Internship at

International Institute of Hospital & Health Management & Research, Delhi

(March 15th, 2022 to June 15th, 2022)

Cost Considerations of Telemedicine Services : a narrative review

A Report by:

Dr. Shabnam Panwar [PG/20/069]

Under the Guidance of :

Dr Pankaj Talreja

Post-graduate Diploma in Hospital & HealthManagement (2020-2022)

International Institute of Health Management Research, New Delhi

Internship Approval Letter

Certificate of Approval

The following dissertation titled **"COST CONSIDERATIONS OF TELEMEDICINE SERVICES"** at **"IIHMR, Delhi"** is hereby approved as a certified study in management carried out and presented in a manner satisfactorily to warrant its acceptance as a prerequisite for the award of **PGDM (Hospital & Health Management)** for which it has been submitted. It is understood that by this approval the undersigned do not necessarily endorse or approve any statement made, opinion expressed or conclusion drawn therein but approve the dissertation only for the purpose it is submitted.

Dissertation Examination Committee for evaluation of dissertation.

Name Signature

(1) Dr. Pankaj Gupta — Pankaj

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TO WHOMSOEVER IT MAY CONCERN

This is to certify that **Dr Shabnam Panwar** student of PGDM (Hospital & Health Management) from International Institute of Health Management Research, New Delhi has undergone internship training at **IIHMR, Delhi** from **March 15th, 2022** to **June 15th, 2022**.

The Candidate has successfully carried out the study designated to him during internship training and his/her approach to the study has been sincere, scientific and analytical.

The Internship is in fulfillment of the course requirements.

I wish him all success in all his/her future endeavors.

Dr. Pankaj Talreja
Mentor
Assistant Professor
IIHMR, New Delhi

Certificate from Dissertation Advisory Committee

This is to certify that **Dr. Shabnam Panwar,** a graduate student of the **PGDM (Hospital & Health Management)** has worked under our guidance and supervision. He/ She is submitting this dissertation titled "COST CONSIDERATIONS OF TELEMEDICINE SERVICES" at "IIHMR, DELHI" in partial fulfillment of the requirements for the award of the **PGDM (Hospital & Health Management).**

This dissertation has the requisite standard and to the best of our knowledge no part of it has been reproduced from any other dissertation, monograph, report or book.

Institute Mentor -

Dr. Pankaj Talreja,
Assistant Professor
Healthcare Finance Specialist

Organization :

IIHMR, Delhi

INTERNATIONAL INSTITUTE OF HEALTH MANAGEMENT RESEARCH, NEW DELHI

CERTIFICATE BY SCHOLAR

This is to certify that the dissertation titled **"Cost Considerations of Telemedicine Services"** and submitted by **Dr Shabnam Panwar**. Enrollment No. - **PG/20/069** under the supervision of **Dr. Pankaj Talreja** for the award of PGDM (Hospital & Health Management) of the Institute carried out during the period from **March 15th,2022** to **June 15th,2022**

embodies my original work and has not formed the basis for the award of any degree, diploma, associate ship, fellowship, titles in this or any other Institute or other similar institution of higher learning.

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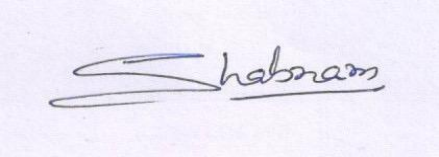


FEEDBACK FORM

Organization Mentor (Dissertation)

Name of the Student: Dr. Shabnam Panwar

Name of the Organization in Which Dissertation Has Been Completed:

IIHMR, DELHI

Area of Dissertation: Cost Considerations of Telemedicine services

Attendance: 8 weeks

Objectives achieved: Satisfactory

Deliverables:

1. Secondary Research of existing literature pertaining to the subject matter
2. Analyze the chosen studies to conduct a narrative review
3. Summarize and clearly present findings

Strengths: Sincere and hardworking

Suggestions for Improvement: None

Suggestions for Institute: None

(Dr. Pankaj Talreja)

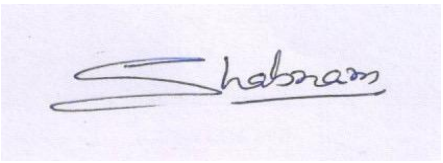
Date: June 24th, 2022
Place: New Delhi

ACKNOWLEDGEMENT

It is my esteemed pleasure to present this research project by thanking each and every one who helped me in this task. I would like to express my sincere gratitude towards my mentor **Dr Pankaj Talreja** in IIHMR for helping me in every way possible for an effective presentation of my project. He inspired me greatly to work in this project with his valuable guidance, support, interest, encouragement, involvement and advice.

I would also like to thank the experts team of all the departments, for their unlisted encouragement and moreover their timely support and guidance till the completion of my project. Their guidance during my internship has made this journey a true success.

I am highly grateful to **Dr. Anandhi Ramachandran** and all the faculty members and staff for giving me this opportunity to learn and to add to my phenomenal experience. Without their cooperation and guidance, it would not have been possible to conduct my study and complete my training successfully.



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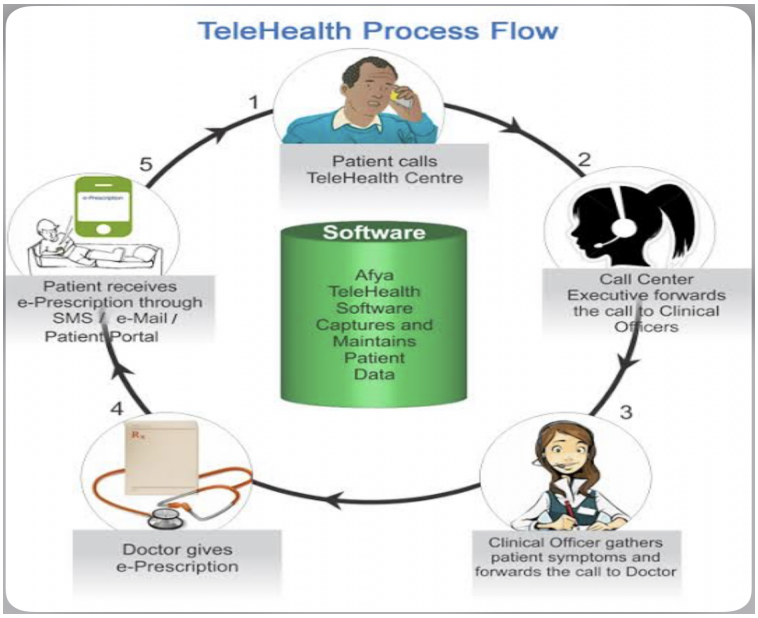
Cost Considerations of Telemedicine Services : Narrative Review

ABSTRACT



It is challenging for the healthcare professionals and services to provide personalized treatments to communities which are prone to chronic ailments and multi-morbidities, and especially in remote tribal regions of India. Likewise, digital technologies are sought with great expectations by the patients, health professionals and policy makers, as tools at a sustainable cost, to improve health care service quality (1). In this context, a literature review has been done on economic evaluation of telemedicine services. The methods used for this narrative review were systematic search of various online databases with specific eligibility criteria.The findings revealed that innovative technology-based solutions are being considered for providing healthcare counseling virtually via telemedicine and remote consultations. This methodology allows health practitioners to work remotely without the logistical and budgetary difficulties that come with forward operating at the site (15).

Background of the Project

It's always been a concern that 'how Hospitals can help strengthen public health in rural India'.

As we all know, hospitals are the healthcare institutions where medical care is provided using specialized health science by the skilled healthcare professionals and at these hospitals there are timely training and audits on the health care Programs launched by the government which contribute to strengthen the public health services. The hospitals in remote areas actually contribute by increasing accessibility, awareness towards healthcare facilities.

The Public health services aim for prolonging life and promoting health by ensuring affordable, accessible health services.

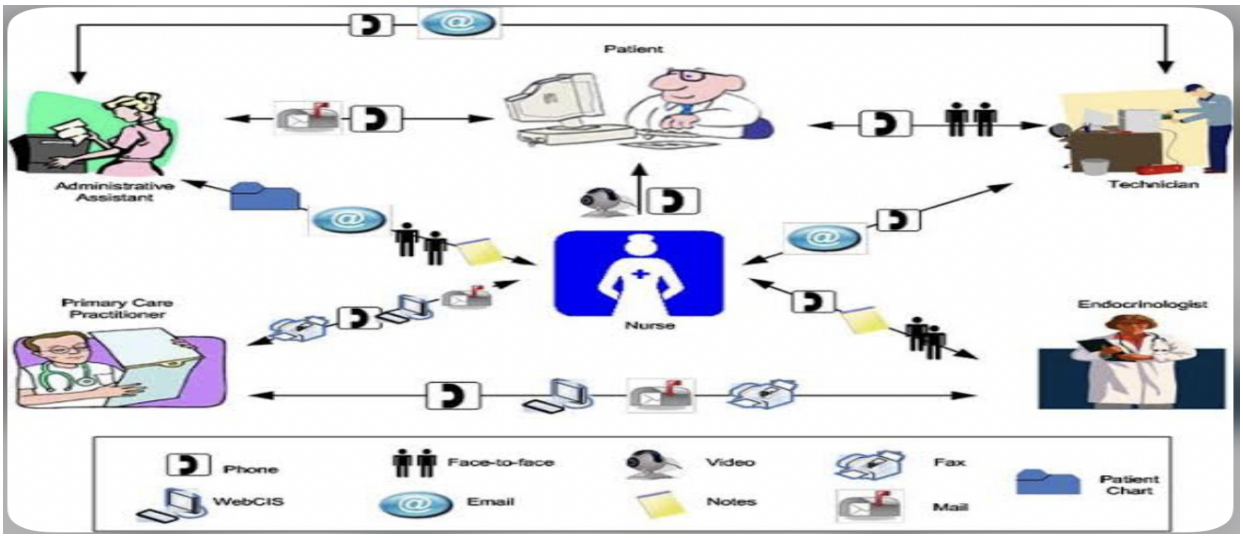
In India rural population is nearly 65% of the total population in 2020, according to the World Bank collection of development indicators. Therefore, we can say Hospitals in rural areas will strengthen the public health in rural India :

- By providing equitable, affordable and accessible health care services
- Hence reducing the out of pocket expenditures that are otherwise involved in traveling for seeking medical services from the city hospitals.
- Increasing Awareness to prevention of diseases to the patients by the auxiliary health care staff
- By increasing footfall of rural patients leading to

- informed choices for healthier options
- Diagnosis of diseases in their early stages leading to better prognosis
- Better maternal child care
- Increase of institutional deliveries
- Better epidemiology and biostatistics studies and researches can be done in the hospitals data of patients
- Better adolescent health program implementation in rural hospitals
- Better immunization coverage
- Better penetration to the remote areas for health care programs implementation
- Better awareness and access to government health schemes and programs to the desired and remote strata of population and so ….

To conclude, in terms of public health indicators, there will be :-

- Decrease in mortality indicators- CD-R, IMR, MMR, etc
- Increase in Life Expectancies
- Decrease in DALY's
- Increase in QALY's
- Decrease in Burden of diseases (metabolic diseases, NCDs- DM,obesity,., avoidable infectious conditions- TB,etc, Nutritional deficiencies …



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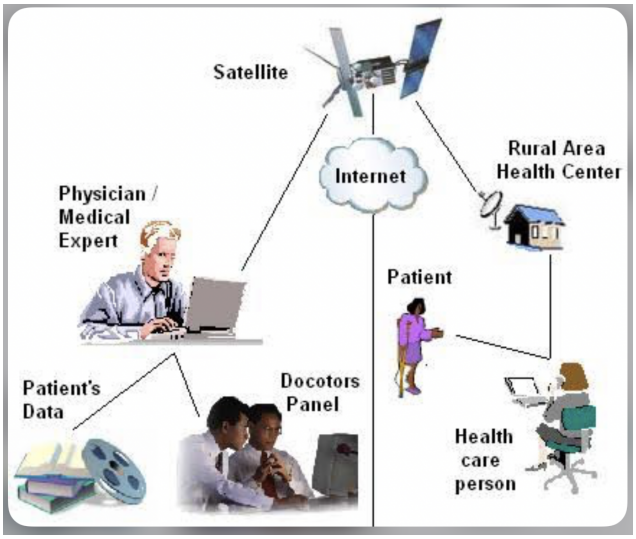
To summarize, hospital health by providing quality health care services which are accessible and affordable by the remotest strata of population, will contribute to strengthening public health in rural India and to meet these challenges, digital technologies are sought with great expectations by the patients, health professionals and policy makers, as tools at a sustainable cost, to improve health care service quality.

For this narrative review PubMed, Google Scholar, Researchgate and Embase databases were searched systematically with specific eligibility criteria. Data extracted from the shortlisted articles included the terminologies that are used to describe telehealth services and their economic evaluations. The available

information was put together and used to present an overview in this narrative review..

Introduction



Decision-makers in the health-care system are confronted with ever-increasing issues as a result of demographic shifts and rising health-care expenses. Telemedicine apps (mobile health apps) have the ability to counteract this pattern. However, before telemedicine apps can be integrated into care organizations, they must first be evaluated (3). Together with the recently stated intentions of the Governments in India and around the world, Digital health technologies and artificial intelligence have piqued interest in medicine in recent years, resulting in improved quality of and access to care, particularly in the field of NCDs [noncommunicable diseases], due to their unique capacity to motivate patients and utilize data for moving toward personalized and precision medicine.

Health technology assessment organizations review the expenditure incurred on a health care service or technology to achieve a specific clinical benefit and offer compensation recommendations. However, economic analyses of telemedicine applications and artificial intelligence are limited. The existing health technology evaluation methodology is ill-equipped to address the unique, dynamic, and unanticipated quality implications of these technologies, highlighting the need for a more comprehensive approach to the assessment of telehealth interventions and artificial intelligence.(4).

Scope

This research aims to evaluate the cost of telemedicine applications in OPEX to meet cost to benefit ratio.

Rationale

In this study it is attempted to evaluate the costs involved in Telemedicine services. A few scattered primary studies from various regions of India showing the economic evaluation of Telemedicine services in India are available. Hence it will help in providing additional evidence and can serve as a useful tool for policy makers in Telehealth. Objective of this review was to systematically evaluate and summarize the available evidence.

Methods

Information was identified via database searches, journal hand-searches, reference and citation searching, and contacting the experts. Studies of any population which were directly related to economic

evaluation of Telemedicine services were included. Studies where outcomes were not yet available were excluded. Studies with reliability concerns were excluded from some aspects of analysis. The economic evaluation of Telemedicine services is used as a framework for synthesis. Synthesis was therefore predominantly narrative. The reported outcome noted from studies should be exclusively for economic evaluation of Telemedicine services.

Search Strategy

We conducted literature search using Pubmed, EMBASE, and reports of WHO, Google Scholar. The subsequent search methodology was adopted: Telemedicine OR Telemedicine applications OR Telemedicine services OR Telemedicine costs OR Telemedicine cost evaluation OR Telemedicine economic evaluation OR Telemedicine cost to benefit OR digital health AND costs OR economic evaluation. For each outcome in each of the databases a variety of combinations of the above mentioned keywords or search terms were used.

Inclusion criteria

All primary research studies of any population resident in India, any form of telemedicine application, economic evaluation of telemedicine applications were included. And the results reported and observed were of interest per se. Telemedicine application's economic evaluation in the studies included "cost to benefit ratio". The conclusion derived from analyzing the studies should be exclusively for economic evaluation of telemedicine applications.

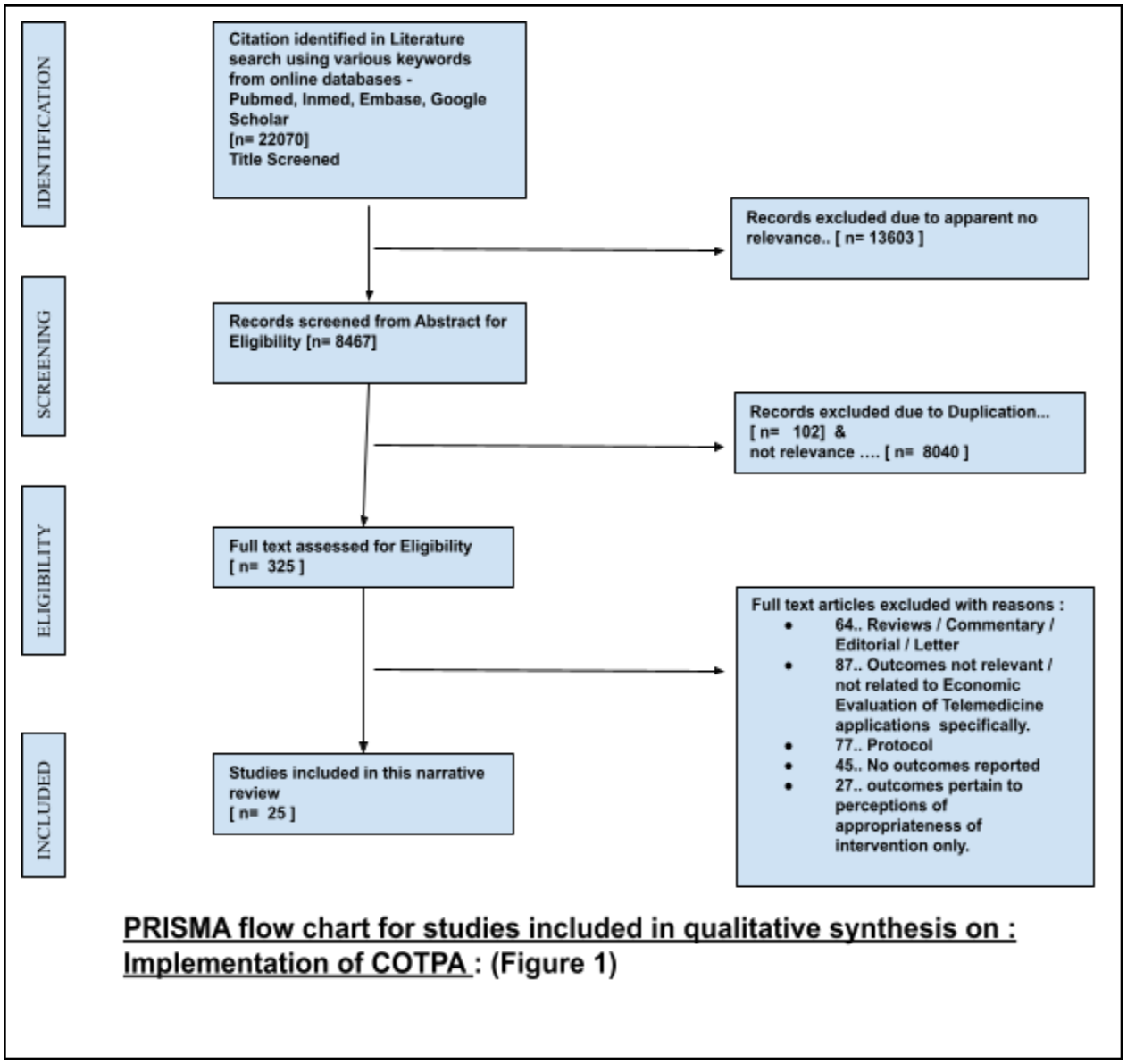
Exclusion criteria

The excluded studies include: Case reports, case series, earlier reviews and studies on ……..
studies printed in languages apart from english, descriptions of interventions that don't seem to be however enforced or presently in trial, or of ways for intervention development, Studies during which results weren't directly associated with economic evaluation, that don't seem to be specific to India, or restricted to perceived quality of interventions, the commentaries, news articles, reviews, letters or alternative opinion items of latest syntheses and therefore the studies that contained informations already mentioned entirely in another enclosed study were all excluded so as to avoid replication of enclosed information.

Selection Process

The PRISMA guidelines have been used for conducting and reporting this study.[24,25] The process of screening of the yielded citations using various checklist criterias for the search of most relevant studies for this review and are detailed as search strategy in Figure 1. The master chart of the selected most relevant studies are presented in tables as appendixes.

Studies were initially assessed for eligibility by screening titles and then followed by reviewing abstracts. and then the accepted studies at this point were reviewed for their full text contents and any other eliminations were done as per above mentioned inclusion norms. The research left at this point progressed to data extraction. Acceptance of required contents of the articles and data extraction was performed. As a whole, 325 full-text studies were identified from 22070 relevant citations and were assessed for the eligibility for this systematic review. Finally, 25 studies were considered suitable for inclusion after applying exclusion criteria (see Methods).



Results & Analysis

Characteristics of the included studies for this Scoping Review on Economic Evaluation ofTelemedicine Applications.

Sr. No.	Author, Reference Study	Aim of Study	Methods	Gaps Identified	Main outcome measures
1.	Eze ND, et al.	findings on four areas of policy	Secondary research from	poor quality and reporting	-83% clinical effectiveness as effective as

		relevance: clinical and cost-effectiveness, patient experience, and implementation.	databases	standards	face-to-face care - 39% cost-effectiveness reviews
2.	Holl F, et al.	to derive substantiated patterns and starting points for future research	standardized questionnaires.	no established and broadly applicable framework for evaluating mHealth interventions	Need to develop a common evaluation framework for professional mHealth apps,
3.	Vervort, et al.	To compare digital health technologies and artificial intelligence with traditional health care technologies	Primary study	not equipped to address the unique, dynamic, and unpredictable value considerations of health technologies	evidence base that may be less mature, compared with traditional health technologies and interventions.
4.	Maddisson, et al.	To determine the effectiveness and cost-effectiveness of a mobile phone intervention	Primary study [RCT]	none	The intervention was effective and probably cost-effective for increasing physical activity
5.	Martin J.A.C.et	To determine the	Primary study	none	may generate a 33 % reduction

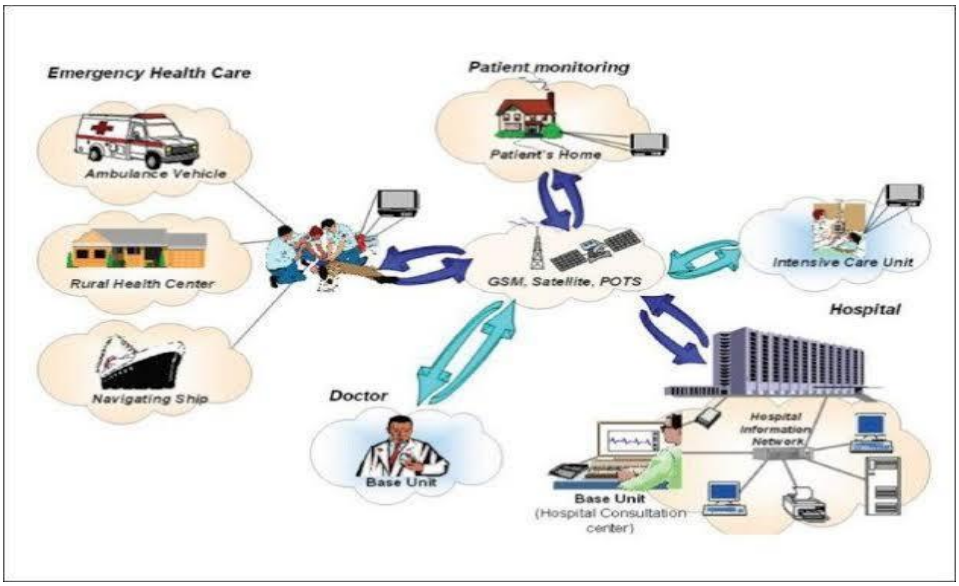
	al.	cost-effectiveness analysis of the use of one of this app	[RCT]		in the cost of management and treatment of the disease.
6.	Carbo, et al.	to conduct a meta-analysis to evaluate m-Health's impact on healthcare services utilization, mortality, and cost.	Secondary Research from databases	More studies reporting consistent quality outcomes are warranted to give conclusive information	- total mortality reduced - HF-related admissions, mortality and cost reduced - total costs related to more clinic visits and implementation of new technologies increased
7.	E Mecintosh, et al.	based on a cost-consequence framework	Secondary research from databases	- constantly changing technology -lack of appropriate study design to manage the frequently inadequate sample sizes - inappropriateness of the conventional techniques of economic evaluation; - valuation of health and	addresses these challenges and suggests ways of advancing the techniques for the economic evaluation of telemedicine.

				non-health outcomes.	
8.	Pavlovic I. et al.	to model PDC and EDC process and to estimate the difference of the costs of PDC and EDC process	Primary study	Lack of standard evaluation techniques, use of Extended Event-driven Process Chains (eEPC) modeling technique to model PDC and EDC process	Electronic Data Collection process may bring from 49% to 62% of savings when compared to Paper based Data Collection process
9.	Kloek CJ, et al.	to evaluate the cost-effectiveness of a blended physiotherapy intervention (e-Exercise)	Primary study using self reported questionnaires	Missing data	costs were significantly lower in e-Exercise
10.	NR Comte, et al.	To implement and assess an economic model supporting our telestroke system	Primary study	Limited studies	10% reduction in costs
11.	Lisa Fahlbusch, et al.	to present and discuss possible applications of video consultations in the latter system and to evaluate	Primary study	Small sample size	-Video consultations might help improve the quality and reduce the costs of the public health insurance system

		economic advantages.			- can be used for follow-up evaluations as well as preparation for initial medical examinations especially in complex cases and for case conferences.

Discussion

Hospital readmissions, for example, are a significant marker of mHealth system performance and efficiency and should be incorporated in an assessment procedure as well. The findings suggest that mHealth apps can reduce heart failure-related hospital days, and studies looking at cost-effectiveness analysis reveal that reducing outpatient and inpatient stays also lowers healthcare expenditures (7). E-Exercise is far less expensive than conventional physiotherapy in individuals with hip and/or knee osteoarthritis, but it was not cost-effective from a societal or healthcare perspective, according to Kloek et al.'s study published in 2018 (11). Similarly, Maddison et al.'s (5) post-hoc economic assessment evaluated the incremental cost-effectiveness ratio (ICER) between costs and quality-adjusted life years (QALYs) obtained and compared the health benefit benefits of moving from conventional in- and outpatient care to mHealth-supported care. In a long course, the authors discovered that mHealth interventions are more cost-effective than standard care and can improve health-related quality of living. Martín et al. applied a “Hidden Markov Model” to measure cost-effectiveness. Long-term costs and outcomes associated with an illness and a particular health intervention can be estimated over multiple cycles, based on resource use and health outcomes (8). Martín et al.’s (6) study modeled the different disease states of patients during the mHealth intervention, using economic



parameters for the outcome analysis and aligning participants' health-specific and follow-up data with healthcare costs published by the health care system. Their cost-effectiveness analysis model showed that introducing an mHealth app lowered the overall cost of disease management by 33% of the total cost of disease management **(6).** According to Pavlovi et al.(9), the use of mobile health apps can reduce the expenses associated with the collection of data in medical scenarios by 50%. Nolwenn also noted that the implementation of an economic model for telestroke can help reduce the costs associated with the treatment of patients. In his paper, Nolwenn states that the economic model helped the spokes establish a financial balance and fund a dedicated medical service **(12)**. The most common conditions that caused the spokes to incur high costs were re-hospitalization and management of patients who were treated intravenously. These conditions were followed by management of patients who were treated without transferring to the hub. According to Lisa Fahlbusch, video consultations could help improve the quality of public health insurance by reducing the costs associated with it. They should also be included in the liability insurance system as a standard tool (13).

Limitations of the review

Although an important outcome in itself, the number and diversity of studies available for review limited the scope for synthesis**.** As exclusions were made where insufficient information was available for adequate assessment of potential methodological concerns, as well as for specific concerns, some potentially useful data may have been omitted, although we note that the outcomes of such excluded studies were never at particular odds with our main outcomes. Among the included studies, concern about the relevance of some results persists. Additional limitations that impact on our ability to draw rigorous conclusions include the extent of reliance on self-reported outcomes and a lack of recent data for some outcomes. Further limitations linked to our own methodology included the possible limited generalizability of some of the included studies.

Conclusions

Telemedicine measures can help diabetic patients improve glycemic control, improve survival and hospital readmissions due to chronic heart failure, help patients manage pain and increase physical activity, improve mental health, food preferences, and dietary habits, and minimize flare ups linked with respiratory diseases like asthma, as per this umbrella review. Telemedicine may be a less effective approach to deliver care in certain diseases and specialty areas. Thus despite there is evidence that telemedicine can be cost-effective, the compromised quality and reporting standards limit generalization of the results. Patients showed a high level of acceptance and satisfaction while using digital health interventions, according to this comprehensive review, but significant impediments to wider adoption persist (14).

Implications

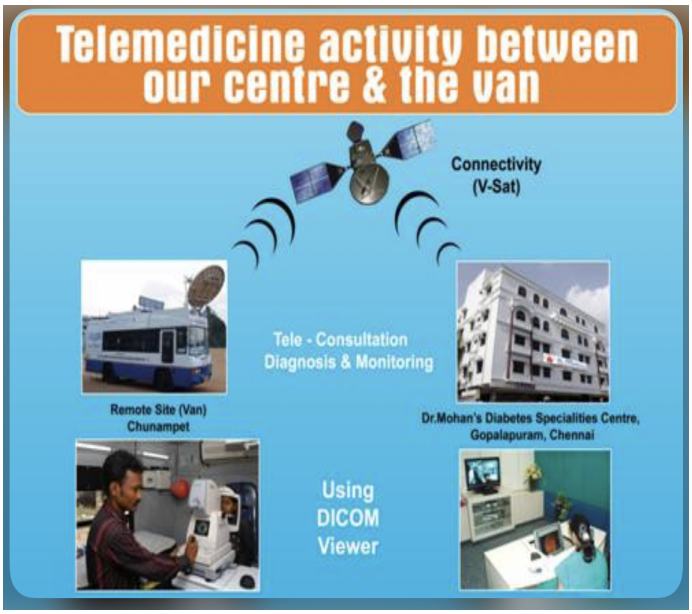
However, the research on assessment reporting systems and best practices for such treatments is lacking. It is recommended to emphasize on the added value of telemedicine applications when it comes to the entire scope and factors for developing telemedicine app's economic assessment methods. Specifically, as the laboratory diagnostics and physical tests are recommended to assess objective physical health.

Likewise, standardized surveys and semi-structured interviews should be used to assess subjective quality of life, and financial outlook and efficiency Key performance indicators, such as hospital readmission data and incremental cost-effectiveness ratios between costs and quality-adjusted life years (10). The use of different standardized surveys and questionnaires might provide heterogeneous findings, which can make analyzing and comparing the results from such a framework difficult. As a result, the data collection method must be chosen carefully.

By applying these recommendations, mHealth app providers, patients, healthcare providers, healthcare systems, and society at large will benefit when developing a novel framework to evaluate economics of telemedicine applications to ensure that they are effective, efficient, empowering, accurate, sustainable, and safe. Such a framework will enable an informed decision to adopt telemedicine applications in broader public health spaces.

To conclude; in order to meet the cost to benefit ratio of telemedicine applications in OPEX; focus should be:

- To make the health services more affordable and a quality health care- **E health, telemedicine,** teleconsultation, CDSS, HL7 & FHIR compliant HMIS should take the center stage.
- Using telemedicine applications in micromanaging and strategic planning of community health programs addressing: Endemic TB, Filariasis, Dengue, Chicken guinea, NCDs ….
- Practicing **Behavior Change Communication** as a component of telemedicine for penetrating deep to the unreachable strata of population and taking the local tribal spiritual leader along with for awareness against violence, & drug abuse …:.
- For cutting edge & Quality healthcare for all: NEHA guidelines and Disha complaint E health model needs to be developed.



- **Ambulance services laced with telemedicine and consultation equipment** may prove to be pivotal in addressing the issues.
- Weekly **monitoring and evaluation of community programs** and other services using telemedicine applications at the hospital will help in making this a quality healthcare model.
- Accordingly, capacity building and training focusing on digital health should be started.
- HR recruiting should include BCC experts and digital health model designing required teams.

- Hospital databases should be created and saved efficiently for research purposes using telemedicine .
- **Communication and Management should use cutting edge technologies to make it a quality and self sustaining model.**
- CDSS, CPOE, FHIR,.... & so, to ease the health services along with maintaining interoperability.

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