International Journal Of Health, Engineering And Technology (IJHET) E-ISSN 2829 - 8683
Volume 5, Number 1, May 2026, *Page. 189 - 195*
Email : editorijhess@gmail.com

The Use Of Telemedicine In The Digital Transformation Of Healthcare Services: A Literature Review

Abdul Haris Pontoh[1)*],Fariz Maulana[2)],Marina[3)],Misbahudin[4)],Sahpur[5)],Abdul Kadri[6)]
[1,2,3,4,5,6)] Master's Program in Public Health, Muhammadiyah University of Palu, Central Sulawesi, Indonesia

*Corresponding Author
Email : pontoh.abd@gmail.com

Abstract

Digital transformation in healthcare services has encouraged the use of technology to improve access, quality, and efficiency of healthcare delivery. One of the key innovations in this transformation is telemedicine, which enables healthcare services to be delivered remotely. This study aims to examine the utilization of telemedicine in the digital transformation of healthcare services through a systematic review approach. The method used was a systematic review based on the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA). Literature searches were conducted in PubMed, Scopus, ScienceDirect, Semantic Scholar, and Google Scholar within the publication years 2020–2025. The article selection process followed identification, screening, eligibility, and inclusion stages. A total of 13 articles that met the inclusion criteria were analyzed narratively. The results indicate that telemedicine improves access to healthcare services, supports health data integration, enhances patient engagement, and promotes more proactive and preventive care. Additionally, telemedicine contributes to improving the efficiency of healthcare systems. However, its implementation still faces challenges such as limited infrastructure, digital literacy, and issues related to data security and system integration. Therefore, telemedicine is an important strategy in the digital transformation of healthcare services that requires support from policies and technological system strengthening.

Keywords: Telemedicine, Digital Transformation, Healthcare Services, E-Health, Mhealth.

INTRODUCTION

Digital transformation in healthcare has accelerated significantly in recent years, especially since the onset of COVID-19, which drove massive adoption of health technologies worldwide (Wosik, 2020). Digital transformation in healthcare represents one of the fundamental changes in modern health systems, aiming to improve access, quality, efficiency, and sustainability of health services (Keesara, 2020).

This transformation involves not only the digitization of data, but also a paradigm shift in the delivery of healthcare from conventional models toward technology-based models that are more integrated, adaptive, and patient-centered. In this context, telemedicine has emerged as one of the key innovations that play a strategic role in supporting the digital transformation of healthcare services (Rutherford, 2024). Telemedicine refers to the use of information and communication technologies to deliver healthcare services at a distance, including consultation, diagnosis, treatment, monitoring, and health education (Topol, 2020).

This concept enables interaction between patients and healthcare professionals without requiring them to be in the same location, thereby overcoming geographical barriers and limitations in access to healthcare. Thus, telemedicine is not merely a technological tool, but also a systemic approach to enhancing the equity of healthcare delivery (Zeneca, 2025). Telemedicine has been shown to improve access to healthcare services, particularly for populations living in remote areas with limited access to health facilities (Smith, 2020).

The development of telemedicine is strongly influenced by advances in digital technologies, such as high-speed internet, mobile devices, cloud computing, and the integration of wearable devices. These innovations enable the creation of a more responsive, data-driven healthcare delivery system. In this system, patients' health data can be collected, analyzed, and used in real time to support clinical

decision-making. This indicates that telemedicine constitutes an integral part of the broader digital health ecosystem (Yun, 2025).

In conventional healthcare systems, access to services is often constrained by geographical factors, time, and the availability of healthcare professionals. These conditions lead to disparities in the distribution of healthcare, especially in remote and rural areas. Telemedicine emerges as an innovative solution that bridges this gap by providing flexible, easily accessible remote healthcare services. With telemedicine, patients can obtain healthcare without traveling long distances, thereby improving the efficiency and effectiveness of care (Bao, 2022).

In addition, the rising burden of chronic diseases such as diabetes, cardiovascular disease, and mental health disorders has become a major challenge for global health systems. Chronic diseases require long-term management involving regular monitoring, treatment adherence, and changes in patient behavior. In this context, telemedicine plays an important role in supporting chronic disease management through remote monitoring (telemonitoring) and digital-based interventions.

One rapidly developing form of telemedicine implementation is the use of integrated e-health systems to support patient self-management. Studies on the POWER2DM system show that integrating medical, behavioral, and psychological data into a single digital platform can improve glycemic control, quality of life, and patients' self-management abilities in diabetes. This system also enables shared decision-making between patients and healthcare professionals, which is a key component of patient-centered care (Gerber, 2023).

These findings indicate that telemedicine functions not only as a communication tool, but also as a clinical decision-support system that can enhance the overall quality of healthcare services. By integrating various health data into one platform, healthcare professionals can obtain a more comprehensive picture of patients' conditions and thus provide more accurate and personalized interventions. Moreover, telemedicine has also proven effective in improving clinical outcomes in various health conditions. The use of mobile health (mHealth)-based interventions in diabetes management, for example, can significantly reduce HbA1c levels through regular monitoring and technology-driven interventions (Hong, 2023).

In the field of mental health, telemedicine likewise demonstrates considerable potential in improving access to therapeutic services. Studies on Internet-delivered Cognitive Behavioral Therapy (ICBT) show that internet-based therapy is effective and cost-effective in treating social anxiety disorder in children and adolescents. This approach helps overcome multiple barriers to accessing mental health services, such as a shortage of professional staff, high costs, and social stigma (Lalani, 2026). These findings reinforce that telemedicine plays an important role in expanding access to healthcare services, not only for physical illnesses but also for mental health. With digital approaches, healthcare services can be delivered more flexibly and reach populations that previously had difficulty accessing care.

Beyond improving access and clinical outcomes, telemedicine also contributes to enhancing the efficiency of healthcare delivery systems. By reducing the need for in-person visits to healthcare facilities, telemedicine can save time and costs for both patients and service providers. This system also allows for better optimization of healthcare resources, thereby improving the productivity of healthcare professionals.

Despite these multiple benefits, the implementation of telemedicine still faces several challenges, such as limited technological infrastructure, low digital literacy, and concerns about data security and patient privacy. In addition, the integration of telemedicine with existing healthcare delivery systems remains suboptimal in many healthcare facilities. Based on the above discussion, telemedicine has a significant role in the digital transformation of healthcare services, both in improving access and service quality as well as the efficiency of health systems (Thwaites, 2025). Therefore, further research is needed to comprehensively understand the use of telemedicine in the

digital transformation of healthcare services, including its effectiveness and the challenges associated with its implementation.

RESEARCH METHODS

This study uses a systematic review design with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) approach to systematically identify, select, and analyze various studies that discuss the use of telemedicine in the digital transformation of healthcare services. This approach was chosen because it can provide a comprehensive, transparent, and structured synthesis of scientific evidence. The literature search was conducted systematically through several international electronic databases: PubMed, Scopus, ScienceDirect, Semantic Scholar, and Google Scholar. The search was performed using combinations of keywords such as "telemedicine", "telehealth", "mHealth", "digital transformation", "digital health", and "healthcare services", combined with Boolean operators (AND and OR). To ensure relevance and data novelty, the search was limited to articles published between 2020 and 2026.

Articles obtained from the search were then selected through several stages following the PRISMA flow: identification, screening, eligibility assessment, and inclusion. In the identification stage, all retrieved articles were gathered and duplicates were removed. Subsequently, in the screening stage, titles and abstracts were reviewed to exclude articles irrelevant to the research topic. Articles that passed this stage were then analyzed in full text during the eligibility stage to verify their compliance with the predefined inclusion criteria. Articles meeting all criteria were included in the final analysis.

Inclusion criteria in this study include original research articles that use quantitative designs such as randomized controlled trials (RCT), quasi-experimental studies, or clinical trials; that discuss the use of telemedicine or mHealth in healthcare services; and that are available in full-text format and published in English or Indonesian. Articles classified as reviews, editorials, opinions, those not relevant to the topic, or those with incomplete data were excluded from the study. Data from the selected articles were then systematically extracted using a data matrix. The information collected included the authors' names, year of publication, study location, study design, sample size, type of telemedicine intervention, measured variables, and the main study findings. This data extraction process was carried out to facilitate grouping and analysis of the research results.

Quality assessment of the included studies was performed to ensure the validity and credibility of the analyzed findings. Studies with an RCT design were evaluated based on potential risk of bias, whereas quasi-experimental studies were assessed for clarity of design, consistency of intervention, and completeness of outcome reporting. This appraisal aimed to ensure that only studies of good quality were included in the analysis. Data analysis was conducted using a descriptive narrative approach, which involved grouping findings according to the type of telemedicine intervention, their effectiveness on clinical outcomes, and their impact on the healthcare delivery system. This approach was used to provide a comprehensive overview of the role of telemedicine in supporting the digital transformation of healthcare services.

This study uses secondary data obtained from scientific publications and therefore does not require ethical approval. All research processes were carried out while maintaining scientific integrity and following the principles of transparency in conducting a systematic review.

RESULTS AND DISCUSSION

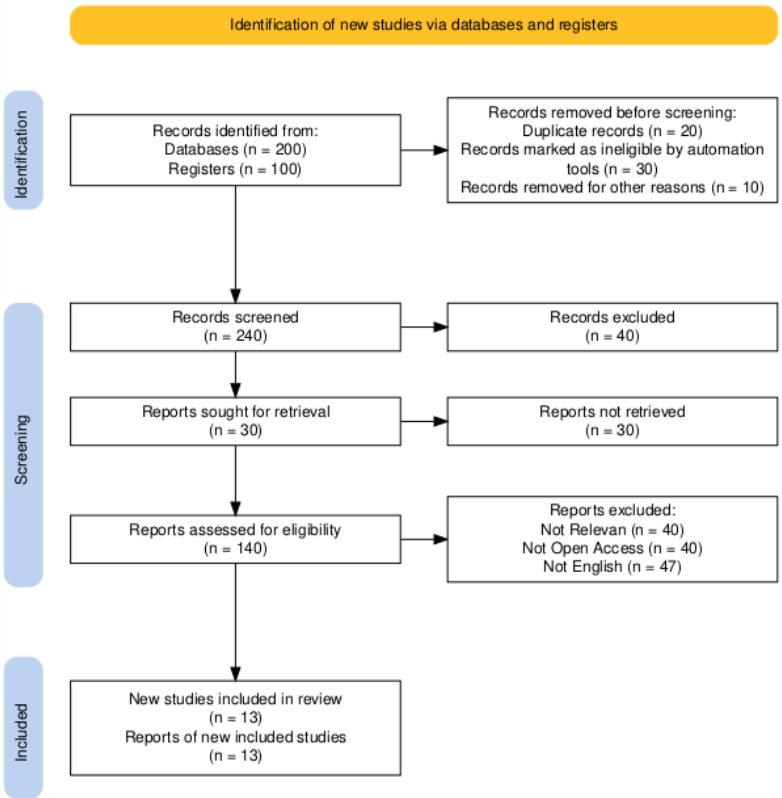

Figure 1. PRISMA Flowchart

The article selection process in this study was carried out systematically following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) flow. In the initial identification phase, a total of 300 articles were obtained from various sources, namely 200 articles from electronic databases and 100 articles from other registry sources. Next, an initial screening process was conducted to remove articles that did not meet the basic criteria, including duplicate articles and those deemed clearly irrelevant. In this stage, 20 duplicate articles were removed, 30 were excluded by automated screening, and another 10 were discarded for various reasons, leaving the remaining articles for the next stage.

In the screening stage, 240 articles were assessed based on their titles and abstracts to evaluate their relevance to the research topic. The screening results showed that 40 articles were not relevant to the study focus and were therefore excluded. In addition, 30 articles could not be accessed in full (not retrieved), and thus could not be carried forward. Subsequently, in the eligibility assessment stage, 140 articles were analyzed in full text to confirm their compliance with the predefined inclusion criteria. From this analysis, several articles had to be excluded because they did not meet the requirements: 40 were deemed irrelevant to the research topic, 40 were not available in open-access format, and 47 were not written in English, and therefore could not be analyzed further.

After completing all selection stages, a total of 13 articles met the inclusion criteria and were considered suitable for analysis in this study. These thirteen articles were then used as the basis for conducting a synthesis to examine the use of telemedicine in the digital transformation of healthcare services.

Discussion

The use of telemedicine is an integral part of the digital transformation of healthcare services, changing the way healthcare is delivered from a conventional model to one based on digital technology. This transformation is not only concerned with the use of technology, but also encompasses changes in the approach to care that are more integrated, efficient, and patient-oriented (Sakane, 2023). In the context of modern healthcare, telemedicine serves as a medium that enables the provision of healthcare services without constraints of space and time. Through digital technologies, interactions between patients and healthcare professionals can occur in real time or asynchronously, thereby improving access to healthcare, especially for populations in areas with limited healthcare facilities. In this way, telemedicine becomes a strategic solution for addressing disparities in access to healthcare services.

In addition to improving access, telemedicine also supports digital transformation through more comprehensive integration of health data. E-health-based telemedicine systems allow the integration of patients' medical, behavioral, and psychological data into a single digital platform (Nordh, 2021). This integration not only simplifies monitoring for healthcare professionals, but also facilitates more accurate, data-driven clinical decision-making. This approach indicates that telemedicine contributes to the development of a more connected (connected care) and sustainable healthcare delivery system (Yoon, 2024).

The use of telemedicine also drives a paradigm shift in healthcare delivery from a reactive to a proactive and preventive model. Through telemonitoring technologies, patients' conditions can be continuously monitored without requiring them to visit healthcare facilities in person (Naqvi, 2023). This enables early detection of changes in patients' health status, allowing interventions to be implemented more quickly and accurately. Thus, telemedicine plays a role not only in treatment, but also in prevention and ongoing disease management (Campbell, 2022).

Moreover, telemedicine strengthens the patient-centered care approach by increasing patients' engagement in managing their own health. Digital technologies enable patients to access health information, monitor their condition independently, and communicate more actively with healthcare professionals. Integrated e-health systems also support shared decision-making between patients and healthcare professionals, which can enhance treatment adherence and the overall quality of healthcare services (Lin, 2022).

In the field of mental health, telemedicine demonstrates an important role in expanding access to digital-based therapy services. Approaches such as Internet-delivered Cognitive Behavioral Therapy (ICBT) provide effective and efficient alternatives that can reach individuals who face barriers in accessing conventional mental health services. This shows that telemedicine is relevant not only in physical healthcare delivery, but also in mental health (Delbaere, 2021).

However, the implementation of telemedicine still faces challenges, such as limited infrastructure, low digital literacy, and issues related to data security and privacy. In addition, the integration of telemedicine systems with existing healthcare services still needs to be improved so that their use becomes more optimal. Thus, telemedicine is an important strategy in the digital transformation of healthcare services, capable of enhancing access, quality, and efficiency of care, although it still requires adequate infrastructure and supportive policies (Ruissen, 2023).

CONCLUSION

The use of telemedicine is a key component of the digital transformation of healthcare services, capable of improving access, quality, and efficiency of healthcare delivery. Through the integration of digital technologies, telemedicine enables healthcare to be provided in a flexible, sustainable, and patient-oriented manner. Moreover, telemedicine supports increased patient engagement, real-time

health monitoring, and more accurate clinical decision-making.

However, telemedicine implementation still faces various challenges, such as limited infrastructure, low digital literacy, and issues concerning data security and system integration. Therefore, policy support, reinforcement of technological systems, and enhancement of human resource capacity are needed so that telemedicine can function optimally in supporting the digital transformation of healthcare services.

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