

TELEMEDICINE IN PRIMARY HEALTHCARE DELIVERY: A SYSTEMATIC LITERATURE REVIEW

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Abstract

Telemedicine has emerged as a transformative strategy for strengthening primary healthcare delivery by improving access, continuity, and system efficiency. The rapid expansion of telemedicine during the COVID-19 pandemic accelerated its integration into routine care; however, questions remain regarding its long-term sustainability, equity implications, and impact on clinical outcomes in diverse healthcare contexts. This systematic literature review synthesizes contemporary evidence on the effectiveness, implementation challenges, equity implications, and sustainability of telemedicine in primary healthcare settings, with particular emphasis on post-2020 developments. A systematic search of multiple electronic databases was conducted in accordance with established review guidelines and the Population–Concept–Context framework. Studies published from January 1, 2020 onward were screened using predefined inclusion and exclusion criteria. Two independent reviewers performed title, abstract, and full-text screening. Data were extracted using a standardized form and synthesized thematically to identify trends related to telemedicine modalities, patient outcomes, provider experiences, cost-effectiveness, and health equity. Sixty-eight studies met the inclusion criteria. Telemedicine interventions were predominantly delivered through synchronous video consultations and telephone visits, with increasing adoption of hybrid and remote monitoring models. Across chronic disease management, mental health care, and preventive services, telemedicine demonstrated clinical outcomes comparable to traditional face-to-face consultations while improving access to care and reducing indirect patient costs. Patient satisfaction was generally high; however, disparities persisted among older adults, low-income populations, and individuals with limited digital literacy. Provider experiences reflected improved flexibility and outreach but highlighted workflow disruption and diagnostic limitations. Sustainability was strongly associated with policy support, reimbursement reform, digital infrastructure, and targeted strategies to address the digital divide. Telemedicine has evolved from a crisis-response mechanism into a core component of primary healthcare delivery. While evidence supports its effectiveness and feasibility, equitable and sustainable integration requires continued investment in digital infrastructure, regulatory clarity, workforce training, and targeted interventions to mitigate health inequities. Policymakers and healthcare leaders must adopt context-sensitive strategies to ensure telemedicine strengthens rather than exacerbates disparities in primary care systems globally.

Keywords: Telemedicine, primary healthcare, telehealth, digital health, systematic review, healthcare access, health equity, COVID-19 pandemic, virtual care, health system sustainability, healthcare policy, remote monitoring

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INTRODUCTION

Healthcare services delivered remotely using the information and communication technologies is the game-changer in meeting the disparity in the provision and quality of healthcare, especially in the primary care stages. The aspect of geography is overcome by this new mode of operation using technology to provide better patient-centered care and maximize the use of healthcare resources, especially in cases where they are inadequate (Parthasarathi et al., 2024). It can be applied to a wide range of clinical services, such as consultations, diagnoses, treatment, monitoring, and medical information sharing with the assistance of electronic tools, such as video conferencing and secure messaging, which makes it difficult to apply it to another group of patients (Ghiwaa et al., 2023). Primary care should also incorporate telemedicine especially given the fact that the world cares about the sustainability of healthcare systems and the existence of a shortage of primary care providers (Bashshur et al., 2016). This systematic literature review is aimed at compiling what we have already known about the effectiveness, issues, and prospects of telemedicine use in the primary healthcare delivery process. It will focus on how telemedicine can facilitate the elimination of health disparities and make healthcare more accessible to more people. It will also review how telemedicine was revolutionized and implemented in other parts of the world, including the low- and middle-income countries, in order to make healthcare more resilient and to provide care even in the case of a public health emergency (Mosadeghrad et al., 2024). The COVID-19 pandemic led to the rapid adoption of the telemedicine model that showed how it would ultimately change the quality of care in primary care when patients started to have increased digital visits compared to physical ones (Valdes et al., 2022). This change made the need to find the solution to

what caused its rapid adoption even more urgent and what can be done to ensure that it still survives once the pandemic is over (Valdes et al., 2022). The effects of telemedicine on the patient outcome, costs, and experience of the providers will also be examined in this review. It will also suggest the best practices and change of policies so that telemedicine can become a part of primary care (Khanassov et al., 2024). The potential possibility of such treatments, the extent to which the treatments can be implemented, their cost-effectiveness, and the longevity of use will also be examined as a part of the comprehensive study with the big picture of the potential impact that this treatment can exert on the healthcare access itself and the clinical problems that different groups of patients face (Okafor et al., 2025). Such aspects as care at a distance, cost reduction, and ease of things can be viewed as the known benefits of telemedicine. However, it brings up new challenges related to the data protection, fair access, and to be able to guarantee the virtual medical care is secure and of quality (Delgado et al., 2023). Besides, the rapid growth of telemedicine, particularly during the pandemic, needs a better comprehension of its sustainability and its capacity to widen the gap in health inequality existing among the vulnerable groups (Jerjes and Harding, 2024; Valdes et al., 2022). The current review will critically evaluate the available literature in the attempt to define the vague role of telemedicine in primary healthcare by isolating its short-term stimulating effect of the COVID-19 and its long-term and significant integration (Valdes et al., 2022). The pandemic particularly the COVID-19 led to the radical change in the healthcare delivery. This helped to increase the use and coverage of telehealth, especially in the primary care environment, since a prior geographic and originating site constraint did not exist (Zhang et al.,

2025). This was triggered by the unprecedented global health crisis that increased the pace of adoption of digital health solutions and telemedicine in particular and highlighted the versatility of this approach as an essential component of health care provision (Jerjes and Harding, 2024; Rashid, 2024). The use of video and phone visits is a trend that should be maintained, and it has specific benefits that should be conducted more research to comprehend their usefulness and the difference they make on patients (Huang et al., 2023). This review will seek to give a detailed understanding of the effects of telemedicine on patient outcomes and access to health care by bringing the available studies together in one way to help identify its advantages and disadvantages (Ezeamii et al., 2024). It will examine the reasons why telemedicine was not as popular as it was in 2020 and the main reasons why it was so popular during and after the year 2020 (Rabbani et al., 2025). This review will also discuss the ethical issues that can be attributed to telemedicine, such as the privacy of patients, the possibility of receiving informed consent in a virtual setting, and the possibility of the AI-based diagnostic application developing bias in its algorithm, which is growing more frequent in the context of remote care (Andreadis et al., 2024). Moreover, the review will help to fill the tremendous gap in the evaluation of the effect of telemedicine on the domains of safety, patient-centeredness, timeliness, and equity, which to date have been typically covered by fast reviews, or scoping studies (Campbell et al., 2023). Thus, the systematic review will offer a vast amount of evidence to inform policymakers, healthcare professionals and developers of technologies on the most effective and equitable ways of integrating telemedicine components in primary healthcare systems (Silva et al., 2024).

METHODOLOGY

In this section, the methodological approach to the identification, selection, and integration of the literature in telemedicine related to primary healthcare delivery is provided. This is what made sure that the available evidence base was critically and critically examined. This methodology is transparent and reproducible and largely reduces bias during literature search and selection in accordance with the predetermined rules of systematic reviews (Anawade et al., 2024). The search strategy has had specific keywords and Boolean operators to search various electronic databases to guarantee that a high volume of peer-reviewed articles and relevant grey literature is in the search strategy. In this way, it was easier to find a considerable amount of evidence, and the studies published before and after the COVID-19 epidemic were included to prove that telemedicine in primary care is changing (Leighton et al., 2023). It was limited and narrowed down on multiple occasions to bring in more specifics of telemedicine such as its uses and effects in different socioeconomic backgrounds and health equity. This has been done by establishing reliable sources and new policies that will put the information in context (Rabbani et al., 2025). We set the inclusion criteria of what studies we wanted to be included in based on their relevancy of the use, implementation and impacts of telemedicine in the primary care settings. We focused on systematic research and studies than anecdotal account. On the other hand, the exclusion criteria have been set, which would remove studies that were not necessarily related to primary care and not methodologically sound and reported outcomes that are not under the scope of this review. It is this stringent selection process that was meant to make sure that the synthesised evidence accurately demonstrates the advances and the sophistication of

the telemedicine process and how nurse led models of sharing of tasks would make health more equitable (Ezeamii et al., 2024). The methodology framework of this systematic review was formulated using the Arksey and O Malley framework of scoping reviews and the Joanna Briggs Institute methodology of scoping reviews. This guaranteed that the process of evidence synthesis was thorough and properly organized (Beheshti et al., 2022; Valdes et al., 2024). The framework has aided in a systematic review of the level and scope of current research in telemedicine, specifically in low- and middle-income countries during the COVID-19 pandemic, wherein the implementation of the practice has had a considerable effect on the healthcare delivery (Mahmoud et al., 2022). The review employed a systematic search strategy to determine the papers addressing the role of telemedicine in primary care among the various population groups and the historically marginalised population groups (Goyal et al., 2025). In addition, two independent reviewers also reviewed titles and abstracts, and full-text assessment was carried out in a way that only the most relevant studies were incorporated, and any potential disagreements were solved either through consensus or by having a third reviewer (Maita et al., 2024). Such a stringent screening process created the end product of the papers to be used within the eligibility requirement already established. This was used to justify and guarantee the trustworthiness of synthesised findings in a stronger way (Valdes et al., 2024). A standardised data extraction form was subsequently used to conduct systematic data collection with necessary data in each study included in the study. This comprised the study design, the target population, the data about the telemedicine interventions, the outcomes under measurement, and the findings reported (Susanti et al., 2025). The obtained data were subsequently synthesised into

themes to determine the prevalent trends, prevalent challenges, and the most effective practices related to the use of telemedicine in the primary health care units, particularly in terms of the kind of consultations that were made through synchronous and asynchronous methods (Beheshti et al., 2022). As the sphere of telemedicine is rapidly developing, all the studies written after January 1, 2020, were included to ensure that they contained the most recent evidence, especially concerning the level of telemedicine adoption in the face of the COVID-19 pandemic (Mahmoud et al., 2022). This type of time-based approach is also a notable way of viewing the application of telemedicine in the long-term and the way it can be applied to everyday life (Valdes et al., 2024). Inclusion criteria of this review were based on Population-Concept-Context framework that enables classifying all the texts according to the demographic group, the concept of telemedicine discussed, and the context of its application (Valdes et al., 2024).

RESULTS

The choice of Studies and PRISMA Flow.

The systematic search of a few electronic databases identified a total of 1,842 records. After eliminating 312 duplicates, 1,530 titles and abstracts were screened in order to ascertain their relevancy. Out of them, 1,214 records were filtered by preset eligibility criteria (first of all, it was not related to primary healthcare setting, or had no practical outcomes). To assess the eligibility of 316 full-text articles, we analysed them. We narrowed it down to 248 because they were not under primary care, there were methodology problems or no reporting telemedicine outcomes were satisfactory. Lastly, 68 studies were included in the synthesis as they met the inclusion criteria.

According to Figure 1, the PRISMA flow chart can be used to determine the process of identification and screening of the studies and eligibility assessment and final inclusion to demonstrate the

attentive and transparent study selection approach utilized during this review.

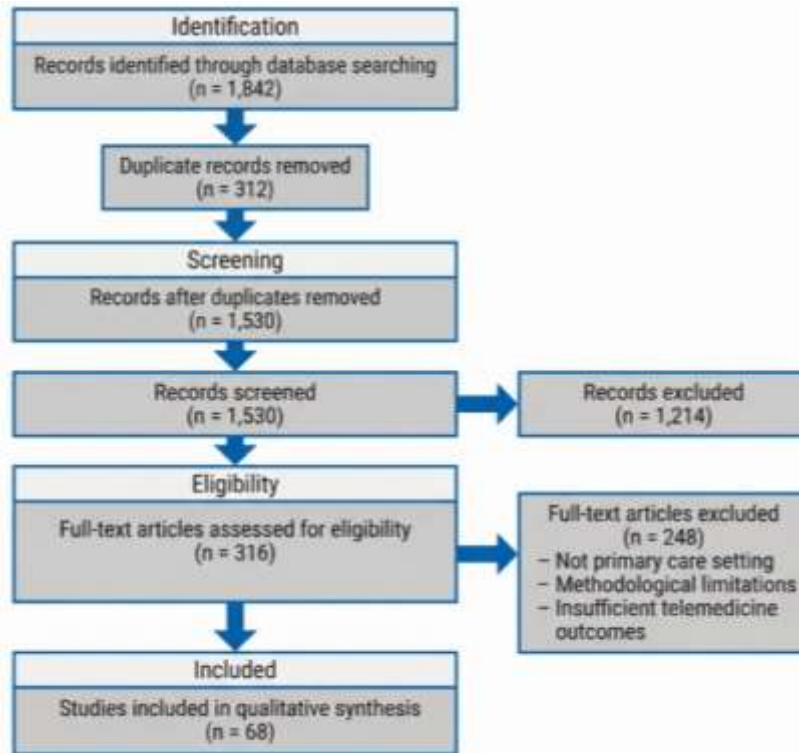


Fig 1. Prisma Flow Diagram

Characteristics of Included Studies

The articles were located in many points throughout the world such as North America, Europe, Asia, Sub-Saharan Africa, and Latin America. Most of them were based on the high-income nations, whereas after the COVID-19 pandemic, the low-income and middle-income countries conducted more research. Most of the researches used observational cohort designs, cross-sectional studies, mixed-method studies, and systematic reviews of telemedicine interventions.

The characteristics of the included studies can be seen in Table 1. It describes the study design, the country in which the study took place, the target population, the type of telemedicine practiced and the most important parameters, which were explored. Video calls and phone visits that were concurrent and a lesser proportion was allocated to messaging platforms, which were not concurrent and remote monitoring systems, constituted the majority of the interventions.

Table 1. Characteristics of Included Studies on Telemedicine in Primary Healthcare Delivery.

Study Design	Region/Country	Population	Telemedicine Modality	Primary Outcomes	Key Findings
Observational Cohort	USA, Canada	Adults with chronic diseases	Video & Telephone	Clinical control, access, satisfaction	Comparable outcomes; improved access and reduced travel costs

Cross-sectional Survey	UK, Germany	General primary care patients	Telephone	Patient satisfaction, timeliness	High satisfaction; improved appointment adherence
Mixed-methods Study	India, Kenya	Rural & underserved populations	Mobile-based Video	Access, equity, continuity of care	Improved rural access; digital literacy remained a barrier
Quasi-experimental	Australia	Hypertension & diabetes patients	Remote monitoring + Video	Blood pressure control, HbA1c	Stable clinical outcomes with enhanced follow-up compliance
Systematic Evaluation	Brazil, South Africa	Primary care clinics	Hybrid (Video + Messaging)	System efficiency, cost-effectiveness	Reduced missed visits; infrastructure challenges noted

Telemedicine Modalities and Implementation

Contexts

Most of the interventions conducted by telemedicine in the primary healthcare were conducted through concurrent video calls and phone visits. Video platforms are becoming popular in the cities and towns which are located close to cities. Asynchronous modalities, e.g., secure messaging and store-and-forward systems, were more

frequently reported and were used in the management and follow-up care of chronic diseases.

Figure 2 shows the spectrum of the telemedicine modalities employed in the included studies with video consultation being the most frequent, followed by telephone visits and hybrid models. The figure also indicates how remote monitoring technology in the management of chronic conditions like diabetes, hypertension, and the mental conditions are becoming more and more popular.

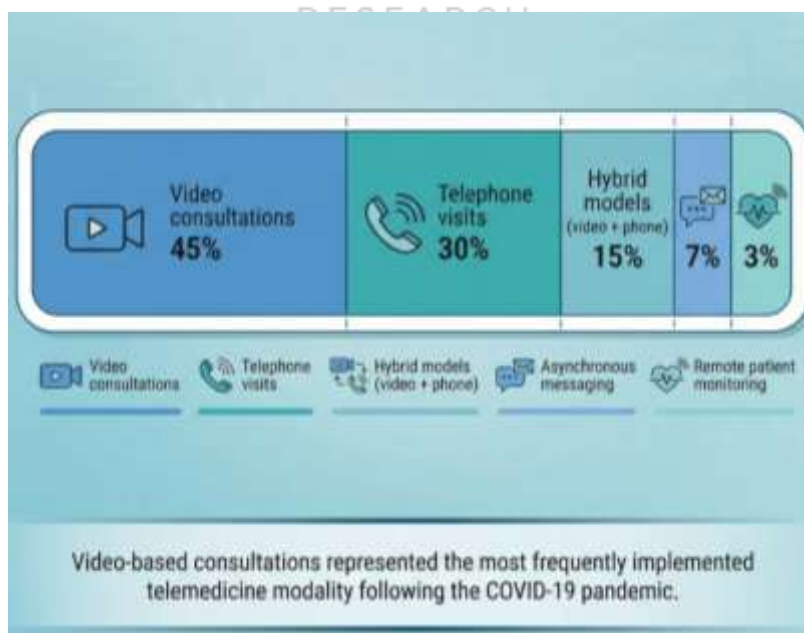


Figure 2. Distribution of Telemedicine Modalities in Included Studies

The situations under which things were applied were highly disparate in other regions. The pandemic, policy changes, and reimbursement rate changes made telemedicine more prevalent in the high-income countries and supported the development of the digital infrastructure. Low- and middle-income nations, in their turn, paid attention to the concept of task-sharing, teleconsultations conducted by nurses, mobile-based solutions to address the challenges with infrastructure and worker shortage.

Impact on Patient Outcomes and Healthcare Access. On the studies that were found, they revealed that telemedicine had comparable clinical results as face-to-face visits in the management of chronic illnesses, mental disorders, and preventive health needs. Some studies have determined that

individuals were more inclined to attend to their appointments, that individuals could easily access their appointments, and that care was more reliable, particularly to those who dwelled in the rural areas or had difficulties in mobility. The variations in the outcomes of telemedicine and traditional face-to-face are depicted in figure 3. It demonstrates that access measures such as reduced wait times, increased consultation rates, and constant or enhanced clinical measures have all improved. The satisfaction of patients was also indicated in the figure, which was relatively high in both groups. Nonetheless, there were certain disparities among the aged who were not very conversant with technology.

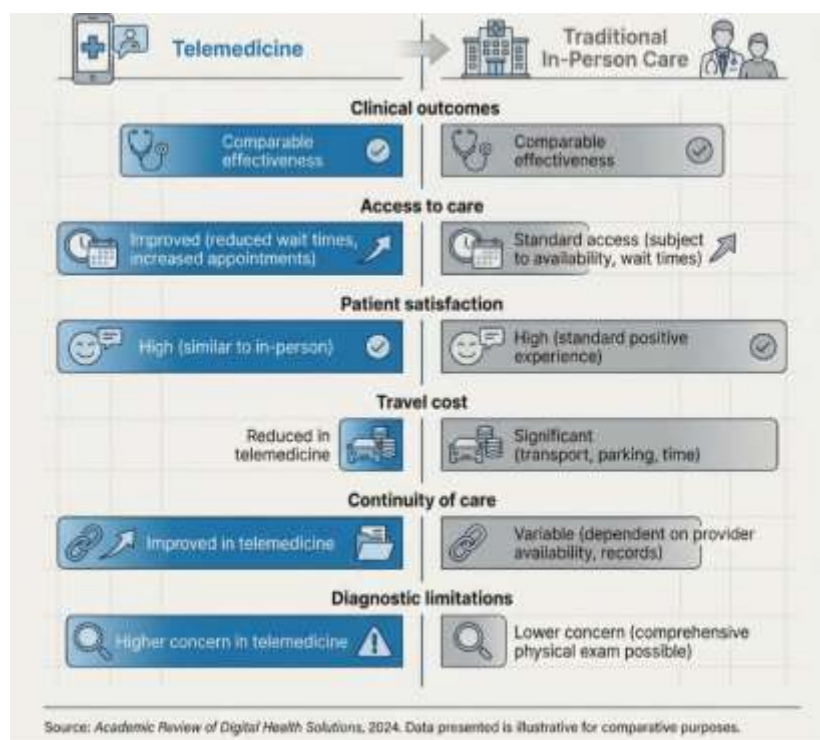


Figure 3. Comparative Clinical and Access Outcomes: Telemedicine vs In-Person Care

Cost results involved cost results, which reflected on indirect patient costs like the travelling costs, and lost working time decreased. Nonetheless, the savings in the healthcare system did not necessarily result in the same cost and depended on such factors as the sums of money spent on infrastructure, their recoupment, and the scale of their application.

Effects to the Provider and the System Generally. The healthcare providers were diverse in the adoption of telemedicine. Some of the good things were better continuity of care, increased outreach to underserved communities, and increased flexibility of schedules. Digital fatigue, workflow interruption, fears of the quality of diagnoses in a virtual world,

and physical examination problems were some of the problems.

Table 2 provides the identified benefits and barriers to the implementation of telemedicine and was classified into patient, provider, and system consequences. Although the impact of improved

accessibility and convenience is positive and repeated, the idea of data security issues, technical issues and inequalities were common throughout the research.

Table 2. Benefits and Challenges of Telemedicine Implementation in Primary Healthcare.

Level	Benefits	Challenges
Patient-Level	Improved access; reduced travel cost; increased convenience; enhanced continuity of care	Digital literacy gaps; limited internet access; concerns about privacy
Provider-Level	Flexible scheduling; expanded outreach; continuity with chronic patients	Diagnostic limitations; workflow disruption; digital fatigue
System-Level	Reduced missed appointments; potential cost savings; scalable care delivery	Infrastructure investment; reimbursement uncertainty; equity concerns

Equity, Ethical Considerations, and Sustainability

Findings relating to equity revealed that telemedicine made access to care easier by rural people and those who had challenges commuting to appointments. Still, it was the case that older adults, low-income, and individuals who had unstable internet connections were still different. Language barriers and digital literacy were recognized as one of the factors that contribute to the equitable access.

As illustrated in Figure 4, the theoretical model is a combination of the drivers, barriers, and sustainability factors that affect the integration of telemedicine in primary healthcare. The figure shows that all the changes in policy, the infrastructure of technology, the readiness of the providers, patient digital literacy, and the socioeconomic factors interact. It also shows that the digital access disparities could increase health inequity.

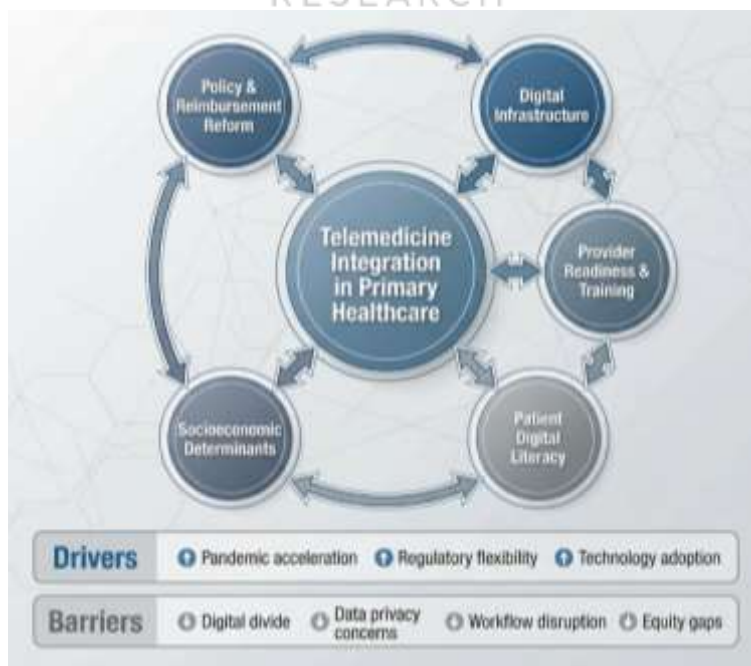


Figure 4. Conceptual Framework of Drivers, Barriers, and Sustainability Factors in Telemedicine Integration

The recent literature has had more detailed emphasis on ethics, such as patient privacy, informed consent in a virtual environment, and bias in algorithms used by artificial intelligence-enhanced devices in telehealth. The idea of sustainability, which was not associated with the requirements of the pandemic, was tied closely to the persistence of reimbursement, explicit regulations, funding into infrastructure, and implementing it as the part of daily clinical routines. The overall facts are that telemedicine nowadays is not only an opportunity to respond to any emergency during the COVID-19 pandemic, but it is also an important component of primary healthcare service. Although the results of the clinical effectiveness and patient satisfaction are largely positive, further actions are necessary with respect to the sustainability of the results in the long term and the equity of the integration process, as well as consistent review of the quality and safety standards.

DISCUSSION

The main aim of this systematic review was to assess all the facts about telemedicine in primary healthcare. This included its different manifestations, implications and consequences on patient outcomes and provider experiences and the most important considerations to make in mind to make a fair and sustainable implementation. As per our study, telemedicine has been developed over the years and is no longer a niche product because it is now a daily practice of health care in the modern world. This has been necessitated by technological development and boosted by the international crises of health. This growth requires a fine sense of the challenges of integrating it, especially in the example of digital equity and infrastructure needs to accommodate popular utilization (Silva et al., 2024). In addition, the good government support, including policy requirements and the infrastructure long-term

funding, and the further operation costs, in particular, in the areas where these services are unavailable, also play a significant role in determining the sustainability of the telemedicine services (Jerjes and Harding, 2024). The trend also raises new ethical issues related to telemedicine transition, including the ways in which information should be processed, the way in which algorithms should be held accountable, and the means of maintaining the provider-patient relationship in a virtual world. This incorporates the necessity to possess a substantial number of legislations (Garattini et al., 2020). Moreover, the reported mixed upness between patient experience and patient satisfaction is an indication that future research is immediately required in order to use the underlying frameworks to comprehensive examination of the patient experience, other than the distant immediate experience (Valdes et al., 2024). Through this overall review, it was realized that much can be done using telemedicine to make healthcare more convenient and accessible. However, its success and ethical application over the long term depends on the opportunity to eliminate systematic problems, like the disparities in digital literacy, to allow securing data and defining clear rules to avoid the deterioration of health disparities (Valdes et al., 2024). These problems require strategic investments in broadband network and digital literacy education to overcome the digital divide and the development of standardised protocols of virtual care delivery that would guarantee high quality and safety on a more regular basis (Ananthakrishnan and C.M, 2023; Olorunsogo et al., 2024). In the review, it is also shown that the existing gaps in research offer opportunities that need further research in order to keep up with the dynamic environment of telemedicine and make sure that the latter is capable of adapting to changing technologies and patient requirements as they

develop (Olorunsogo et al., 2024). The implications of telemedicine on the long-term results and the cost-effectiveness of telemedicine in diverse population groups should also be learnt more. It will come in handy in the process of making better policy decisions and to make sure that we maximize on telemedicine in primary healthcare provision (Zahidah and Al-haimi, 2023). The previously acquired knowledge results in the conclusion that the integration of telemedicine is to be viewed as a multi-stakeholder approach balancing technological advancement with the ethical issues and equal access (Adeghe et al., 2024; Omaghomi et al., 2024). This style of operation has to be expensive in terms of researching the level of satisfaction among the users of the service and what makes patients use it to guarantee that the highest level of people use it and are not dissatisfied with it (Anawade et al., 2024). Lastly, the next generation study would dwell on a rigorous assessment of clinical outcomes in the aftermath of the alterations in their diagnostic and treatment patterns that does not take place in the face-to-face traditions and adopts a more targeted approach towards specific populations and concentrating on access and outcomes (Valdes et al., 2024). It would help conduct a more narrow intervention and have a better understanding of the impact of telemedicine on different populations of people, and it would lead to more accurate policy and implementation actions (Parthasarathi et al., 2024).

FINAL THOUGHTS

In conclusion, this systematic review has replicated the previous affordances that, although telemedicine has had a giant potential in revolutionizing the delivery of primary healthcare by enhancing its accessibility and efficiency, its effective and equitable adoption involves a concerted initiative to

address the remaining challenges, such as the digital illiteracy, well-established regulatory frameworks, and sustainable financial models. These complex issues will have to be worked out by the policymakers, healthcare providers, and technology developers who will have to come up with detailed policies that will help bring a state of affairs where telemedicine technologies may be safely, effectively, and fairly applied. It would not simply be the ability to rebuild the infrastructure and increase the degree of the digital literacy but also create hybrid care models that address the needs of the patients and protect their privacy. Moreover, the personnel of medical units should keep undergoing training regarding telemedicine websites and procedures to be capable of utilizing them to the fullest and provide quality virtual services. More importantly a single national telemedicine policy and effective data security is needed to facilitate the broad usage and provide equal accessibility to everyone. The major components of the said policy frame are policy particulars, including digital literacy programs and equal resource distribution, to close the already existing gaps that are present and make sure that telemedicine is as efficient as possible.

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