there is still a considerable gap in understanding poor telemedicine adoption from a patient perspective. This can be achieved by using eHealth literacy as a measure to understand the slow adoption in rural communities.

4. Theoretical and Conceptual Framework

The focus of this paper is on challenges or barriers impeding the adoption of telemedicine solutions in developing countries. The research will be using India as an example to build the necessary framework for developing countries. Challenges to adoption of telemedicine solutions differ by type of country. There has been a major gap identifying a theoretical framework to understand the telemedicine adoption challenges in context to developing nations. Systematic literature review from research databases such as Cumulative Index of Nursing and Allied Health Literature (CINAHL) and PubMed (MEDLINE) identified adoption barriers by type, country, organization, patient, medical staff, and programmer. Telemedicine adoption barriers for India

include poor design, high expectation of users and technically challenged staff [11]. Cost, reimbursement, and legal liability were the top three adoption barriers for organizations. Age, level of education and computer literacy were the top three adoption barriers for patients. Technical challenges, resistance to change and licensing were the most prominent adoption barriers for medical staff and programmers [12]. These identified adoption barriers will serve as a good starting point in developing a detailed framework for India (more specifically looking into patients and health care providers).

eHealth literacy is an important theoretical concept that can be used to understand the slow adoption of telemedicine in developing countries. eHealth can be defined as the degree to which end users have the capacity to process and understand the basic health information in order to make significant health decisions [8]. This includes basic computer skills, reading and writing skills to fully engage and understand the eHealth content. Studies indicate that there is still a considerable gap in eHealth literacy among adult populations of developed nations such as United States and Canada [8]. This raises a question of poor eHealth literacy in developing nations. eHealth literacy models such as the "Lily eHealth literacy model" identifies the basic skillsets required by consumers to fully engage with eHealth content. The model identifies six core skills organized into two specific types as analytical and context - specific [8]. Authors in subsequent research have included other factors such as situational, cultural and communication to the existing Lily model of eHealth literacy [9]. All these skills are relevant in evaluating the role of eHealth literacy in slow adoption of telemedicine solutions in developing nations. eHealth literacy model can be quantitatively used in research through the eHeals scale. eHeals scale is an eight - point measure of eHealth literacy to measure consumer or end user's level of knowledge and interaction with eHealth content. This scale can be used across populations to estimate the level of comfort engaging with eHealth content [8].

5. Nature of the Study for Future Research

The purpose of the study is to understand the challenges impeding the implementation of telemedicine solutions in developing countries. The study looks at India as an example of a developing country and tries to explore the challenges faced in the adoption of telemedicine solutions from a patient and health care provider perspective.

5.1 Explication of Research Methods and Consistent Alignments

The research will be a quantitative study analyzing publicly available data and literature. The gaps from the publicly available data and literature will be filled from an online survey directed at the remote and urban population (both patients and health care providers) of India. The research method is aligned with the purpose of the study and tries to understand the real challenges faced by the patients and healthcare providers. While the publicly available data gives a country level perspective, the online survey will give a more granular view on the challenges faced by the users of telemedicine.

5.2 Nature of Data and Procedure for Data Collection

To get an overall understanding of telemedicine adoption challenges in India, data from surveys conducted by World Health Organization and Statista will be accessed. The survey data from Global observatory on eHealth (WHO) can be accessed from the WHO (World Health Organization) website. This survey focuses on the use of telemedicine in developing nations and is a reliable source in getting country specific perspective on telemedicine adoption [10]. For an in depth understanding of challenges specific to India, Statista survey data on telemedicine adoption in India will be accessed. This survey was released in 2018 with a sample size of approximately 500 respondents. The survey can be accessed via Statista membership and provides an overall user perception of telemedicine usage in India.

5.3 Data Collection Instrument (s)

To understand the granular level details in terms of telemedicine challenges from a patient and healthcare provider perspective, an online survey will be fielded. Efforts will be made to ensure that respondents are adults. Survey participant recruitment will ensure equal sampling of rural and urban community respondents. Informed consent from the survey participants will be taken to use the survey data for analysis. Healthcare providers or doctors participating in the survey will be recruited based on convenience and purpose. Convenience sampling will focus on reaching the doctors practicing in private or government hospitals and who are easily approachable. Purposive sampling will include tracking the social media activity related to telemedicine of doctors or health care providers [2]. Patient recruitment efforts for the survey will be coordinated by the sampled healthcare providers practicing in both rural and urban communities of India. To understand the level of eHealth literacy and evaluating the relationship with telemedicine adoption, survey participants will be asked to complete 8 items on electronic health literacy scale (eHeals) [8]. eHealth literacy score will be generated by summing the 8 items on the eHeals scale. Previous studies have found the eHeals scale to be reliable and consistent in providing results related to eHealth literacy [15].

5.4 Population and Sample (s)

The target population in this research are doctors and patients in rural and urban parts of India. Doctors or health care providers will be sampled based on both convenience and purpose. Convenience sampling will focus on doctors practicing in government or private hospitals and who are easily approachable. Purposive sampling will include recruiting doctors by following their social activity related to telemedicine on hospital websites [2]. Patients for this research will be sampled based on their association with the above sampled doctors or healthcare providers.

5.5 Research Analytics

Descriptive statistics such as mean, frequency and standard deviation will be used to summarize the data. Pearson's Chi square test will be used to evaluate whether categorical variables are independent or related. Independent sample t

test will be used to examine statistically significant differences between means of unrelated groups of data such as telemedicine usage differences by age or gender. Correlations will be used to examine the relationship between eHealth literacy and telemedicine adoption or usage.

Correlation coefficient is an important statistical measure to predict the strength of relationship between two variables. The value of the correlation coefficient usually lies between -1 and +1. A value of +1 means that there is perfect positive correlation between the variables. This means that an increase in one variable leads to increase in another variable. Similarly, a value of -1 means that there is perfect negative correlation between the variables. A value of 0 means that there is no relationship between the variables [16]. These theoretical statistical concepts will be used to establish the relationship between eHealth literacy and telemedicine usage or adoption.

Structural equation modeling (SEM) has been used in studies related to telemedicine to analyze the data. SEM has been preferred over other methods of data analysis since it combines standard methods such as multiple regression, correlation, and factor analysis into a single software [2]. SEM is preferred over regression as it allows comparison of cause and effect of various factors. Data analysis in this research will follow two steps. The first step will confirm the validity and reliability of the model. The second step will investigate the null and alternate hypothesis [5].

6. Conclusion

The focus of the study on understanding the challenges impeding the implementation of telemedicine solutions in developing countries such as India is the need of the hour worldwide. During Covid 19 pandemic, the need to reduce face to face consultations without affecting the quality and access of essential health care services has revitalized the need for telemedicine. The research framework suggested in this paper might be interesting for researchers trying to understand the technology adoption process in health care scenario—There has been ongoing research to understand the factors impeding the adoption of technology in healthcare industry [2]. Recently, there has been a push from the World Health Organization to improve adoption of telemedicine solutions worldwide by providing detailed guidelines [14]. This requires coordination among regulators, healthcare providers, and technology companies.

The research framework from this paper might be useful for policy makers and technology companies to better understand their roles in successful implementation and adoption of telemedicine solutions. Constant support from technology companies to health care professionals in understanding the technology is critical to its adoption. Many studies have stressed on the need for addressing concerns of risks among users to improve the adoption of any technology [6].

Policy makers and regulators of countries play a key role in rapid adoption of technology solutions in countries. The research framework might be used by regulators to implement regulations or provide incentives to health care providers. The research framework on understanding the challenges of telemedicine solutions from a provider perspective might be

useful in understanding the type of risks perceived by healthcare providers. This might help both the technology companies and regulators. The logistical challenges studied in the paper might provide the necessary guidelines to policy makers to successfully implement telemedicine solutions. Even though the focus of this paper is on India, this might be useful for other emerging economies as well.

Since this paper is focused on India, it might help the Government of India to evaluate the success of their telemedicine programs and plan the next steps. The risks identified in this paper from a patient and healthcare provider perspective could help the Government of India plan telemedicine implementation programs with end users in mind. Further, the focus of the paper on eHealth literacy might be useful both for government officials and technology companies [10]. The level of eHealth literacy might help Government of India to implement certain telemedicine programs in certain parts of the country. Similarly, technology companies can launch certain solutions depending on the eHealth literacy levels in specific regions of the country. Finally, this paper might further aid in establishing a strong case for the need of telemedicine solutions in improving present and future healthcare systems.

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