ROLE OF TELEMEDICINE IN HEALTH CARE SYSTEM: A SEMI SYSTEMATIC REVIEW

Dissertation submitted to

The IIHMR University, Jaipur

for the partial fulfilment for the award of the degree of

Master of Business Administration (MBA)

in

Hospital and Health Management

by

Dr. Dayala Iswarya

Under the Supervision and Guidance of

Dr. Dhirendra kumar

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DECLARATION BY STUDENT

I hereby declare that this dissertation titled **Role of Telemedicine in Health Care System: A Semi Systematic Review** is the bonafide record of my original research work. I declare that it has not been submitted to any other university or institution for the award of any degree or diploma. Information derived from the published or unpublished work of others has been duly acknowledged in the text.

D. Iswarya

Name of Student

Date

CERTIFICATE BY SCHOLAR

This is to certify that dissertation titled **Role of Telemedicine in Health Care System: A Semi Systematic Review** is a record of the research work undertaken by Dayala Iswarya in partial fulfilment of the requirements for the award of the degree of MBA (Hospital and Health Management) from the IIHMR University, Jaipur under my guidance and supervision and his/her approach to the research study has been sincere, scientific, and analytical.

Dr. Dhirendra Kumar
IIHMR University, Jaipur
Date

Dr. Dhirendra Kumar
IIHMR University, Jaipur
Date

Role of Telemedicine in Health Care System: A Semi Systematic Review

Abstract:

Background: Until the end of 2019, there was a question in one's mind referring 'whether technology is shaping healthcare or healthcare is shaping technology'? The current pandemic situation has shown us answer that how technology is changing today's healthcare. A year ago, we never imagined that we might see doctors on computer screen, but now it has become most common and this will create a forum for making the future of healthcare. In recent times one amongst the foremost important transformation arising within the healthcare industry is **telemedicine**. Telemedicine is "The delivery of healthcare services, where distance is a critical factor, by all healthcare professionals using information and communication technologies for the exchange of valid information for diagnosis treatment and prevention of diseases and injuries research and evaluation and for the continuing education of health care providers all in the interest of advancing the health of individuals and their communities".

Methods: Different surveillance databases such as PubMed, Google Scholar, Medline were used to evaluate standardized published articles with reference to Telemedicine, Healthcare, ehealth, Telehealth, India in the intervening period of 2010-2020. Inclusion and exclusion criteria were followed based on PRISMA guidelines and the articles only in English language was taken.

Results: In many underserved areas of India, healthcare delivery in the form of Telemedicine has been used effectively and efficiently through the initiatives taken by the central and state governments and as well as private sectors in India. At the same time telemedicine cannot replace the in-person consultation or emergency medicine.

Conclusion: Telemedicine in health industry has an important role to play in the improvement of quality and efficiency of healthcare. TM has shown to have widespread benefits both clinically and financially to those involved in the healthcare process and service providers.

Keywords: Telemedicine, Healthcare, Telehealth, ehealth, India.

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With immense pleasure I present my report as a part of my dissertation. I would like to thank all the people who gave me enormous support.

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I find no such measure adequate to quantify all that our parents and family have done for us. Words with me are insufficient to express the feeling of our heart to acknowledge them for educating me and keeping me in all comfort without which this work not seen the light of the day at all.

Dr. Dayala Iswarya

MBA- Hospital and Health Management

IIHMR University, Jaipur

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Abbreviations

ITEM	
TM	Tele Medicine
WHO	World health organization
COVID 19	Corona Virus Disease 19
PRISMA	Preferred Reporting Items for Systematic Reviews and Meta-Analyses
STARPHAC	Space Technology Applied to Rural Papago Advanced Health Care
NASA	National Aeronautics and Space Administration
ISRO	India space research organisation
DIT	Department of information technology
MOHFW	Ministry of Health and Family Welfare
IDSP	Integrated Disease Surveillance Project
RMP's	Registered Medical Practitioners
DM	Diabetes Mellitus
SWOT	Strengths, Weakness, Opportunities, Threats
AI	Artificial Intelligence
ML	Machine Learning

CHAPTER 1

1. Introduction:

With a population of over 135 crores India is one of the developing and world's second populated country[1]. The doctor-population ratio in India is 1:1456, so the number of doctors treating the population is not equally high[2]. Due to this fact, there has been inequality in delivering healthcare services to every citizen of the country.

In India 70% of the population is living in rural areas, 90% of secondary and territory care facilities are situated in cities and towns. It's a burden for the people living in rural areas to receive treatment in emergency situations[3].

India is far away from an advanced healthcare system. In particular, there are hardly seven beds available for every 100 patients and a single nurse for every 1,000 patients in the country. Shortage of adequate resources and precautions in Indian hospitals can cause a high risk of hospital-acquired infections. The recent pandemic has created an unprecedented burden on an already burdened healthcare care system. Telemedicine (TM) is an important tool that can really help in these unprecedented times.

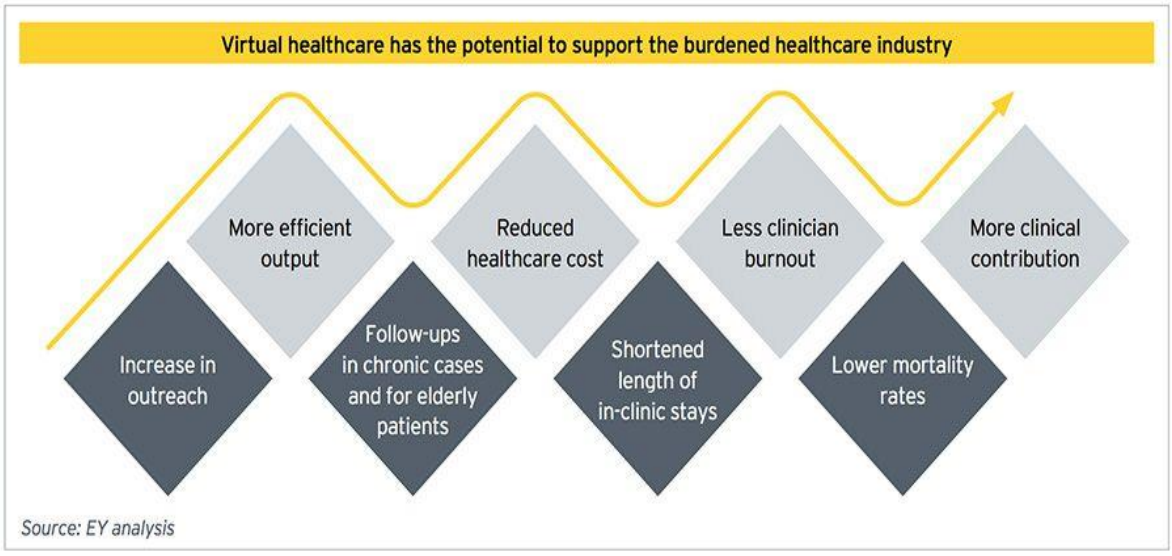

Figure 1 Potential of virtual healthcare

Simultaneously, the necessity of the healthcare has driven many individuals to digital avenues Figure[1] Everything results in rapidly expanding TM market. Undoubtedly, technology can transform the future of India's healthcare sector.

World Health Organization (WHO) has defined telemedicine as "The delivery of healthcare services, where distance is a critical factor, by all healthcare professionals using information and communication technologies for the exchange of valid information for diagnosis treatment and prevention of diseases and injuries research and evaluation and for the continuing education of health care providers all in the interest of advancing the health of individuals and their communities"[4].

TM, in turn, may be divided into three types: (i) Store and forward for "transferring digital images from one location to another" and (ii) Two-way interactive television used when "a consultation between the patient, primary provider, and specialist is necessary and real-time interactive services. (iii) Technical category, virtual or 3-D technology, is futuristic although some work is being conducted in the area of robotic surgery (Figure 2)

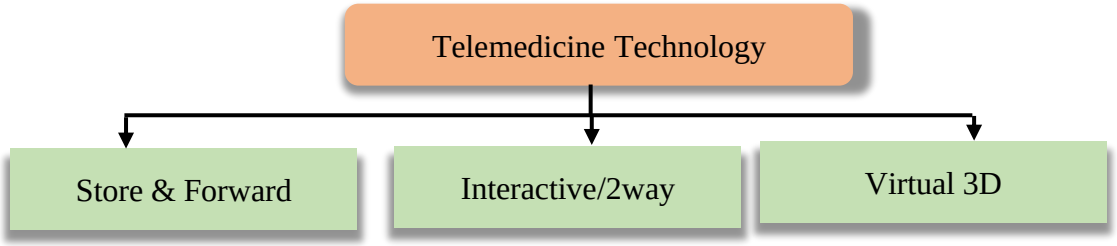

Figure 2. Types of Telemedicine Technology

Each of these types has a favourable role to take part in overall health care and, when we used properly it can offer many tangible benefits for both healthcare workers and as well as patients.

The model of telehealth and telemedicine (Figure 3) is proposed based on types of general healthcare services offered by nurses and allied healthcare workers (Tele-Monitoring, Tele-Nursing, Tele-Allied Care); primary care and specialty physicians (Telemedicine, Tele-

Consultation, Tele-Diagnosis, Tele-Treatment); and healthcare educators and administrators (Tele-Education for providers and/or patients, Tele-Administration, and Tele-Business related to healthcare).

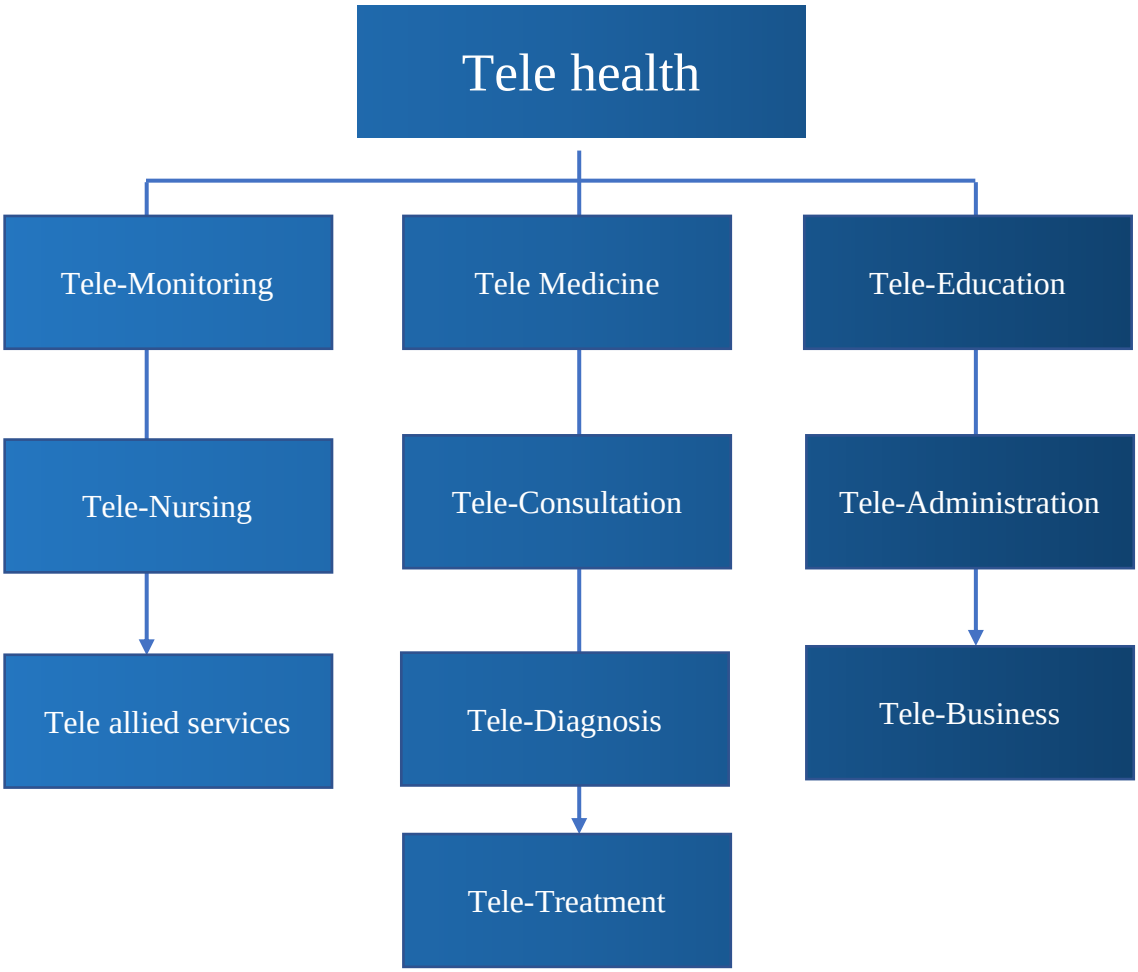

Figure 3. Types of Telehealth

TABLE 1. CATEGORIES AND EXAMPLES OF TELEMEDICINE APPLICATIONS	
Category	Examples
Patient care	Radiology consultations; post-surgical monitoring; triage of emergency patients
Professional education	Continuing medical education programmes; online information and education resources; individual mentoring and instruction
Patient education	Online help service for patients with long term conditions
Research	Aggregation of data from multiple sites; conducting and coordinating research at multiple sites
Public health	Access to care for disadvantaged groups; poison control centres; reporting
Healthcare administration	Video conferences for managers of integrated health systems; quality monitoring
Source: Field (1996)	

Table 1 Categories and examples of Telemedicine applications

Since the onset of the COVID-19 pandemic, most patients started using TM services for doctor consultation and treatment due to the lockdown and fear of risk of infection. Since then TM has rapidly increased. Not only consultation and access to healthcare TM indirectly help in conserving medical consumables and maintaining social distance.

Rationale:

This study reveals the role of telecommunication technology on healthcare services which has helped in reducing the turnaround time.

Objective:

- To study the importance of telemedicine in healthcare
- Determine potential benefits and limitations of telemedicine for a health care system.

CHAPTER 2

2. REVIEW OF LITERATURE:

The research study is based on secondary data.

Various research articles on TM have been studied to understand various thoughts and theories regarding TM activities. Following are some articles reviewed for the present study:

Pankaj Mathur (2017), in this study, it is found that in many underserved areas of India, healthcare delivery in the form of TM has been used effectively and efficiently through the actions accompanied by the central, state governments and as well as private sectors in India. From this study, it can be presumed that TM cannot be an overall replacement for traditional healthcare system, but it can be used to minimize the healthcare inequalities in the rural areas[5].

A study conducted by Protásio Lemos da Luz revealed why doctor patient relation is necessary for the treatment of chronic disease such as heart disease, cancer and pulmonary diseases. He further stated that TM wouldn't allow the physical inspection and the doctor can miss major tumours underlying in the tissues. So, at least one face to face consultation is necessary to know the complete details about the patient and diagnosis and after that they can follow up through TM[6].

Gautham et al. (2015) developed the clinical guidance system with the employment of mobile phone technology to increase the management of various diseases. By the help of 16 service providers this application was experimented on 128 cases in the two rural states of Tamil Nadu, and found that the application was easy to use by both the patients and as well as service providers[7].

Kapoor et al.(2014) pointed out some challenges faced by providers while implementing TM technologies. This paper revealed that the problems are not connected to technology but are connected to the funding and the behaviour of doctors and lack of awareness and training of the staff. The other type of problem was the availability of doctors at tertiary hospitals in rural areas[8].

A study conducted by sonu Baskar et al on TM across the globe listed out the current status and recommendations of TM across the globe. They also pointed out some gaps in TM implementation such as lack of awareness among the people, limited access to technology, financial status and language barriers[9].

CHAPTER 3

3. Methodology:

3.0 Methods

Starting the study, depending upon the eligibility criteria, search strategy, study selection. The review method was reported according to the PRISMA standard model[10].

3.1 | Eligibility Criteria

Study articles were taken when they clearly scrutinize the Role of Telemedicine in Health Care System. Included studies are 25 articles, 6 articles were excluded with reasons mentioned in (Figure 4). Articles only in English language was taken.

3.2 | Data Sources and Searches

Different surveillance databases such as PubMed, Google Scholar were used to evaluate standardized published articles with reference to the Role of Telemedicine in Health Care System in the intervening period of 2010-2020. To prevent the deletion of appropriate articles, a comprehensive procedure was developed with the use of index terms such as ‘Telemedicine’ and ‘ehealth’ and ‘Telehealth’ and Healthcare and ‘India’.

3.3 | Study Selection

In selecting articles for this study purpose more than 150 abstracts was read and the relevant articles with full text was taken into consideration. Duplicate articles were excluded and the eligible articles are 25 articles. Out of 25 articles, 17 are research articles three are case studies and the remaining five were review articles.

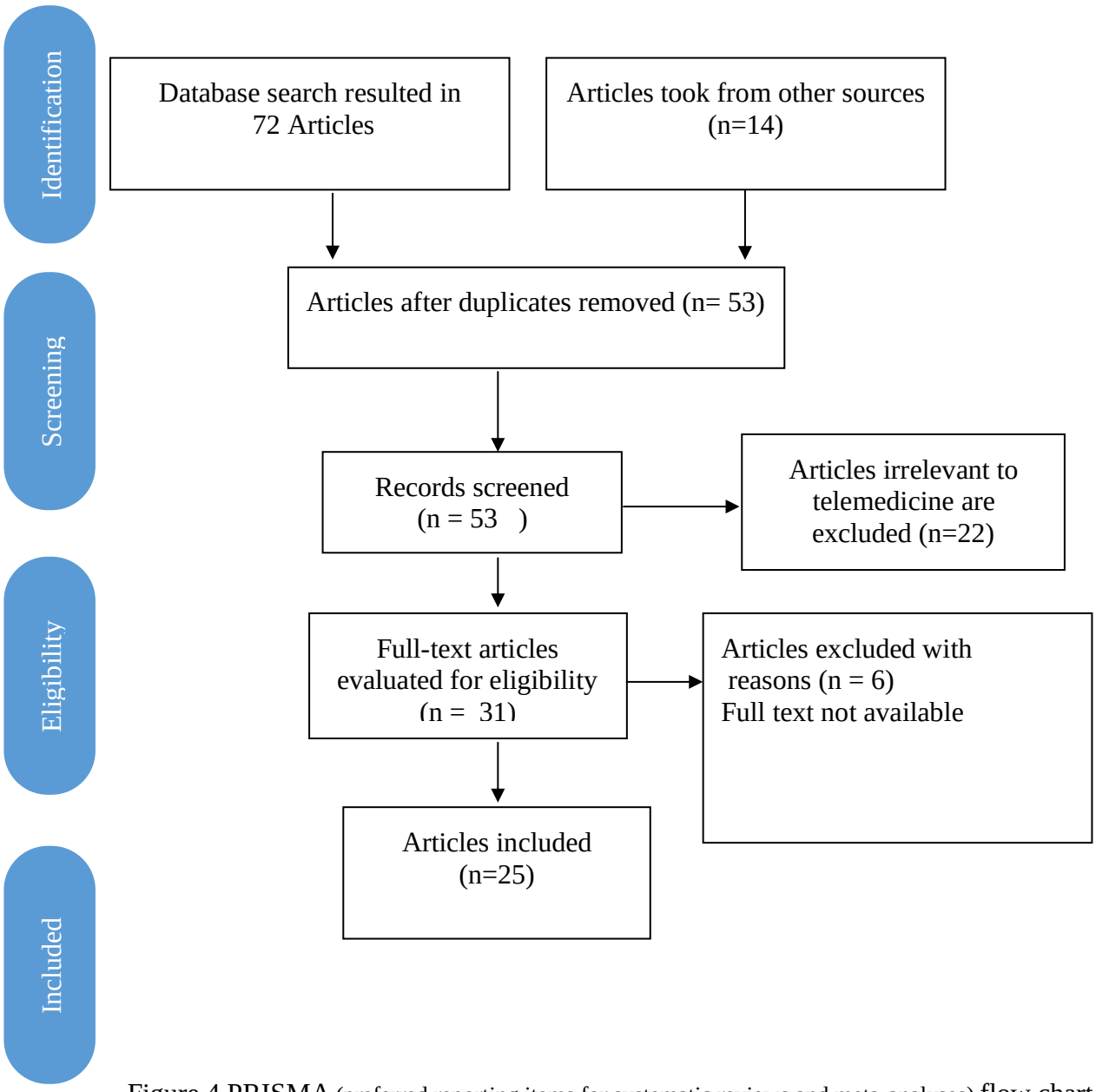

Figure 4 PRISMA (preferred reporting items for systematic reviews and meta-analyses) flow chart

CHAPTER 4

4. Results and Discussion:

Early Telemedicine projects

Telemedicine was advanced in the early 1960s when, NASA developed a TM project, Space Technology Applied to Rural Papago Advanced Health Care (STARPAHC), to deliver the healthcare to Papago Indian Reservation in Arizona[11]

Although STARPAHC was successful in increasing access to health care to a medically underserved population, the project was expensive, and like many of the early telemedicine programs, it died from lack of funding and provider participation.

With the decreasing cost and increasing bandwidth of technologies in the latter half of the 1990s came a renewed interest in telemedicine[12]

In the year 2001, ISRO (India space research organisation) made an origin in telemedicine India, ISRO took a pilot project by linking Chennai's Apollo Hospital with Aragonda's Apollo rural hospital in Chittoor district of Andhra Pradesh.

In the development of telemedicine services initiatives taken by the Department of information technology (DIT), Ministry of External Affairs, Ministry of Health and Family Welfare (MOHFW) and state governments played a key role[13].

Projects such as the National Cancer Network (ONCONET), Integrated Disease Surveillance Project (IDSP), the National Rural Telemedicine Network, the National Medical College Network, and the Digital Medical Library Network have been undertaken by India's Ministry of Health[14]

Along with Government organisations, private or corporate entities have begun to engage in TM. Private institutions such as Apollo Telemedicine Network Foundation, Narayana Hrudayalaya, and Fortis hospitals were early adopters of telemedicine. They work with the help of the federal and state governments, as well as organisations like ISRO, who provide them with appropriate and up-to-date technology (Figure 5).

On March 25, 2020, the (MOHFW) India, had released the "Telemedicine Practice Guidelines" for allopathic registered medical practitioners (RMPs). This guideline is

prepared by the Board of Governors, Medical Council of India, in partnership with the National Institution for Transforming India (Aayog).

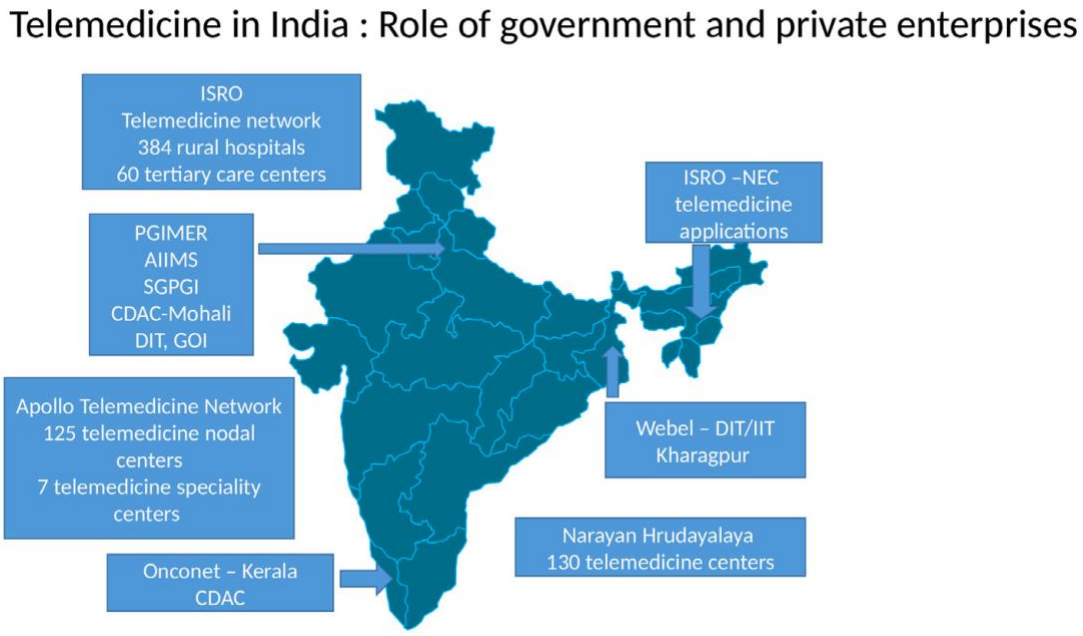

Figure 5 Telemedicine in India: Role of Government and private enterprises.

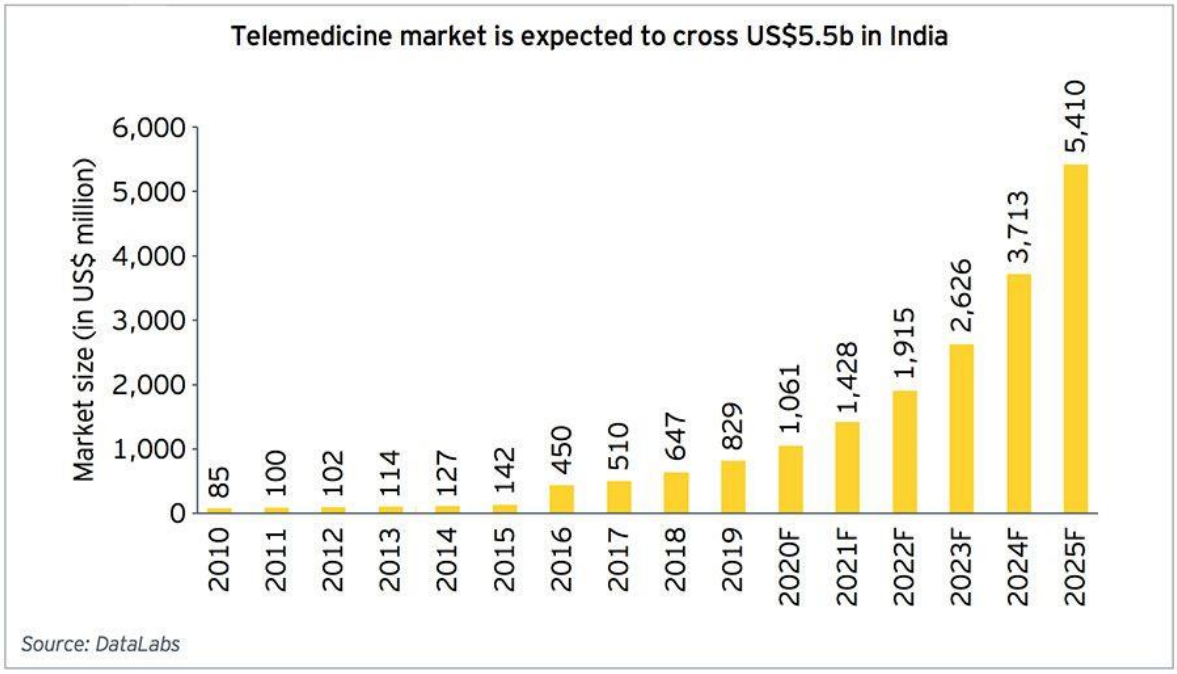

Figure 6 Telemedicine market size in India (US $)

Based on the report presented by EY and Indian Pharmaceutical Alliance (IPA) It has been estimated that India's TM market is to reach **$5.5 billion** by the year 2025 Figure[6].
This report is placed upon the background of Covid-19 pandemic, and how it has disturbed the pillars of healthcare across the world.

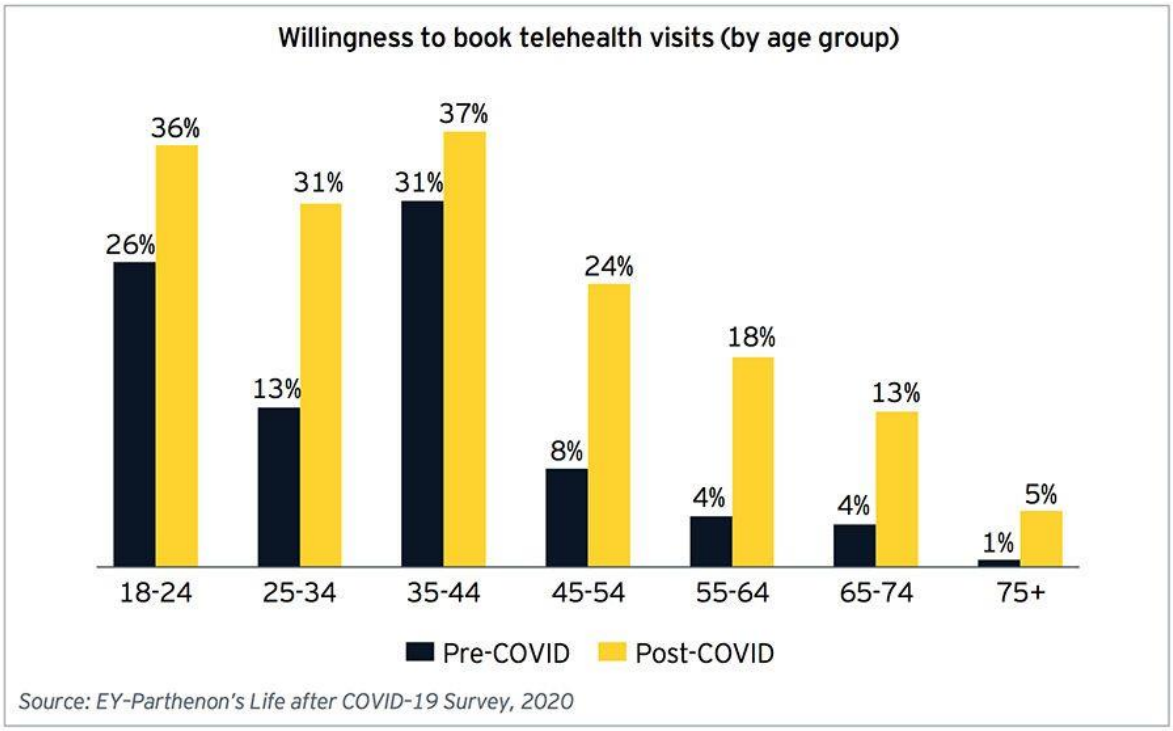

Figure 7 exhibits willingness to book telehealth visits (by age group)

"Due to lockdown and risk of infection most of the patients have refrained to go to the hospital for in-person doctor consultations. Patients mostly depend upon self-medication/self-diagnostic apps or took medical consultation with general practitioners or family doctors on calls/virtual tools.
This pandemic has pushing patients of all ages especially high risk patients to take up digital alternatives for constant care and management.
This report shows that patients of all age groups are willing to book telehealth consultations and the rise of telehealth visits post-covid (Figure 7).

Benefits in the use of Telemedicine

1. Potential benefits of TM includes it can be used for the continuous monitoring of some chronic diseases Hypertension, Diabetes Mellitus (DM), Bronchial asthma, especially during the period of physical/social distance.
2. Increased, faster access to “just in time” healthcare advice
3. Helps in monitoring the patients at their own homes providing home healthcare.
4. Reduced pain exacerbated by travel to the doctor or clinic
5. Reduced confusion over medication, diet, and other instructions
6. Helps in providing counselling to the patients who are suffering from mental illness and psychological issues.

Limitations in the use of Telemedicine

Despite all the benefits, there are certain limitations in the use of TM as an important tool in healthcare

1. Occasional technical problem with the equipment or phone lines.
2. There is a question of liability while using TM as the information provided through TM is misinterpreted
3. There is no reimbursement process for the medical services provided through TM.
4. The information provided through TM might be lost due to a software glitch
5. Training the technical support staff is important for the protection of information of the client.
6. There may be delay because the doctor might be busy with other consultations[15]

In SWOT analysis, Strengths acts as a guiding factor while weakness act as a limiting factor to implement the necessary plans towards the implementation of TM in healthcare. The following figure 8 represents the internal (strengths, weakness) and external (opportunities, threats) that are currently challenging the prosecution and the performance of TM [16,17].

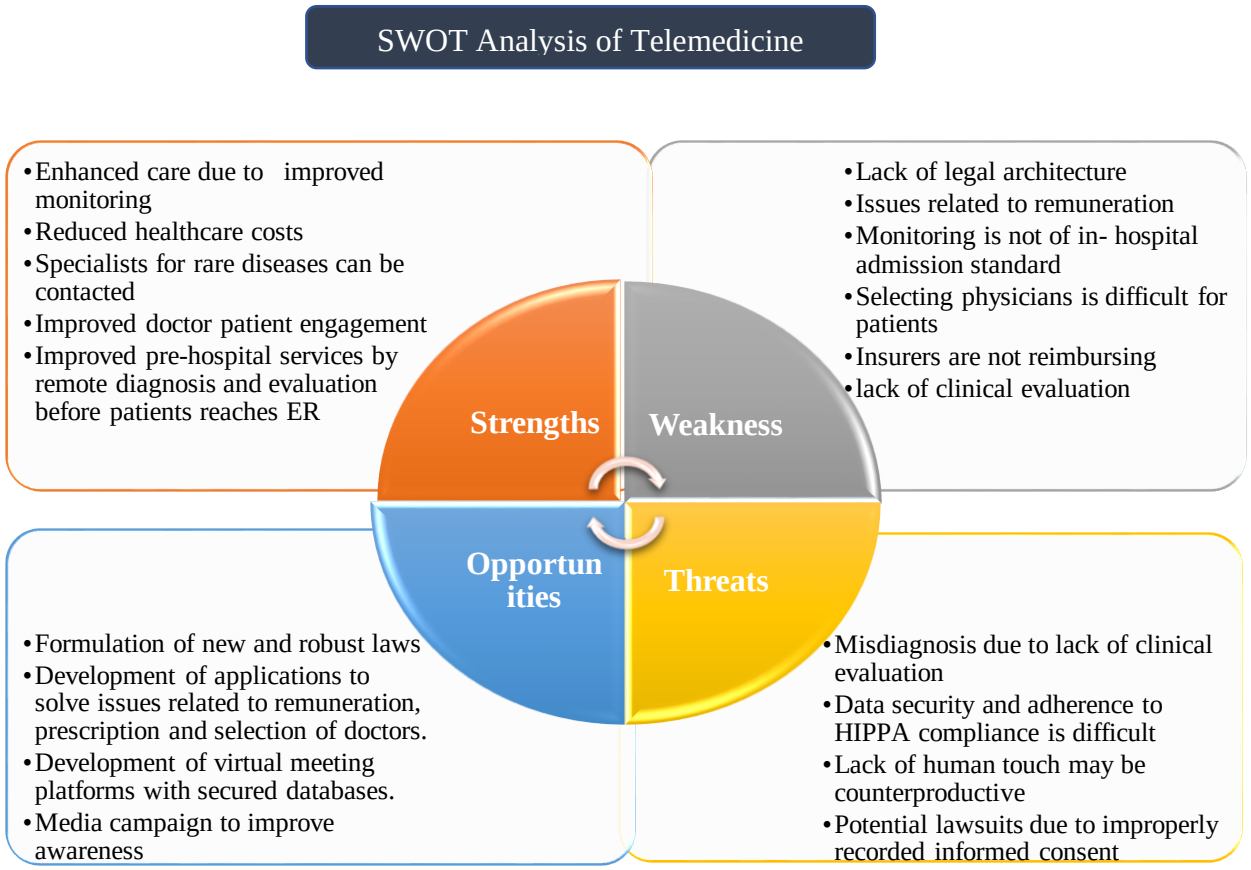

Figure 8 SWOT analysis of Telemedicine

According to a survey by Statista Research Department, India's expected smart phone users would reach over 760 million in 2021. Users who are familiar with the use of a smart phone can use telemedicine services. Telemedicine is one of the most recent services that allows consumers to access health care more swiftly.

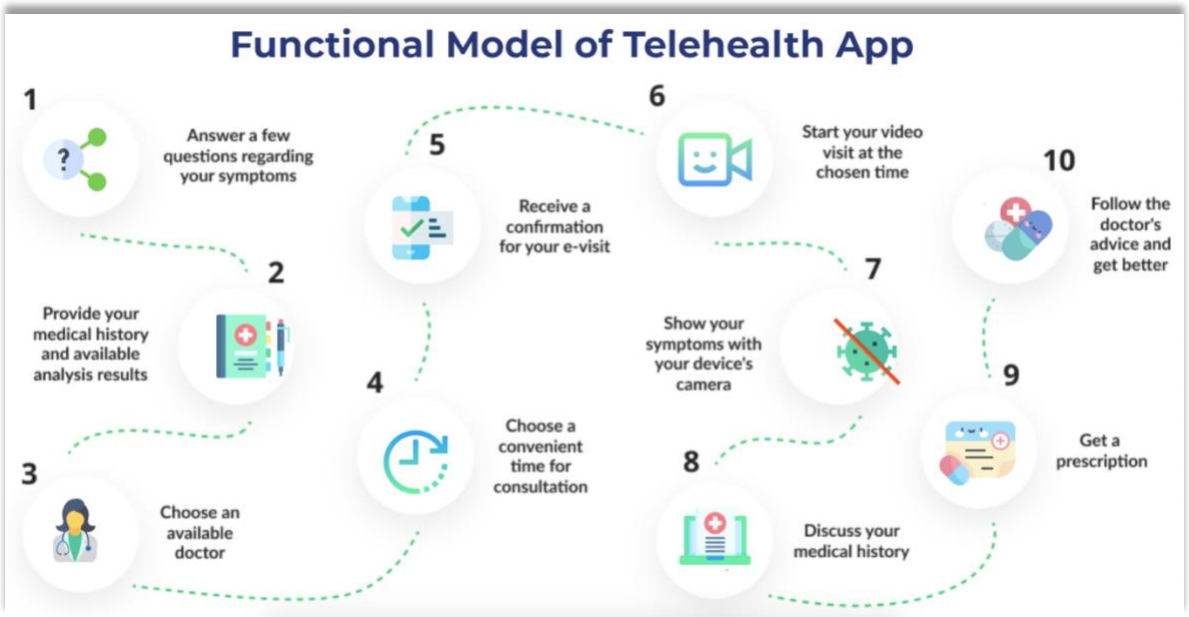

Figure 9 The functional model of Telehealth app

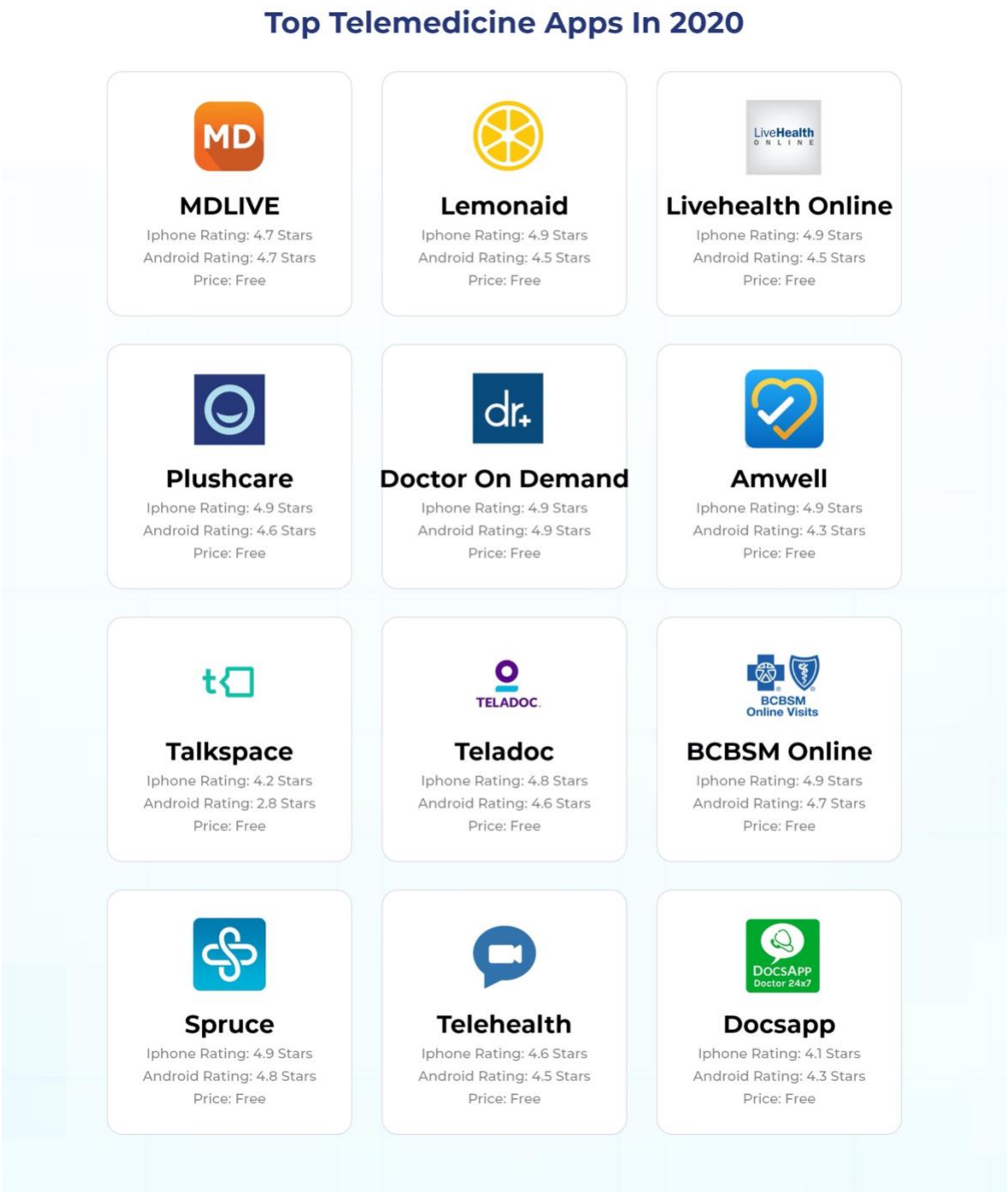

Figure 10 Top Telemedicine apps in India

These are the most frequently used apps for online consultations and they have gained popularity especially during and post COVID 19 [18].

Telehealth is the future of medicine. TM has shown to have widespread benefits both clinically and financially to those involved in the healthcare process and service providers. The current pandemic also has given a hint for all the investors to invest in developing the tool as it is usability, remote monitoring and cost-effective.

Besides all these the main challenges faced by TM regarding its widespread acceptance, is maintaining the same level of confidentiality and there was no strict rules, guidelines or legislation on the practice of TM.

As there is uncertainty in rules & regulation this can create potential risk to both healthcare workers and as well as patients.

CHAPTER 5

5. Recommendations :

- TM has the capacity to decrease the burden on hospitals and healthcare providers by giving online consultations.
- Technology is changing day by day and the future of healthcare is going to replace with artificial intelligence (AI) and machine learning (ML), But rural penetration of the internet is one of the major challenges, funding should be provided by the government to develop rural tele health models to overcome the challenge.
- Along with the advanced technology, financial status and individual perception towards the TM needs to be improved so that people can avail TM services.
- New regulations for the reimbursement of TM services should be developed to match the increased upfront costs to providers and decreased long term healthcare costs to insurers.
- Finally, TM cannot be the answer to all the health problems, but if it is used efficiently, it can be the potential answer for the future of healthcare.

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