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A NARRATIVE REVIEW OF TELEHEALTH SERVICE SUCCESS AND SUSTAINABILITY IN RURAL HEALTHCARE SETTINGS

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Abstract

Telehealth services have emerged as a promising solution to address healthcare disparities, improving access to care, reducing costs, and enhancing patient outcomes. This review explores the potential of telehealth in improving healthcare access, as well as the factors leading to its success and sustainability. Examining the promise and constraints of telemedicine adoption provides insights into the broader possibility and implications of telehealth technologies. A narrative review analysed 12 English-language literatures (2019-2023) from PubMed, Science Direct, Scopus, ProQuest, and Emerald Insight, focusing on telehealth data, regulations, success factors, and rural access. Telehealth offers significant benefits, particularly in improving access to healthcare for rural and underserved populations, reducing travel time and costs, and enhancing patient engagement. It also aids in early disease detection and management, leading to better patient outcomes and reducing unnecessary hospital admissions. However, challenges remain, especially in technological infrastructure, where inadequate internet connectivity in rural areas hampers effective implementation. Patient satisfaction depends on convenience, efficiency, privacy, and communication, all of which can be compromised by technical issues. Six critical factors for telehealth success include vision, ownership, adaptability, economics, efficiency, and equipment, which must be addressed for sustainable adoption, particularly in rural settings. Despite the potential of telehealth services to revolutionize healthcare access, challenges such as funding limitations, infrastructure barriers, and concerns about the quality of telemedicine encounters persist. For telehealth services to be successful and sustainable in the long run, several issues must be resolved. Strategies include enhancing infrastructure, ensuring adherence to regulations and guidelines, and fostering awareness and acceptance among healthcare professionals and patients. The results highlight the necessity of ongoing investigation, assessment, and strategic planning to fully realize the promise of telehealth services, particularly concerning cancer treatment and other crucial areas of healthcare.

Keywords: Telehealth, Healthcare Access, Rural Health, Health Technology, Sustainability in Healthcare

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INTRODUCTION

The integration of information and communication technology with health services has given rise to the concept of telehealth, which encompasses a broad range of remote healthcare services, including non-clinical applications such as education, administrative support, and health system management. Telemedicine, a subset of telehealth, specifically refers to the remote provision of clinical services, including diagnosis, treatment, and patient monitoring, through telecommunication technologies (Salmanizadeh F et al, 2022), Telehealth has become a critical solution for addressing healthcare disparities. This is especially true in rural and suburban areas where establishing communication infrastructure is more feasible than deploying a large number of healthcare providers (Maroju et al., 2023). Despite efforts by both government and private sectors, the lack of primary healthcare facilities in rural areas persists, with 90% of secondary and tertiary healthcare services located outside these regions, which are home to 68% of the population. The application of digital pathology for routine diagnoses in India highlights the potential of telehealth, although its broader implementation is often hindered by practical, technological, and financial challenges.

One of the major obstacles to telehealth, particularly telemedicine services in rural settings, is the need for improved internet infrastructure. Initiatives aimed at enhancing connectivity, such as laying optic fiber and linking smaller healthcare providers to larger institutions, are vital for the long-term success of telehealth (Graves et al., 2021). Additionally, a review of current telemedicine practices and adjustments to regulatory frameworks are necessary to ensure that remote clinical services remain effective and sustainable. Training healthcare professionals in the effective use of telemedicine is another crucial factor in enhancing rural healthcare delivery.

The high levels of patient satisfaction with telehealth services, including both telemedicine and non-clinical support, underscore its potential as a model for rural healthcare delivery. However, further research with larger and more diverse samples is necessary to generalize the findings to broader populations. Key factors that contribute to the success and sustainability of telehealth include vision, ownership, adaptability, economics, efficiency, and equipment (Gajarawala & Pelkowski, 2021). Strategic planning and strong leadership are essential to effectively implement these services.

Telemedicine has proven particularly beneficial in expanding healthcare access in remote areas by facilitating real-time clinical consultations, telemonitoring, and virtual follow-ups. Despite its potential to revolutionize healthcare access for rural populations, the limited availability of funding has hindered widespread implementation, particularly in rural and remote areas. Addressing this issue requires ensuring that appropriate technology infrastructure supports telehealth implementation and management, as disruptions in the telehealth experience can impact patient care and outcomes (Orlando et al., 2019). Telehealth plays a crucial role in healthcare system efficiency by reducing unnecessary hospital

admissions and facilitating timely specialist consultations, while telemedicine specifically improves patient diagnosis and treatment through remote interactions with healthcare providers (Tsou et al., 2021).

Moreover, patient satisfaction with telehealth services, including telemedicine consultations, is linked to factors such as convenience, efficiency, communication, privacy, and comfort. Barriers such as poor internet connectivity may lead to inadequate audio and visual quality, potentially causing diagnostic inaccuracies and care delays. A study in Portugal by (Maria et al., 2022) highlighted barriers for telemedicine-based teleconsultations including poor internet quality which affects image quality and the lack of synchronization between audio and video during online sessions can hinder the effectiveness of teleconsultation, causing disruptions and reducing the clarity during medical information exchanges. Addressing these barriers is vital to the success of teleconsultation. Participation from the patient's side will be less if the barriers remain.

This review aims to examine the criteria and factors that contribute to the success and sustainability of telehealth and telemedicine, emphasizing the importance of optimal planning, implementation, and long-term viability of these digital health solutions.

METHODS

This narrative review followed a systematic approach to ensure transparency in article selection and synthesis. A comprehensive literature search was conducted across five major databases—PubMed, ScienceDirect, Scopus, ProQuest, and Emerald Insight—to identify relevant studies on telehealth service success and sustainability published between 2019 and 2023. The search was restricted to English-language peer-reviewed articles. The following keywords and Boolean operators were used:

- ("Telehealth" OR "Telemedicine") AND ("Success factors" OR "Sustainability") AND ("Rural healthcare" OR "Remote healthcare")
- ("Digital health services" OR "E-health") AND ("Implementation challenges" OR "Health disparities")

The selection process followed a structured approach to enhance transparency and reproducibility. The initial database search retrieved 320 articles, and after removing 40 duplicates, 280 unique articles remained. Title and abstract screening was performed independently by all authors, leading to the exclusion of 200 articles that did not meet the eligibility criteria. Full-text screening of the remaining 80 articles was conducted based on relevance, methodological rigor, and adherence to the study focus, resulting in the exclusion of 68 articles for insufficient emphasis on telehealth success or sustainability. Finally, 12 high-quality studies were selected for inclusion in this narrative review (Figure 1).

The review adopted clear eligibility criteria to ensure relevance and consistency. Studies were included if they examined success factors and sustainability of telehealth or telemedicine services, focused on rural and underserved healthcare settings, and discussed challenges, infrastructure requirements, or policy considerations related to telehealth. Empirical studies, systematic reviews, and policy analyses were considered, while studies focusing solely on technological aspects without healthcare implementation insights, non-peer-reviewed sources, conference abstracts, and opinion papers were excluded.

To maintain consistency and reliability in data extraction, a standardized data extraction form was used to collect information on study characteristics (authors, year, country, study design), telehealth interventions (type of service, technology used), success factors and sustainability indicators (infrastructure, policy, financial viability), and challenges and barriers (internet access, regulatory issues, user acceptance). The extracted data were thematically synthesized into key domains, including technological, economic, regulatory, and user-related factors, to provide a structured and comprehensive analysis of the findings. This methodological approach enhances reproducibility, transparency, and reliability, ensuring that the review systematically captures critical factors influencing telehealth service success and sustainability in rural healthcare settings.

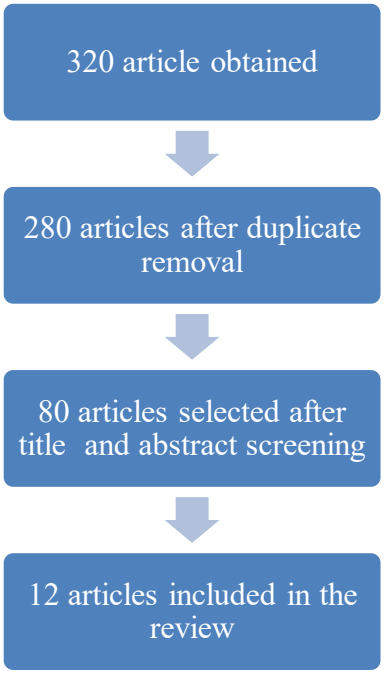

Figure 1: Flowchart

RESULTS AND DISCUSSION

Telehealth services have significantly improved healthcare access in underserved and remote areas, particularly in regions like India where many communities lack sufficient medical professionals. This improvement in access is crucial in areas where traditional healthcare infrastructure is either limited or non-existent. The use of telehealth has led to reduced travel costs, increased patient engagement, and enhanced healthcare efficiency. The main challenges identified include funding limitations, inadequate technological infrastructure, concerns over telemedicine encounter quality, and regulatory hurdles.

One of the major challenges is the financial burden associated with implementing and sustaining telehealth services. The high cost of setting up digital platforms, maintaining secure data storage, and training healthcare professionals often limits telehealth adoption, particularly in low-resource settings. To address this, public-private partnerships (PPPs) could provide a sustainable funding model by engaging both government and private entities in cost-sharing

initiatives. Additionally, integrating telehealth reimbursement policies into national healthcare systems and expanding insurance coverage for telemedicine services could ensure long-term financial sustainability. Governments could also incentivize telehealth adoption through tax breaks and subsidies for healthcare providers implementing telehealth solutions in underserved areas.

Another key barrier is technological infrastructure, particularly poor internet connectivity and inadequate digital literacy among both patients and healthcare providers. In many rural areas, limited broadband access and low-quality internet services affect the reliability and quality of telehealth consultations, often leading to misdiagnoses and care delays. A feasible solution is to expand internet infrastructure through national broadband initiatives or satellite-based internet solutions that provide stable connections to remote areas. Additionally, mobile-based telehealth applications with offline functionality could serve as an alternative for low-connectivity regions, allowing patients and providers to access telehealth services even with intermittent internet availability.

The quality of telemedicine encounters remains a concern, as low-resolution images, poor audio quality, and lack of physical interaction may compromise diagnostic accuracy and patient trust. One practical solution is the adoption of AI-powered diagnostic tools to enhance remote consultations. AI-assisted image recognition and real-time clinical decision support systems could help mitigate errors and improve the effectiveness of virtual consultations. Furthermore, standardized telemedicine training programs for healthcare providers would ensure they are proficient in delivering high-quality remote care while improving patient-provider communication techniques to enhance patient engagement.

Regulatory and legal challenges also pose barriers to telehealth sustainability. Unclear policies on licensing, cross-border telemedicine consultations, and data security continue to hinder seamless implementation. A potential solution is the harmonization of telehealth regulations at the national and regional levels, ensuring clear guidelines on licensing, data protection, and telemedicine service scope. Establishing centralized telehealth governance bodies could streamline regulatory processes and ensure compliance with ethical and legal requirements.

Another critical barrier is resistance from both healthcare providers and patients due to concerns over privacy, trust, and workflow integration. Many healthcare workers express scepticism regarding increased workloads, documentation requirements, and the risk of depersonalized care in telehealth services. Addressing these concerns requires the integration of telehealth platforms into existing hospital electronic medical record (EMR) systems, minimizing administrative burden and enhancing workflow efficiency. Additionally, educational campaigns and community engagement programs could increase public awareness and acceptance of telehealth, addressing patient reluctance.

While the review highlights these challenges, a multifaceted approach combining technological investment, financial incentives, regulatory reforms, and user acceptance strategies is necessary to fully realize the potential of telehealth services. The feasibility of

these solutions depends on government commitment, cross-sector collaboration, and ongoing innovation in telehealth technologies. Future research should focus on pilot programs evaluating the implementation of these solutions to assess their real-world effectiveness and scalability, particularly in rural and resource-limited settings.

Benefits of Telehealth

The use of contemporary communication and information technologies in telehealth offers expert-based healthcare to understaffed remote locations, providing cutting-edge emergency treatment, and contributing to early detection, better cure, prevention, and rehabilitation, particularly in managing diseases like cancer. Orlando et al (2019) highlighted the telehealth's potential to decrease the incidence of cancer in the nation is emphasized by raising national awareness of cancer and its care. For example, telehealth platforms can be used to launch awareness campaigns targeting specific populations that might be at higher risk due to environmental, genetic, or lifestyle factors. For instance, a campaign focusing on lung cancer awareness in areas with high pollution or smoking rates might use targeted messages through telehealth apps to encourage users to understand their risk factors and participate in preventive screenings. It has also been linked to changes in service use patterns, including increased local hospital admissions and reduced unnecessary patient transfers, which have translated into improved patient outcomes (Tsou et al., 2021). Furthermore, the regular use of telehealth workstations was associated with increased confidence among users and was perceived to enhance medical treatment (Valentin et al., 2022)

Barriers of Telehealth

However, telehealth encounters challenges such as patient and medical professional reluctance. Some patients may prefer physical visits, while healthcare professionals may be skeptical about visual quality during teleconsultations and telediagnostics. According to Maria et al. (2022), while patients held views on the value of face-to-face consultations, physicians emphasized on comfort in asking questions during face-to-face interactions. Legal and ethical issues, particularly regarding the application of laws in cross-border teleconsultations, continue to be a concern. Telehealth platforms are usually highly encrypted and follow regulations, but it is not entirely hack-proof which leads to concerns about the privacy and security of telehealth systems hinder broader acceptance (Gajarawala & Pelkowski 2021). Also, it is found that, there are concerns from physicians in terms of increased workloads especially regarding administrative tasks related to teleconsultation which includes scheduling, documentation and other administrative responsibilities (Maria et al., 2022).

Addressing these challenges is crucial for the success and sustainability of telehealth services. Improving visual quality in tele-radiology, telepathology, and tele dermatology to meet international standards can prevent incorrect interpretation and misdiagnosis. Integrating telehealth into daily tasks, expanding education and awareness efforts, and addressing reluctance and scepticism about telemedicine are essential.

For telehealth to reach its maximum potential, it is important to not only understand its limitations and challenges, but also to identify the criteria or factors that contribute to its success (Gajarawala & Pelkowski 2021).

Factors influencing success and sustainability:

1. The **vision** in defining the purpose of the service has to be clear and focused. As such, a well-defined and clear vision will not only help to develop a focused planning, but also makes the implementation of the program much smoother and eventually gains a good outcome.

2. **Ownership** in developing the service needs to be purposeful and empowered by all stakeholders. The involvement of patients or targeted populations, the clinicians or service providers and managers of the telehealth service will be crucial in developing a telehealth program that responds to the real need of the local health service and further improves the overall healthcare deliverance.

3. **Adaptability** of the telehealth service to the real needs of the local health service, considering the local limitations and restrictions before establishing a suitable model. For example, in rural populations, telehealth developers should consider the simplicity of interface or using a platform that has a wider or better accessibility to gain better acceptance by the local populations.

4. **Economics** aspect of the telehealth service in terms of time saving and cost effectiveness provided by telehealth as compared to conventional face to face service. For example, setting up an online platform is more cost effective as compared to setting up a new clinic in the rural area. The online platform can also serve as a communicative point between the outreach point and the referral centre to refine and speed up the referral process.

5. **Efficiency** related to the development and sustainability of the telehealth service is another important aspect to look into during the development of the telehealth system. The manpower or skills needed in developing the program framework as well as to manage and sustain the program in the long run plays a vital role in ensuring a successful outcome for the program.

6. **Equipment** needed for the establishment of the telehealth services is also very crucial in determining the successfulness of the program. Substandard equipment might result in poor internet connection and subsequently affect the quality of image and audio during a telehealth session thus leading to incomplete or failure telehealth sessions.

CONCLUSION

This review of telehealth literature from 2019 to 2023 highlights its potential to improve healthcare access for rural and underserved populations, demonstrating benefits such as enhanced patient engagement, reduced travel costs, and improved health outcomes. However, challenges persist, primarily due to inadequate technological infrastructure in rural areas, impacting the effectiveness and satisfaction associated with telehealth services.

Key success factors for telehealth include strategic vision, adaptability, economic viability, and technological adequacy. Addressing infrastructure deficiencies, regulatory compliance, and fostering acceptance among healthcare providers and patients are crucial for overcoming barriers and realizing telehealth's full potential.

Continued research and strategic implementation are essential to optimize telehealth services, ensuring they meet the needs of diverse populations and effectively manage healthcare challenges in rural settings. The success of telehealth depends on a balanced approach that integrates technological advancements with user-centric designs and inclusive health policies.

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