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NARRATIVE REVIEW

Challenges to Virtual Healthcare Remain to be Addressed for More Equitable Access

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ABSTRACT

Introduction: The use of telehealth has demonstrated its benefits with enhanced access to health care services, often called virtual healthcare. Despite the potential value, there remain many challenges in achieving more universal adoption, effective utilization, and addressing inequities. If virtual healthcare, telemedicine, and digital health can offer a transformation in enhancing access to health care services and have demonstrated improvements in outcomes, what are the barriers that need to be addressed and, if possible, resolved or avoided?

Approach: Many challenges are reviewed in achieving adoption and sustained utilization of telemedicine services and virtual health care, along with potential solutions to overcome or avoid those barriers in order to better ensure more successful implementation and sustainability as part of overall health care.

Results: The review outlines the major challenges, obstacles and barriers to implementing and sustaining telehealth and virtual healthcare along with several solutions that can be applied. These challenges fall into these general categories: 1) Technical, 2) Workforce, 3) Administrative Governance, 4) Financial, and 5) Political, Social, and Cultural - all of which can impact equitable access to the true value of virtual healthcare and can be addressed when developing and implementing a telemedicine virtual healthcare program.

Conclusion: By addressing known challenges early in the process of integration of virtual healthcare, and as part of continued quality improvement, successful implementation and sustainability are more likely to be achieved, providing more pervasive global adoption and effective utilization, overcoming inequities to access, and enhancing the health and wellness of all patients being served.

Keywords: Telehealth, telemedicine, digital health, virtual healthcare, global health, inequities and challenges.

Introduction

Telemedicine, telehealth, and virtual healthcare are related systems that allow access to healthcare services, health information, and the sharing of ideas, experience and expertise related to health, independent of distance, both synchronously and asynchronously, when and where it is needed[1,2]. Furthermore, these platforms allow collaboration of individuals at multiple locations without being in-person in development of healthcare planning, research activities, and addressing public health issues, as well as providing support during disasters, both natural and manmade[3,4]. These virtual modalities can also be used to complement in-person encounters and activities used together as a mixed care or "hybrid" model when providing healthcare services and blended management[5]. The benefits of telehealth and virtual healthcare have been demonstrated in several studies and further amplified during the COVID-19 pandemic when in-person care was a risk due to the contagiousness and seriousness of contracting the infection and "virtual" healthcare, telehealth, and telemedicine offered a safer effective option for providing health services[6-8]. Despite the benefits demonstrated, telehealth and virtual healthcare are still not universally or ubiquitously adopted, nor utilized due to several challenges, barriers, and inequities[9,10]. This article reviews and outlines those challenges, as well as advances potential solutions to overcome them.

Results

Eight of the articles referenced[11-18] were used to assist in outlining the challenges and barriers being faced in implementation and sustainability of telemedicine and virtual healthcare. These were then organized into relevant categories with related sub-components along with possible solutions that could be applied to address them. The challenges tended to fall into five general categories: 1) Technical, 2) Workforce Limitations, 3) Administrative/Governance, 4) Financial, and 5) Political, Social, Cultural.

1) TECHNICAL

Access to appropriate devices for the health application desired, need for technical literacy, and user knowledge, and finally resistance and reluctance to use the technologies created significant challenges in implementation. Solutions proposed, included, enhance ease of use with better user interfaces, education regarding use of the technologies being deployed, promotion of the benefits, through user education and training for providers and patients, and finally, offer reasonable and affordable options, including cellphone applications, platforms such as "WhatsApp"[19] and other less expensive platforms for videoconferencing, or asynchronous services such as those on secure Web sites[20].

Second, access to adequate connectivity, broadband, and the internet constitutes another significant technical challenge. Solutions to consider include cellphone networks, wireless networks with microwave, or satellite[21,22], connection into existing fiber or fiber network rings. Also, there is a need to have systems to monitor the network connections and association with an appropriate network operating center (NOC)[23].

Next, costs create a challenge in implementation and sustainability. Although costs have been decreasing, consideration must be given to identifying available resources, subsidies, or grants to assist in covering those costs, along with the use of existing devices such as cell phones, personal computers, and laptops.

Another challenge is the ack of interoperability across devices and platforms. Solutions entail promoting standards that enable interoperability across devices and platforms, e.g. Android vs Apple, or Health Level Seven (HL7) and Fast Healthcare Interoperability Resources (FHIR) for health information exchange[24]. Vendor confusion and selection among multiple options also is challenging. Therefore, institutions must determine the most affordable and effective systems that meet the needs of the planned health-related application and determine the need for associated peripheral devices and the potential for interoperability.

Rapid changes in technology and creates need to adapt and adopt advances in telemedicine, telehealth and digital health, such as the emerging use of artificial intelligence, data analytic and use of geospatial mapping, simulation, robotics, remote monitoring, and concepts such as "hospital at home." Also, part of institutional decision-making will be to ensure ROI over any period of use along with the impact of anticipated changes, and the

consideration of contracts that allow for automatic or reasonably priced upgrades overtime.

Time zone differences create challenges in scheduling encounters – requiring the establishment of appropriate timing for real-time encounters across time zones. The consideration of asynchronous interactions to accommodate providers in other time zones when provision of services would be problematic, or "after-hours" in one time zone, but better offered in another time zone during regular working hours, such as in the case of international teleradiology services[25].

Language differences often create the need for adequate interpretation - thus a demand to consider integrating appropriate medical translation services for such consultations as required. Despite the advantages, telehealth and virtual healthcare continues to encounter significant implementation challenges, such as the shortage of bilingual and culturally competent providers capable of effectively serving patients with diverse linguistic and cultural backgrounds. Although artificial intelligence–based tools have been introduced to mitigate these challenges, evidence suggests that such technologies may produce inaccuracies in the interpretation and communication of medical information[26].

Furthermore, these systems often place additional burdens on caregivers, who are required to configure the technology, educate their patients on platform use, and manage telehealth functionalities, including login procedures and virtual meeting setup. Consequently, these limitations may reduce the overall effectiveness and equity of telehealth services. A quantitative study conducted by the University of California, San Francisco examined healthcare experiences among patients who prefer languages other than English (PLOE), with a particular focus on Cantonese and Spanish-speaking populations[27]. The study identified substantial communication barriers in clinical settings when certified medical interpreters were not available. Participants reported difficulties in understanding diagnostic information and treatment plans, as well as challenges in asking questions necessary to address their concerns, fears, and uncertainties. In the absence of professional interpretation services, family members and caregivers frequently assumed the role of interpreters despite lacking formal medical training. This practice may increase the risk of miscommunication and compromise patients' autonomy, confidentiality, and dignity, underscoring the need for improved access to qualified language services in healthcare delivery.

For example, receiving a cancer diagnosis can be profoundly distressing, particularly when it involves a family member, friend, or colleague. Both the patient and others involved can have an immediate emotional and physical reaction, compounded by the responsibility of the provider in relaying complex and devastating medical information to the patient. This highlights the significant burden placed on family members or friends when they are required to act as ad hoc interpreters without appropriate training. Therefore, it is strongly encouraged to have patients request certified medical interpreters to ensure accurate communication, facilitate informed decision-making, and allow patients to ask questions until all medical information is clearly understood, particularly when using telemedicine and virtual healthcare.

Reasonable standards of care should be followed that are appropriate for the service being offered and that the telehealth encounter should meet minimal standards of care for diagnosis and management[28]. If needed, using a trained health professional at the originating site with the patient can assist in the hands-on physical examination.

2) WORKFORCE LIMITATIONS

A lack of adequately trained health professionals and technical expertise to provide the telehealth and virtual health care services is another challenge particularly in resource limited regions and low- and middle-income countries. Therefore, when implementing a virtual healthcare program, ensure there is access to appropriate providers with verified credentials to allow provision of the needed service, both primary and specialty, physical and behavioral when using virtual healthcare, as well as access to adequate technical support.

Licenses may be needed for providers outside regional regulatory boundaries, state, provincial, or international.

Contingencies should be in place for patient support and safety at originating sites for unexpected emergencies; both critical physical

issues or behavioral issues such as suicidal or homicidal ideation.

Another challenge is having systems and programs that address the need for initial and ongoing adequate training of all users to address sustainability of the telehealth or virtual health care service. When implementing a virtual healthcare program, ensure training of staff and providers is included, not only in the in the planning, but also in the budget of any telehealth program and its implementation. In addition, anticipate staffing turnover and need for retraining to maintain use of the telehealth platforms and devices.

As part of developing the program, consider need for IT support and consultation if system failure and prepare options and contingencies for system failure.

3) ADMINISTRATIVE/GOVERNANCE
A significant challenge is the lack of adequate administrative support at the leadership level and for internal operations Ensure organizational "C-suite" buy-in and provision of appropriate financial support

An appropriate internal telehealth program governance structure is needed to support the development, implementation and sustainability of the telehealth programs, health related applications, and associated systems: devices, software and network.

Legal/regulatory: licensure, liability, and malpractice insurance issues need to be addressed ensuring that all legal and regulatory requirements are met based on both originating and distant sites. Also, adequate liability and malpractice coverage for attested bad outcomes should be incorporated.

Adequate documentation and integration with electronic health records (EHRs) and Health Information Exchanges (HIEs) should be incorporated and how telehealth encounters will be documented and what EHR will be utilized for documentation should also be identified. As noted previously, interface with a Health Information Exchange (HIE) should be considered to allow access to other pertinent patient health data in other systems related to the telehealth encounter[24].

There is a need for proof of benefits of the telehealth or virtual healthcare service that demonstrates enhanced health and improved outcomes. There is a need to develop systems for ongoing relevant data capture, collection, monitoring of the program, and the analysis.

Appropriate privacy and confidentiality need to be ensured at all times, meeting regional and national HIPAA-type requirements[29]. Systems must provide safe and appropriate locations for encounters that ensure patient privacy and ensure that only appropriate individuals should be present and identified during a telehealth encounter.

Authentication of participants must be addressed with equal diligence, appropriate identification, and demonstration of credentials to provide a given service. Systems need to be in place to verify that individuals involved in an encounter are who they say they are, to ensure that providers are appropriately credentialed and vetted to offer the services needed.

4) FINANCIAL;
Insufficient organizational financial support can be a major challenge for both implementation and sustainability of telehealth and virtual health care. Therefore, a business plan needs to be established that adequately will cover costs, cost vs benefit, and return on investment (ROI), and value on investment (VOI) that that not only outlines costs, along with potential cost savings, cost avoidance, opportunity costs, as well as other benefits related to improved access and enhanced outcomes[30-32]. When indicated it is important to address reimbursement equity of virtual healthcare with in-person care, as well as originating site and distant site equity to adequately cover costs of operations and the service being provided[33].

5) POLITICAL, SOCIAL, AND CULTURAL
It is important to understand and address the resistance among providers and patients, and governmental entities and recognize that some providers and patients may be uncomfortable with using telehealth and prepare for offering in-patient options. It is important to incorporate discussion with users, understand their reluctance to use telemedicine and virtual healthcare, address the concerns, and demonstrate to them the benefits which may be important in eventual successful implementation and use. Also consider offering informed consent to use telehealth and virtual healthcare for clinical encounters.

Political Agendas and changing levels of interest and support, individual or organizational egos can create challenges. There is a need to effectively engage governments, politicians, as well as individuals with varying perspectives and political philosophies understanding that there may exist innovative ideas related to public health[34]. There is often a need for national or regional governmental support. If possible, ensure there is overall government support for implementing and expanding a telehealth or virtual healthcare program, within a distinct district or nation-wide, such as engaging Ministries of Health. If that is not possible, consider other non-governmental organizations for conceptual or financial support.

An example of addressing national political challenges is the current state of telemedicine in Mexico, including federal public institutions, national-level deployment, and the degree of adoption across the country. Currently, general status telemedicine is actively operating within Mexico's public health system, and federal and state initiatives. Services include remote consultations, specialty teleconsultations, and rural telemedicine hubs. However, deployment remains uneven across the 32 states along with uneven coverage and national reach. According to federal reports, 606 telehealth centers are active across 21 states, demonstrating significant advancement but still there is incomplete nationwide adoption[35,36]. Another government program is expanding telemedicine nodes in rural and underserved regions, including Chiapas, Nayarit, and Sinaloa[37]. The degree of adoption of Telemedicine in Mexico is not in its early stages; rather, it is in a phase of expansion and progressing toward consolidation. The system is functional, growing, and institutionally supported, but not yet uniformly deployed nationwide. Key limitations include digital infrastructure disparities, interoperability challenges, and regulatory gaps[38-40]. Artificial Intelligence in Healthcare AI is increasingly used in radiology, clinical decision support, and administrative tools, although adoption varies. Broader application depends on regulatory development, digitalization, and clinical validation[41] Overall, Mexico is in an intermediate stage: telemedicine is established and expanding but not fully adopted. Continued investment, regulation, and standardized implementation across states are challenges that are essential for national-level maturity, but again challenges remain to be solved[42-47].

As another national regional example, "TeleAPS" (a formal telehealth project administered by the provincial Ministry of Health) is under the direction of the Digital Health Office and implemented in the region of northwestern Argentina, in the province of Jujuy, since 2020, but continuously since 2023. It is known that Telemedicine "is the provision of healthcare services remotely using information and communication technologies[48]." Their premise is that Primary Health Care is the foundation of any health system. In this context, TeleAPS is a telemedicine program that shares the same objectives as Primary Health Care, which is, health promotion and disease prevention, delivered remotely. The province of Jujuy has 811,000 inhabitants. The program works in 64 health posts located far from large hospitals in the interior of the province, where the ratio is less than 1 per 1,000 inhabitants (the minimum recommended by the World Health Organization). In this province, the roads to reach these hospitals are challenging due to the local geography and transportation can take up to two hours to complete. When the weather is bad, it becomes dangerous for both drivers and passengers. Public transportation sometimes runs only once a week. In some areas, health outreach programs are conducted for one, two, or three months with a single medical team. However, despite all these challenges, most health centers have internet access. TeleAPS takes advantage of this, offering teleconsultations so that citizens can consult a doctor on weekdays. The team includes eight medical specialists in Pediatrics, General Medicine, and Internal Medicine. They also have a traumatologist who treats patients with diabetic foot ulcers. These are scheduled appointments, primarily for well-child checkups and for adult patients with chronic non-communicable diseases. In addition, they coordinate their work with a team of nurses and administrative staff who facilitate all patient processes, such as scheduling appointments with subspecialists. The innovative aspect of their care model is a triad involving the patient, a health agent, and a telemedicine specialist. A complete medical history is taken, and a physical examination is performed by the health agent, guided by the telemedicine specialist. The diagnoses and

therapeutic plan are discussed with both the patient and the healthcare worker. They strive to coordinate appointments to minimize the patient's travel. In cases where in-person care is required, the appropriate referral is made. To date, more than 6,200 consultations from the interior of the province have occurred. All encounters are recorded in an electronic medical record. These consultations include 35% for children and 65% for adults.

In recent months, the program has experienced an increase in requests for video consultations, encouraged by the Ministry of Health itself and through press outreach strategies. This increase is also related to recommendations made by patients to their family and friends. Challenges in this region of Argentina include: 1) the delay in drafting a telemedicine bill in the province to regulate this activity and overcoming national political differences; 2) the need for greater public awareness of this bill to encourage more patients to use it; 3) streamlining certain aspects related to medication provision; and 4) determination of finding maintaining financial and technical support to sustain the program. In general, from a political perspective, it is important to understand that instability related to changes in governments, civil and political unrest, conflicts, and disasters can become challenges in implementation and sustainability of telehealth and virtual healthcare. Stakeholders must be prepared for those changes and plan for possible contingencies.

Consideration must also be made to address social and cultural issues, health and wellness inequities. There is the need to address social determinants of health[49] and cultural perspectives, including respectful acknowledgement of traditional indigenous health practices and beliefs, and how they might be integrated. Therefore, the participants in the program should be aware of cultural perspectives related to health, diagnosis and management of patients involved in the telehealth encounter. Telehealth can itself be integrated as a social determinant of health by improving access to primary care and specialists, providing timely care, and eliminating transportation barriers. Telehealth can also reduce stigma and improve medication adherence and can be a valuable tool to increase connection to care and reduce health disparities. However, the concern is whether telehealth will decrease health disparities in vulnerable populations that often lack access to technology by improving connections to care, or, will it simply result in new barriers? The evidence for patients with diabetes is that telehealth can be a highly effective method of improving glycemic control by keeping vulnerable patients connected to their care team and involved in their care. The telehealth approach must be flexible and patient-centered in order to ensure timely access to care. To be most effective, telehealth services approaches must be designed with an understanding of the importance of non-medical factors that influence health outcomes[50].

It is critical for healthcare providers to understand and address the cultural and linguistic, as well as the social, factors that affect patient care to improve patient experiences and health outcomes. It is essential to bridge communication gaps, enhance trust, improve health equity, and address healthcare disparities. Therapists have ethical and legal responsibilities as they work, through telehealth, to address the key issues of cultural competence in health care. This is especially true for culturally diverse patients, who need such techniques as the cultural formulated interview and the bio-psych-socio-cultural model to help providers achieve cultural competence[51].

In addition, it is also important to understand the local limitations in access to health-related resources for diagnostic testing, treatment, and management, particularly in low resource locations and adjust approaches accordingly or determine ways to fill the gaps in providing appropriate virtual healthcare.

Another example is the limitations of telemedicine in remote areas of Ecuador. Ecuador, with its geographical diversity (on the land, coast, Amazon, and Galapagos), faces unique challenges in implementing telemedicine in rural and remote areas, where approximately 37% of the population resides. Although there have been significant advances — such as the 27% increase in virtual consultations post-pandemic, the 2023-2027 Digital Health Transformation Agenda by the Ministry of Public Health (MSP), and pilot projects in the Galápagos and the Amazon — structural barriers that limit telemedicine's effectiveness as a reliable service persist. The general limitations in the Ecuadorian context, based on recent data (2024-2025), are evidenced in the following categories:

1) Lack of technological infrastructure and connectivity such as the main barrier in Ecuador is the digital divide: in 2023, only 44.4% of rural households had internet access, compared to 69.7% in urban areas (a difference of 25.3 points) - Provinces such as Guayas and Pichincha account for 61% of connections, leaving behind such remote areas as the indigenous Amazon (e.g., the Chachi communities in Esmeraldas) and the Galápagos. Unstable or nonexistent connections prevent smooth video consultations, especially in areas with irregular electricity. Although solutions like satellite internet are proposed, coverage is still insufficient.

2) Given the digital divide and technological illiteracy in rural, indigenous, and older adult populations (common in the Sierra and Amazon), there is low familiarity with digital devices. Factors such as low educational levels, an aging population, and cultural barriers create resistance, with a preference for in-person consultations. Several studies highlight the fact that this gap affects more women, low-income people, and isolated communities, limiting adoption even in pilot projects.

3) Clinical and diagnostic limitations as in general contexts, as applied to telemedicine, does not replace physical exams or emergency procedures. In remote areas of Ecuador (e.g., rural parishes with only 35% of well-equipped centers), this necessitates long and costly transfers to the mainland (from the Galápagos) or cities, delaying diagnoses of common chronic diseases such as diabetes or hypertension.

4) Insufficient training of healthcare personnel along with shortages of rural doctors and the lack of training in digital tools reduce effectiveness. Initiatives such as those by the MSP and Inter-American Development Bank (IDB) through a US$2 million loan to "DoctorOne[52]," a virtual medical assistance system, for rural expansion with the aim to provide training, but the deficit persists, worsened by the unequal distribution of specialists (concentrated in Quito and Guayaquil).

5) Privacy, security, and ethical issues, as in systems with weak infrastructure, increase the risks of cyberattacks and data breaches. Additionally, equity is a challenge - not everyone in remote areas can give consent or access services safely, perpetuating inequalities in indigenous communities.

6) Economic sustainability and cultural resilience, where high costs for equipment and training in rural centers with limited budgets, have an additional impact. In the Amazonian or Galapagos communities, cultural distrust of virtual solutions persists, with a preference for direct interaction. Projects like those of UTPL[53], an on-line education program, as applied in the Amazon or specialist itinerancy show progress, but sustainability depends on public-private partnerships.

In summary, telemedicine in Ecuador is a promising complement for healthcare in remote centers, enjoying a high satisfaction rate (90% of patients) where it has been implemented. However, overcoming these limitations requires urgent investment in infrastructure (rural connectivity), inclusive training, and equitable policies, aligned with the MSP Digital Agenda and international support from the Pan American Health Organization PAHO and IDB. In regions such as the Amazon and Galápagos, where geography worsens isolation, progress is slow but visible in recent pilot studies[54-56].

These examples demonstrate the challenges common to many telemedicine and virtual healthcare programs that need to be addressed when integrating these systems into a meaningful health delivery program that can potentially improve access and ultimately enhance the health of the people being served regardless of their location.

Discussion

Many authors have recognized the benefits and challenges related to telehealth and virtual healthcare and related inequities and discussed similar categories related to those challenges which correlated well with the categories outlined in this review[11-18]. As we imagine a world in which collaborative action for the betterment of mankind was our "go-to" priority in all avenues of societal organization and individual activity, we can visualize a world in which we never had to admit to each other the glaring reality of "haves" and "have-nots" within the human family, there was universal access to healthcare, and that access was considered a human right[57,58].

Given all the threats humanity faces, as rampant population growth exacerbates virtually all the world's problems – ecological 'health,' environmental 'health,' social 'health,' economic

'health,' political 'health' – our symbiotic relationship with Nature becomes a survival-determining factor of our continued coexistence. The common measure weaving all those very real determinants together is "Health." The realities of growing population demand for healthcare in all societies, mixed with an unequal distribution of professional care available – constituting a burgeoning demand vs diminishing supply scenario – commands inquiry into the medical community's response to this predicament. The location and availability of "healers" within most countries is unequal. The distribution of state-of-the-art medical diagnostic and treatment technologies is unequal around the world. The tools and technologies we have so assiduously developed to provide care to patient populations across the world have not been equitably deployed to address humanity's most urgent demands where they occur. The fact that healthcare delivery, recognized as a vital activity of societal guidance everywhere, is an "industry" that is the subject of constant breakthroughs in technology that enable, support, and strengthen diagnostic capabilities and treatment options demonstrates the global importance of population health in all nations.

If national governments, charged with the institutional responsibility to protect public health for their constituencies, fail continuously to prioritize that responsibility, or arguably worse, provide only counterproductive anemic actions to address public health demand which only showcase their political ineffectiveness, then it seems only reasonable that we can, and must, turn to the global medical community to take concerted action to address the demand for quality healthcare. However, particularly in the developing world, the professional attention of that medical community of providers is, unfortunately, being diluted due to government ineffectiveness as private sector healthcare delivery systems have emerged to operate in direct competition with the public sector healthcare institutions, thus expending ever greater resources than is otherwise necessary and perpetuating the disparities in the quality of care delivered. The obvious and most sensible solution would be to strengthen a country's national healthcare delivery system by creating public/private partnerships that would pool scarce resources, thereby eliminating the competition for such resources, and enabling professional providers working in both sectors to complement each other's expert delivery of care. Competing healthcare delivery systems, operating simultaneously and in parallel, mostly result in diminishing the reputation of one or the other in the minds of the patient populations the two systems purport to serve, thus widening the gap of confidence in the care being delivered by either system. Ultimately, why is such an ongoing phenomenon so inefficient and ineffective – first, because particularly in resource-poor countries, the doubling of resources consumed is a waste, and second, to passively permit healthcare delivery in any society to degenerate into a 'who-can-pay' and 'who-cannot-pay' industry is morally unacceptable. The pervasive experience of human suffering is indivisible. The world cannot afford to divorce its attention from acute suffering in the human family of which we are all members[57-58]. Continued acceptance of institutional, social, and political inequity in the healthcare delivery situation in the world will only result in a diminishment of the human condition and a significant number of preventable deaths. As quoted by Dr. Martin Luther King, Jr[59], "Of all the forms of inequality, injustice in healthcare is the most shocking and inhumane."

Conclusion

This evidence of inequities in access to telehealth and virtual healthcare underscores the importance of understanding and preparing for the many challenges and then applying approaches to avoid or overcome them. Experience has demonstrated that considering and addressing those challenges, barriers, and obstacles to the diffusion of virtual healthcare can lead to more significant adoption and sustainability throughout the global community and change the existing inequities. Thus, the promise of virtual health care can be realized as an important complementary part of overall healthcare and be more universally implemented and adopted to improve access to critical services that can enhance the health and quality of life of all citizens worldwide and become a true transformation in the evolution of healthcare delivery and global health.

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