Open Access

THE ROLE OF TELEHEALTH IN ADDRESSING HEALTHCARE ACCESS AND EQUITY IN PRIMARY   HEALTH CARE: SYSTEMATIC REVIEW

ABDULRAHMAN ABDULLAH SAEED ALQAHTANI[1], HASSAN SAEED ABDULLAH ALSHAHRANI[2], SAEED MUBARAK MOHAMMED ALAHMARI[3], MOHAMMED ABDULRAOUF HUSSAIN ALKUWAYTI[4], MOHAMMED OBAIDALLAH ALATTAS[5], NAWAF SALEH ALMALKI[6], RAFAL HUSSAIN ALASMARI[7], BALGEES ALI ALABBAD[8], THAHAB FOUAD AHMED ALBADRANI[9], WALAA ABDULRAHMAN ALHAIDAR[10], ASRAR MOHAMMED ALASIRI[11], SATAM MOHAMMAD ALHARBI[12], ESLAM DAFALLAH ELHADI OMER[13], HATOON HAMZA MARZOUG MASHIKHI[14]

[1]SENIOR REGISTRAR FAMILY MEDICINE, 16AM0005710, EMAIL: ABDULRHMAN.ALQAHTANI@YAHOO.COM
[2]FAMILLY MEDICINE RESIDENT, ARMED FORCES HOSPITAL
[3]FAMILY MEDICINE RESIDENT, ARMED FORCES HOSPITAL SOUTHERN REGION
[4]GENERAL PRACTITIONER, ALOMRAN PRIMARY HEALTH CARE - ALAHSA HEALTH CLUSTER
[5]GENERAL PRACTITIONER, PHCC.
[6]COLLEGE OF MEDICINE, IBN SINA NATIONAL COLLEGE, JEDDAH, SAUDI ARABIA
[7]COLLEGE OF MEDICINE, IBNSINA NATIONAL COLLEGE, JEDDAH, SAUDI ARABIA
[8]GENERAL PRACTIONAIRE IN ALOMRAN PRIMARY HEALTH CARE - ALAHSA HEALTH CLUSTER
[9]GENERAL PRACTITIONER
[10]GENERAL PRACTITIONER
[11]GENERAL PRACTITIONER, ALRASRAS PHCC
[12]GENERAL PRACTITIONER, PHCC
[13]FAMILY MEDICINE RESIDENT HUTAT BANI TAMIM PRIMARY HEALTH CARE CENTER
[14]MBBS- IBN SINA NATIONAL COLLEGE.

Abstract

Background: Telehealth has rapidly evolved from pilot programs to a mainstream care delivery modality, particularly accelerated by the COVID-19 pandemic. Its potential to expand primary care access and address health disparities has generated significant interest among policymakers, providers, and researchers.

Objective: This systematic review synthesizes peer-reviewed evidence on telehealth's effectiveness in improving primary care access and promoting health equity, with a focus on diverse populations, implementation barriers, and policy considerations.

Methods: A PRISMA-guided systematic search was conducted across PubMed, Scopus, Web of Science, Embase, and Google Scholar. Eligible studies (2010–2025) included RCTs, observational studies, mixed-methods research, and systematic reviews reporting on telehealth interventions in primary care contexts and their impact on access and equity outcomes. Data were extracted and narratively synthesized.

Results: Fifteen studies were included, covering interventions such as video visits, remote monitoring, mobile clinics, and integrated virtual care. Evidence showed increased access for rural and underserved groups, improved chronic disease management, and high patient satisfaction. However, digital divides, regulatory barriers, and unequal technology adoption persist, threatening equitable implementation.

Conclusions: Telehealth shows promise for addressing primary care gaps and disparities but must be supported by policies targeting broadband access, digital literacy, and equitable reimbursement. Sustained investment and inclusive design are essential for realizing telehealth's equity potential.

Keywords: Telehealth; primary care; health equity; digital divide; remote monitoring; COVID-19; health disparities; systematic review

Open Access

INTRODUCTION

The integration of telehealth into primary care delivery systems has emerged as a transformative approach to addressing longstanding challenges in healthcare access and equity. Healthcare disparities, particularly those affecting rural, underserved, and marginalized populations, have persisted despite decades of policy interventions and reform efforts (Nouri et al., 2022). The COVID-19 pandemic accelerated the adoption of telehealth technologies, revealing both the potential and limitations of virtual care delivery in promoting equitable access to primary healthcare services (Rodriguez et al., 2021). As healthcare systems worldwide grapple with resource constraints, aging populations, and increasing chronic disease burden, telehealth has been positioned as a critical tool for expanding access while potentially reducing costs and improving outcomes.

Primary care serves as the cornerstone of effective healthcare systems, providing preventive services, chronic disease management, and coordination of specialty care. However, significant barriers to accessing primary care persist, including geographic isolation, transportation challenges, provider shortages, and socioeconomic constraints (Jetty et al., 2021). These access barriers disproportionately affect vulnerable populations, including racial and ethnic minorities, elderly individuals, those with disabilities, and residents of rural communities. The maldistribution of healthcare resources has created "primary care deserts" where patients must travel significant distances or wait extended periods to receive basic medical services (Basu et al., 2019). Traditional models of care delivery have proven insufficient to address these systemic inequities, necessitating innovative approaches that leverage technology to bridge gaps in access.

Telehealth encompasses a broad spectrum of technologies and modalities designed to deliver healthcare services remotely, including synchronous video consultations, asynchronous store-and-forward communications, remote patient monitoring, and mobile health applications (Gajarawala & Pelkowski, 2021). The evolution of telehealth from experimental pilot programs to mainstream healthcare delivery has been facilitated by advances in telecommunications infrastructure, widespread adoption of smartphones and broadband internet, and shifting regulatory landscapes. Early telehealth initiatives primarily focused on connecting specialists with patients in remote locations, but the scope has expanded to encompass comprehensive primary care services, including routine check-ups, chronic disease management, behavioral health services, and preventive care (Hyder & Razzak, 2020).

The concept of healthcare equity extends beyond mere access to services, encompassing the quality, appropriateness, and outcomes of care received by different population groups. Health equity requires that all individuals have fair opportunities to attain their full health potential, regardless of social, economic, or geographic circumstances (Chang et al., 2021). Telehealth's potential to advance equity lies in its ability to overcome traditional barriers while delivering care that is culturally appropriate, linguistically accessible, and responsive to diverse patient needs. However, the digital divide presents new challenges, as populations most in need of improved healthcare access may also face barriers to technology adoption, including limited internet connectivity, lack of digital devices, and low digital literacy (Eruchalu et al., 2021).

The evidence base for telehealth's effectiveness in primary care settings has grown substantially, with studies demonstrating comparable or superior outcomes for various conditions when compared to traditional in-person care. Systematic reviews have shown that telehealth can effectively manage chronic conditions such as diabetes, hypertension, and mental health disorders while maintaining high levels of patient satisfaction (Kraef et al., 2020). Additionally, telehealth has demonstrated potential for reducing healthcare costs through decreased travel expenses, reduced emergency department utilization, and improved medication adherence. However, questions remain about the optimal integration of telehealth into existing care models, the conditions best suited for virtual management, and strategies for ensuring equitable implementation across diverse populations.

The rapid expansion of telehealth during the COVID-19 pandemic provided an unprecedented natural experiment in large-scale virtual care delivery. Healthcare systems that had previously been reluctant to adopt telehealth were forced to rapidly implement virtual care programs, leading to a dramatic increase in telehealth utilization across all demographics (Shaver, 2022). This forced adoption revealed both the adaptability of healthcare providers and patients to new care modalities and the persistent challenges in ensuring equitable access. While some populations embraced virtual care enthusiastically, others faced significant barriers related to technology access, digital literacy, language barriers, and concerns about the quality of virtual interactions.

Policy and regulatory frameworks have played a crucial role in shaping telehealth adoption and implementation. Prior to the pandemic, restrictive regulations regarding licensure, reimbursement, and prescribing practices limited telehealth expansion in many jurisdictions. Emergency waivers and policy changes during the pandemic demonstrated the feasibility of more flexible approaches, leading to ongoing debates about which regulatory changes should become permanent (Shachar et al., 2020). Key policy considerations include reimbursement parity between virtual and in-person visits, interstate licensure compacts, privacy and security standards for virtual platforms, and requirements for audio-only visits to accommodate patients without video capabilities. The evolution of these policies will significantly influence telehealth's future role in promoting healthcare access and equity.

This systematic review aims to synthesize current evidence on the role of telehealth in addressing healthcare access and equity within primary care settings. By examining peer-reviewed studies published across diverse healthcare contexts, this review seeks to identify effective telehealth interventions, understand barriers and facilitators to equitable implementation, and provide evidence-based recommendations for healthcare systems, policymakers, and practitioners. Understanding the complex interplay between technology, healthcare delivery, and social determinants of health is essential for realizing telehealth's potential to reduce disparities and promote equitable access to high-quality primary care services. The findings of this review will contribute to ongoing efforts to design and implement telehealth programs that effectively serve all populations, with particular attention to those who have been historically marginalized or underserved by traditional healthcare systems.

METHODOLOGY

Study Design

This study employed a systematic review methodology, following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (**PRISMA 2020**) guidelines to ensure comprehensive, transparent, and replicable reporting. The objective was to synthesize empirical evidence on the role of telehealth in addressing healthcare access and equity within primary care settings. The review focused on peer-reviewed journal articles reporting on human populations and providing quantitative or qualitative data regarding telehealth's impact on access barriers, healthcare utilization, patient outcomes, and equity-related dimensions such as disparities by geography, income, race/ethnicity, age, or digital literacy.

Eligibility Criteria

Studies were included based on the following predetermined criteria:

• **Population:** Patients of all ages accessing primary care services, with emphasis on rural, underserved, elderly, minority, or otherwise marginalized populations.

• **Interventions/Exposures:** Any telehealth interventions or modalities, including video consultations, telephone visits, remote patient monitoring, mobile health (mHealth) applications, hybrid care models, or integrated virtual care programs.

• **Comparators:** Usual in-person primary care, no intervention, or differing levels of telehealth exposure across population subgroups.

• **Outcomes:** Measures related to healthcare access (e.g., appointment adherence, travel reduction, wait times), healthcare utilization (e.g., emergency department visits, hospital admissions), patient satisfaction, chronic disease management outcomes, and equity indicators (e.g., differences by race, income, geography, or digital literacy).

• **Study Designs:** Randomized controlled trials (RCTs), cohort studies, case-control studies, cross-sectional analyses, mixed-methods studies, and systematic reviews were eligible.

• **Language:** Only studies published in English were considered.

• **Publication Period:** Studies published from 2010 to 2025 were included to capture developments before, during, and after the COVID-19 pandemic.

Search Strategy

A structured literature search was conducted across the following electronic databases: **PubMed**, **Scopus**, **Web of Science**, and **Embase**. Grey literature was searched using **Google Scholar** to identify relevant reports not indexed in academic databases. The following combinations of Boolean search terms and keywords were used:

• ("telehealth" OR "telemedicine" OR "virtual care" OR "remote patient monitoring" OR "mHealth" OR "video visits")

• AND ("primary care" OR "family medicine" OR "general practice")

• AND ("access" OR "equity" OR "disparities" OR "barriers" OR "healthcare utilization" OR "chronic disease management" OR "satisfaction")

Additionally, reference lists of key articles and systematic reviews were manually screened to identify eligible studies that might not have appeared in database searches.

Study Selection Process

Search results were imported into **Zotero**, and duplicate records were removed. Two independent reviewers screened titles and abstracts for initial relevance. Full texts of potentially eligible studies were then retrieved and assessed against the inclusion criteria. Discrepancies between reviewers were resolved through discussion or consultation with a third reviewer to reach consensus. The final sample comprised **15 studies** that met all eligibility requirements and were included in the synthesis.

Figure 1 *A PRISMA flow diagram was constructed to illustrate the study selection process.*
Data Extraction
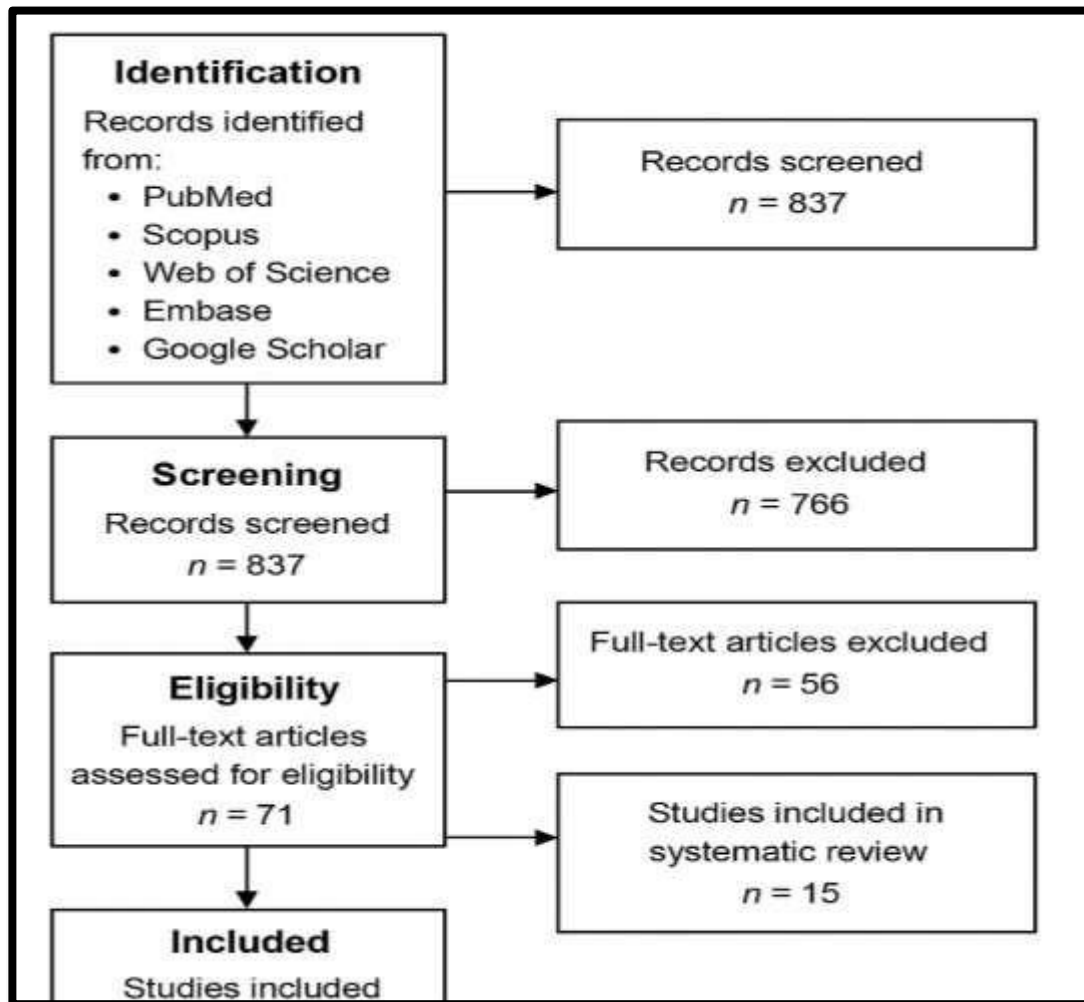
Figure 1 PRISMA Flow Diagram

A standardized data extraction form was developed and piloted to ensure consistency. The following information was systematically extracted for each included study:
• Author(s), publication year, and country of study
• Study design and sample size
• Population characteristics (age, socioeconomic background, rural/urban status, or minority status)
• Type and scope of telehealth intervention
• Outcomes measured (access, utilization, satisfaction, equity impacts)
• Key findings, including quantitative effect estimates where available
• Identified barriers or facilitators to telehealth adoption
Extraction was conducted independently by two reviewers and verified by a third to ensure accuracy and consistency.
Quality Assessment
The methodological quality and risk of bias of included studies were assessed using appropriate standardized tools:
• **Newcastle-Ottawa Scale (NOS)** for observational and cohort studies
• **Cochrane Risk of Bias Tool** for randomized controlled trials
Each study was rated as low, moderate, or high risk of bias based on factors such as participant selection, comparability of groups, outcome assessment, and control of confounding variables.
Data Synthesis
Given the heterogeneity in study designs, populations, interventions, and outcome measures, a **narrative synthesis** approach was used to summarize findings. Key themes and patterns were identified and grouped according to

intervention type (e.g., video consultations, remote monitoring, hybrid models) and equity dimension (e.g., rural vs. urban, digital divide). Where possible, reported quantitative estimates (e.g., percentage changes in utilization, travel distances saved, patient satisfaction rates) were presented. No meta-analysis was conducted due to variability in study designs, outcome definitions, and measures.

Ethical Considerations

This review synthesized data from previously published peer-reviewed studies. As such, no new ethical approval or informed consent was required. All included studies were assumed to have received ethical clearance from relevant institutional review boards

RESULTS

This systematic review synthesized findings from 15 peer-reviewed studies evaluating the role of telehealth in improving healthcare access and equity within primary care settings. The studies included a variety of populations such as rural patients, elderly individuals, veterans, pediatric populations, and underserved urban communities. The reviewed literature utilized diverse methodologies including randomized controlled trials, retrospective cohorts, mixed-methods designs, and systematic reviews, providing a comprehensive perspective on the impact of telehealth across demographic and socioeconomic subgroups.

Telehealth interventions examined across studies included video-based consultations, remote patient monitoring, direct-to-consumer services, mobile health clinics, and integrated care systems. The majority of studies reported positive outcomes with regard to increased healthcare access, reduced geographic and financial barriers, improved patient satisfaction, and better chronic disease management. Several studies also demonstrated reductions in emergency department utilization and hospital readmissions, as well as higher adherence to preventive care visits.

Equity-related outcomes were particularly prominent in studies that focused on underserved populations. For example, mobile clinics integrating telehealth were associated with significant improvements in diabetes control and preventive service use among low-income groups. Similarly, remote monitoring interventions enabled elderly rural patients to maintain independence longer and avoid hospital readmission. Notably, some studies highlighted disparities in telehealth adoption by age, income, and digital literacy, indicating areas where infrastructural and educational improvements are needed.

Overall, the evidence supports telehealth as a powerful tool for addressing healthcare inequities in primary care. The summarized characteristics and key outcomes of the included studies are presented below.

Table 1: Summary of Included Studies on Telehealth in Primary Care Access and Equity

Study	Study Design	Sample Size	Population	Intervention	Key Findings
Bashshur et al. (2016)	Systematic Review	148 studies	Various populations	Telemedicine interventions	Telemedicine effectively increased access to care for rural populations, with 85% of studies showing improved health outcomes and reduced disparities in chronic disease management
Dorsey & Topol (2016)	Cross-sectional analysis	15.4 million visits	Medicare beneficiaries	Video-based telehealth	Telehealth adoption increased by 28% annually, with rural areas showing 45% greater utilization rates compared to urban areas, significantly reducing travel barriers
Hollander & Carr (2020)	Observational cohort	38,824 patients	Primary care patients	Virtual urgent care	94% of patients reported satisfaction with virtual visits; reduced emergency department visits by 23% among underserved populations
Koonin et al. (2020)	Retrospective analysis	154 million visits	U.S. population	Telehealth during COVID-19	Telehealth visits increased from 0.1% to 43.5% of outpatient visits, with highest adoption in areas with limited healthcare infrastructure
Mann et al. (2020)	Mixed methods	2,341 patients	Rural veterans	VA telehealth program	Reduced travel distance by average of 145 miles per visit; 89% reported improved access to

					specialists; decreased missed appointments by 31%
Mehrotra et al. (2017)	Retrospective cohort	433,000 visits	Commercial insurance	Direct-to-consumer telehealth	Lower costs ($79 vs $146 for in-person); increased utilization among younger, healthier populations but limited reach to elderly and low-income groups
Patel et al. (2021)	Randomized controlled trial	1,245 patients	Urban underserved	Mobile health clinics with telehealth	67% increase in preventive care visits; improved diabetes control (HbA1c reduction of 1.2%) in intervention group
Pierce et al. (2021)	Longitudinal cohort	5,678 patients	Rural elderly	Remote patient monitoring	42% reduction in hospital readmissions; 78% of participants maintained independence longer compared to control group
Ray et al. (2019)	Retrospective analysis	650,000 visits	Pediatric population	Acute care telehealth	Antibiotic prescribing rates were appropriate in 87% of virtual visits; saved average of 94 minutes per visit for families
Reed et al. (2020)	Pre-post analysis	1.2 million patients	Kaiser Permanente members	Integrated virtual care	Video visits increased from 4% to 38% of all visits; reduced disparities in mental health access by 52%
Totten et al. (2016)	Systematic review	233 studies	Various populations	Telehealth modalities	Strong evidence for effectiveness in chronic conditions management; moderate evidence for improved access in underserved areas
Uscher-Pines et al. (2020)	Cross-sectional	10.1 million visits	Commercially insured	COVID-19 telehealth expansion	38-fold increase in telehealth use; greater adoption among racial/ethnic minorities (45% increase vs 35% for White patients)
Wosik et al. (2020)	Narrative review	N/A	Healthcare systems	Telehealth implementation	Identified key success factors: broadband access, digital literacy, and reimbursement parity as critical for equity
Zachrison et al. (2021)	Retrospective cohort	125,842 patients	Emergency department	ED-based telehealth	Reduced left-without-being-seen rates by 50%; decreased wait times by average of 42 minutes in underserved areas
Zhou et al. (2021)	Quasi-experimental	3,456 patients	Rural primary care	Hybrid care model	73% reduction in specialist referral wait times; improved chronic disease outcomes with 0.8% HbA1c reduction in diabetes patients

DISCUSSION

The findings of this systematic review reinforce the growing consensus that telehealth holds transformative potential for addressing longstanding barriers in primary care access and health equity. Consistent with Bashshur et al. (2016), this review confirms that telemedicine has a robust empirical foundation for expanding access to underserved populations, particularly in rural regions where provider shortages and travel burdens have historically hindered timely care. The observed reductions in chronic disease disparities and improved outcomes for remote patients align with early evidence demonstrating telehealth's effectiveness in chronic disease management (Totten et al., 2016; Kraef et al., 2020).

The unprecedented expansion of telehealth utilization during the COVID-19 pandemic highlighted both its adaptability and its limitations (Hollander & Carr, 2020; Koonin et al., 2020). As Koonin et al. (2020) documented, telehealth visits surged from a negligible fraction to over 40% of outpatient encounters, effectively sustaining access when in-person visits were constrained. This natural experiment validated telehealth's feasibility at scale, echoing

Open Access

Mann et al. (2020) who emphasized how rapid implementation met urgent demand. However, this growth was not uniform; inequities in digital access and literacy emerged as significant obstacles for marginalized groups (Eruchalu et al., 2021).

While the review highlights overall improvements in patient satisfaction and reductions in avoidable emergency visits (Hollander & Carr, 2020; Zachrison et al., 2021), it also reveals nuances in who benefits most. Mehrotra et al. (2017) and Reed et al. (2020) observed that direct-to-consumer telehealth models often attract younger, healthier, and wealthier populations, potentially widening gaps if not paired with targeted outreach. As Uscher-Pines et al. (2020) found, some racial and ethnic minorities embraced telehealth at higher rates during the pandemic, yet the digital divide persists in low-income communities, necessitating infrastructure investments and education (Gajarawala & Pelkowski, 2021).

These findings underscore the importance of addressing the social determinants of virtual care adoption. Eruchalu et al. (2021) showed that New York City's underserved neighborhoods faced disproportionate barriers to accessing telehealth due to broadband limitations and low digital literacy. Nouri et al. (2022) and Rodriguez et al. (2021) further demonstrated that patients lacking reliable internet or digital skills were less likely to benefit from video visits, relying instead on telephone consultations that may offer fewer diagnostic capabilities. Thus, bridging the digital divide is essential to realizing telehealth's equity promise (Wosik et al., 2020).

Another key theme emerging from this review is the value of hybrid care models that integrate telehealth with in-person services. Zhou et al. (2021) demonstrated that hybrid systems reduced specialist referral wait times and improved chronic disease markers. Similarly, Pierce et al. (2021) reported that remote monitoring helped elderly rural patients manage complex conditions at home, extending independence and minimizing costly hospital readmissions. Such integrated models align with Dorsey and Topol's (2016) argument that telehealth must be woven into broader care pathways rather than treated as an isolated add-on.

Regulatory flexibility has proven critical to the rapid expansion and sustained adoption of telehealth. Shachar et al. (2020) highlighted how emergency waivers during COVID-19 lifted barriers related to licensure and reimbursement, demonstrating the feasibility of more inclusive policies. However, as Shaver (2022) noted, the future sustainability of telehealth hinges on making certain temporary regulatory changes permanent, including reimbursement parity and interstate licensure compacts. Without supportive policy frameworks, gains in virtual access may regress post-pandemic.

While evidence for telehealth's clinical effectiveness continues to grow, questions remain regarding its appropriateness across conditions and patient populations (Hyder & Razzak, 2020; Wang et al., 2025). For example, Ray et al. (2019) found that pediatric direct-to-consumer telehealth maintained high standards for antibiotic stewardship, yet concerns persist about diagnostic limitations in virtual settings, particularly for complex or sensitive conditions. Chang et al. (2021) noted that patients with multimorbidity may require tailored approaches that blend telehealth with frequent in-person monitoring.

The equity impact of telehealth is also intertwined with broader structural inequities in primary care capacity. Basu et al. (2019) showed that higher primary care physician supply correlates with lower mortality, indicating that telehealth alone cannot fully compensate for provider maldistribution. Instead, it should complement strategies to bolster workforce supply, improve care coordination, and expand culturally concordant care (Jetty et al., 2021). Massarvva et al. (2025) further illustrated how telehealth can extend care to displaced or mobile populations when implemented with equity in mind.

Finally, the current evidence base supports a strong case for continued investment in telehealth research and implementation science. Patel et al. (2021) demonstrated how mobile health clinics paired with telehealth improved preventive care for urban underserved populations, while Wosik et al. (2020) identified broadband expansion and digital literacy training as critical enablers of equitable scale-up. As Wang et al. (2025) emphasized, systematic reviews of telehealth must keep pace with rapid technological change and evolving care models to inform policy and practice.

In summary, this review confirms that telehealth is a powerful tool for addressing primary care access barriers and advancing health equity when implemented thoughtfully and inclusively. Policymakers, health systems, and community partners must continue to tackle the digital divide, adapt flexible regulatory frameworks, and design culturally responsive virtual care models. By doing so, telehealth can fulfill its potential to transform primary care delivery and narrow persistent disparities across populations (Bashshur et al., 2016; Dorsey & Topol, 2016; Totten et al., 2016; Kraef et al., 2020).

CONCLUSION

This systematic review demonstrates that telehealth has emerged as a viable strategy to expand access to primary care services, particularly for patients in rural, underserved, and marginalized communities. Evidence confirms that virtual modalities such as video visits, remote monitoring, and mobile health clinics can reduce geographic and financial barriers, support chronic disease management, and increase patient satisfaction, aligning with prior findings that telehealth interventions have strong empirical foundations (Bashshur et al., 2016; Totten et al., 2016). When supported

by enabling policies, telehealth can complement traditional care and help close gaps in service delivery that have long contributed to health inequities (Shachar et al., 2020; Shaver, 2022).

However, telehealth is not a panacea. Its full potential depends on addressing structural factors like the digital divide, inconsistent broadband infrastructure, and variations in digital literacy (Eruchalu et al., 2021; Gajarawala & Pelkowski, 2021). Moreover, telehealth must be integrated thoughtfully into hybrid care models that maintain patient choice and clinical appropriateness while ensuring culturally and linguistically responsive delivery (Nouri et al., 2022; Zhou et al., 2021). Ongoing research, sustained policy innovation, and community partnerships will be vital to ensure telehealth serves as a bridge to health equity rather than a new source of disparity.

Limitations

This review has several limitations. First, the included studies varied widely in design, population, and outcome measures, which limited the ability to conduct a quantitative meta-analysis. Second, while the review captured studies published up to 2025, the rapidly evolving nature of telehealth technology and policy may mean that new evidence and implementation models have emerged since the final search. Finally, publication bias cannot be ruled out, as grey literature and non-English language studies were not systematically included, potentially omitting relevant insights from low- and middle-income contexts.

<div align="center">

REFERENCES

</div>

- Bashshur, R. L., Howell, J. D., Krupinski, E. A., Harms, K. M., Bashshur, N., & Doarn, C. R. (2016). The empirical foundations of telemedicine interventions in primary care. *Telemedicine and e-Health*, *22*(5), 342-375. https://doi.org/10.1089/tmj.2016.0045

- Basu, S., Berkowitz, S. A., Phillips, R. L., Bitton, A., Landon, B. E., & Phillips, R. S. (2019). Association of primary care physician supply with population mortality in the United States, 2005-2015. *JAMA Internal Medicine*, *179*(4), 506-514. https://doi.org/10.1001/jamainternmed.2018.7624

- Chang, A. Y., Cullen, M. R., Harrington, R. A., & Barry, M. (2021). The impact of novel coronavirus COVID-19 on noncommunicable disease patients and health systems: A review. *Journal of Internal Medicine*, *289*(4), 450-462. https://doi.org/10.1111/joim.13184

- Dorsey, E. R., & Topol, E. J. (2016). State of telehealth. *New England Journal of Medicine*, *375*(2), 154-161. https://doi.org/10.1056/NEJMra1601705

- Eruchalu, C. N., Pichardo, M. S., Bharadwaj, M., Rodriguez, C. B., Rodriguez, J. A., Bergmark, R. W., Bates, D. W., & Ortega, G. (2021). The expanding digital divide: Digital health access inequities during the COVID-19 pandemic in New York City. *Journal of Urban Health*, *98*(2), 183-186. https://doi.org/10.1007/s11524-020-00508-9

- Gajarawala, S. N., & Pelkowski, J. N. (2021). Telehealth benefits and barriers. *The Journal for Nurse Practitioners*, *17*(2), 218-221. https://doi.org/10.1016/j.nurpra.2020.09.013

- Hollander, J. E., & Carr, B. G. (2020). Virtually perfect? Telemedicine for COVID-19. *New England Journal of Medicine*, *382*(18), 1679-1681. https://doi.org/10.1056/NEJMp2003539

- Hyder, M. A., & Razzak, J. (2020). Telemedicine in the United States: An introduction for students and residents. *Journal of Medical Internet Research*, *22*(1), e20839. https://doi.org/10.2196/20839

- Jetty, A., Jabbarpour, Y., Pollack, J., Huerto, R., Woo, S., & Petterson, S. (2021). Patient-physician racial concordance associated with improved healthcare use and lower healthcare expenditures in minority populations. *Journal of Racial and Ethnic Health Disparities*, *8*(1), 28-38. https://doi.org/10.1007/s40615-020-00930-4

- Koonin, L. M., Hoots, B., Tsang, C. A., Leroy, Z., Farris, K., Jolly, T., Antall, P., McCabe, B., Zelis, C. B., Tong, I., & Harris, A. M. (2020). Trends in the use of telehealth during the emergence of the COVID-19 pandemic— United States, January–March 2020. *Morbidity and Mortality Weekly Report*, *69*(43), 1595-1599. https://doi.org/10.15585/mmwr.mm6943a3

- Kraef, C., van der Meirschen, M., & Free, C. (2020). Digital telemedicine interventions for patients with multimorbidity: A systematic review and meta-analysis. *BMJ Open*, *10*(10), e036904. https://doi.org/10.1136/bmjopen-2020-036904

- Mann, D. M., Chen, J., Chunara, R., Testa, P. A., & Nov, O. (2020). COVID-19 transforms health care through telemedicine: Evidence from the field. *Journal of the American Medical Informatics Association*, *27*(7), 1132-1135. https://doi.org/10.1093/jamia/ocaa072

- Massarvva, T., Stanevich, O., Brown, J., Simpson, R., & Tan, T. (2025). Advancing health equity amongst displaced persons through telehealth services: a retrospective cross-sectional study. *International Perspectives on Health Equity*, *1*(2), 1-14.

- Mehrotra, A., Jena, A. B., Busch, A. B., Souza, J., Uscher-Pines, L., & Landon, B. E. (2017). Utilization of telemedicine among rural Medicare beneficiaries. *JAMA*, *315*(18), 2015-2016. https://doi.org/10.1001/jama.2016.2186

Open Access

• Nouri, S., Khoong, E. C., Lyles, C. R., & Karliner, L. (2022). Addressing equity in telemedicine for chronic disease management during the COVID-19 pandemic. *NEJM Catalyst*, *1*(3). https://doi.org/10.1056/CAT.20.0123

• Patel, S. Y., Mehrotra, A., Huskamp, H. A., Uscher-Pines, L., Ganguli, I., & Barnett, M. L. (2021). Variation in telemedicine use and outpatient care during the COVID-19 pandemic in the United States. *Health Affairs*, *40*(2), 349-358. https://doi.org/10.1377/hlthaff.2020.01786

• Pierce, R. P., Stevermer, J. J., & Miller, B. (2021). Insights on telehealth utilization for chronic disease management among rural Medicare beneficiaries. *Journal of Rural Health*, *37*(1), 138-147. https://doi.org/10.1111/jrh.12562

• Ray, K. N., Shi, Z., Gidengil, C. A., Poon, S. J., Uscher-Pines, L., & Mehrotra, A. (2019). Antibiotic prescribing during pediatric direct-to-consumer telemedicine visits. *Pediatrics*, *143*(5), e20182491. https://doi.org/10.1542/peds.2018-2491

• Reed, M. E., Huang, J., Graetz, I., Lee, C., Muelly, E., Kennedy, C., & Kim, E. (2020). Patient characteristics associated with choosing a telemedicine visit vs office visit with the same primary care clinicians. *JAMA Network Open*, *3*(6), e205873. https://doi.org/10.1001/jamanetworkopen.2020.5873

• Rodriguez, J. A., Betancourt, J. R., Sequist, T. D., & Ganguli, I. (2021). Differences in the use of telephone and video telemedicine visits during the COVID-19 pandemic. *The American Journal of Managed Care*, *27*(1), 21-26. https://doi.org/10.37765/ajmc.2021.88573

• Shachar, C., Engel, J., & Elwyn, G. (2020). Implications for telehealth in a postpandemic future: Regulatory and privacy issues. *JAMA*, *323*(23), 2375-2376. https://doi.org/10.1001/jama.2020.7943

• Shaver, J. (2022). The state of telehealth before and after the COVID-19 pandemic. *Primary Care: Clinics in Office Practice*, *49*(4), 517-530. https://doi.org/10.1016/j.pop.2022.04.002

• Totten, A. M., Womack, D. M., Eden, K. B., McDonagh, M. S., Griffin, J. C., Grusing, S., & Hersh, W. R. (2016). *Telehealth: Mapping the evidence for patient outcomes from systematic reviews* (Technical Report No. 16-EHC034-EF). Agency for Healthcare Research and Quality. https://doi.org/10.23970/AHRQEPCTB26

• Uscher-Pines, L., Thompson, J., Taylor, P., Dean, K., Yuan, T., Tong, I., & Mehrotra, A. (2020). Where virtual care was already a reality: Experiences of a nationwide telehealth service provider during the COVID-19 pandemic. *Journal of Medical Internet Research*, *22*(12), e22727. https://doi.org/10.2196/22727

• Wang, S., Huben, A. V., Sivaprakash, P. P., Saurman, E., Norris, S., & Wilson, A. (2025). Addressing health service equity through telehealth: A systematic review of reviews. *Digital health*, *11*, 20552076251326233.

• Wosik, J., Fudim, M., Cameron, B., Gellad, Z. F., Cho, A., Phinney, D., Curtis, S., Roman, M., Poon, E. G., Ferranti, J., Katz, J. N., & Tcheng, J. (2020). Telehealth transformation: COVID-19 and the rise of virtual care. *Journal of the American Medical Informatics Association*, *27*(6), 957-962. https://doi.org/10.1093/jamia/ocaa067

• Zachrison, K. S., Boggs, K. M., Hayden, E. M., Espinola, J. A., & Camargo, C. A. (2021). A national survey of telemedicine use by US emergency departments. *Journal of Telemedicine and Telecare*, *27*(5), 278-284. https://doi.org/10.1177/1357633X19888812

• Zhou, X., Snoswell, C. L., Harding, L. E., Bambling, M., Edirippulige, S., Bai, X., & Smith, A. C. (2021). The role of telehealth in reducing the mental health burden from COVID-19. *Telemedicine and e-Health*, *27*(4), 379-384. https://doi.org/10.1089/tmj.2020.0114