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TELEPHARMACY: CURRENT TRENDS AND FUTURE SCOPE

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ABSTRACT

Telepharmacy – the practice of delivering pharmaceutical services via telecommunications and IT technologies in the absence of physical proximity of the pharmacist and the patient – has transitioned from being a temporary measure aimed at solving pharmacist shortage into being a regular technological element of the digital delivery of healthcare services. The current narrative review provides the overview of evidence on telepharmacy models, clinical advantages, implementation obstacles and trends, based on twenty articles published between 1999 and 2026, including scoping reviews, systematic reviews of reviews, retrospective service evaluation, cohort studies of state-level policy, pharmacist perception research, and industry market analysis.

The existing trends include expanding the scope of telepharmacy to chronic disease management through mHealth technologies, greater integration with EHR and wearables, increasing interest in applying AI solutions to clinical decision-making, regulatory changes that were introduced during the COVID-19 pandemic and commercial growth of the telepharmacy market worldwide. The reported advantages of telepharmacy include increased access in rural areas, reducing pharmacy desertification, cost savings, increased medication adherence and better glycaemic and blood pressure control in chronic disease patients. Obstacles remain as the inconsistency in regulation and licensure across states and countries, technological and connectivity problems, lack of digital literacy among users, uncertain reimbursement policies, and lack of security of personal health information.

The possible trends in the future include the transition towards AI-based, personalized and hybrid telepharmacy models, facilitated by regulatory and reimbursement policies. Realizing this potential will require joint efforts in terms of infrastructural development, workforce education and policy harmonization.

KEYWORDS: Telepharmacy; Telehealth; Mobile Health; Pharmaceutical Care; Chronic Disease Management; Digital Health; Pharmacy Deserts; Artificial Intelligence; Pharmacist.

1. INTRODUCTION

According to the National Association of Boards of Pharmacy, telepharmacy involves the use of telecommunications and other forms of information technology to deliver pharmaceutical care to patients in remote locations [1]. The United States Department of Drug Enforcement Administration provided a very similar definition of telepharmacy by defining it as the provision of pharmacist care via a pharmacist at a remote location using various technologies to a patient at a distant dispensing point [2]. Telepharmacy has been developed as an offshoot of telemedicine in order to resolve the issues arising due to the pharmacist shortage and closing down of retail pharmacies in remote communities, where people had no option other than traveling miles to visit pharmacies, order medicines via mail-order, or receive no pharmacological supervision [1].

Over the last twenty years, the scope of telepharmacy has significantly expanded. In addition to remote order review, automated and technician-managed dispensing, tele-counselling, IV compounding, and self-service dispensing, the telepharmacy now includes mobile-health (mHealth) applications for managing chronic diseases [1]. The COVID-19 pandemic has acted as an accelerator in this respect, since it forced various regulators to relax rules and showed the feasibility of providing pharmaceutical care via telepharmacy [7]. After the acute period of the pandemic, pharmacists in many health systems are willing to adopt telepharmacy if the infrastructural, financial, and regulatory barriers are resolved [8].

This review will summarize recent literature on telepharmacy (scoping reviews, systematic review of reviews, retrospective multi-hospital service evaluation, policy cohort study at a state level, studies about the perception of pharmacists, and narrative reviews provided by various professional organizations and industry analysts) in order to highlight: (i) principal models of telepharmacy and their operational workflow; (ii) current trends shaping telepharmacy practices; (iii) clinical, economical, and access benefits shown by literature; (iv) ongoing barriers for implementation of telepharmacy; (v) regulations and policies in the area; and (vi) the future development of the field.

1.1 Rationale and Scope of this Review

Diabetes, hypertension, and other chronic diseases cause a significant part of the global morbidity; however, these diseases cannot be managed without continuous medical monitoring, proper medication, and patient education – services which are particularly hard to obtain in remote areas [5]. At the same time, there is an under-supply of pharmacists all over the world and emergence of so-called "pharmacy deserts" in which local access to pharmaceutical care becomes unavailable [1]. This review will focus on the following questions: (a) how have telepharmacy models adapted to these challenges; (b) what is the empirical evidence of the effects of telepharmacy on the health outcomes, behavior, economy, and access; and (c) what are barriers and regulatory issues related to

telepharmacy adoption in low and middle income countries. This review is not systematic but it relies heavily on recently published systematic and scoping reviews and a rigorous policy cohort study in the states.

2. METHODS

This narrative review brings together twenty sources that have been published between 1999 and 2026, including: a pioneering review of telemedicine and telepharmacy [2]; a general overview of contemporary practice, AI/ML advances, and regulation [4]; a retrospective cross-sectional analysis of a rural hub-and-spoke telepharmacy model [12]; a review of clinical benefits and challenges written by a pharmacist [1]; a review of models for management of chronic diseases among underserved populations [5]; a scoping review of telepharmacy implementation in response to the COVID-19 pandemic [7]; a scoping review of telepharmacy-enabled mHealth for diabetes [13]; a qualitative study of pharmacist perception regarding future scope of telepharmacy in New Zealand [9]; a literature review of telepharmacy current practice and future perspectives [3]; a narrative review of telepharmacy by the International Pharmaceutical Federation [14]; a review of opportunities, challenges, and future scope for practice in community pharmacies [15]; a cross-sectional study of pharmacist expectations of telepharmacy practice in Indonesian community pharmacies [8]; a systematic scoping review of telepharmacy practice in response to the COVID-19 pandemic [16]; a systematic review of systematic reviews of telehealth interventions in pharmacy practice [17]; a systematic review of RCTs of community pharmacist-led telehealth services [18]; a cohort study of the relationship between state telepharmacy policy and pharmacy desert in the United States [10]; a geospatial analysis of pharmacy deserts [11]; a study on the impact of reimbursement policy on adoption of telehealth in US hospitals [19]; a systematic review of telepharmacy field practice in response to the COVID-19 pandemic [6]; and a market analysis report on the global telepharmacy market [20].

Content has been thematically organized by telepharmacy models of care, current trends, benefits, barriers, regulatory/policy updates, and future directions. Whenever multiple sources provided similar information, preference is given to more recent or methodologically detailed one, although some older sources have been included to track development of the field. The table 1 below outlines the sources used for this review.

Table 1. Summary of the twenty sources underpinning this narrative review.

Sr. NO.	Source (author, year)	Design / focus	Setting
1	Poudel & Nissen, 2016	Pharmacist-perspective review of clinical benefits and challenges	Global
2	Angaran, 1999	Foundational review of telemedicine and telepharmacy	USA
3	Baldoni et al., 2019	Literature review of telepharmacy	Global

Sr. NO.	Source (author, year)	Design / focus	Setting
		status and perspectives	
4	Mishra et al., 2026	Narrative overview of telepharmacy practice, AI/ML trends, regulation	India
5	Banji et al., 2024	Review of telepharmacy models for chronic disease management	Global / underserved
6	Truong Van Dat et al., 2023	Systematic review of field application during COVID-19 (39 articles)	Multinational
7	Unni et al., 2021	Scoping review of telepharmacy during COVID-19 (33 articles)	Multinational
8	Fathorrahman et al., 2025	Cross-sectional study of pharmacist expectations	Indonesia
9	Saeed et al., 2024	Qualitative study of pharmacist perceptions	New Zealand
10	Urick et al., 2023	Cohort study of state telepharmacy policy and pharmacy deserts	USA (12 states)
11	Wittenauer et al., 2024	Geospatial study of pharmacy deserts	USA
12	Sankaranarayanan et al., 2014	Retrospective evaluation of remote pharmacist interventions	USA (Nebraska/Iowa)
13	Rumi et al., 2026	Scoping review of mHealth telepharmacy for diabetes (6 studies)	Malaysia, China, Japan, Pakistan, Thailand, Indonesia
14	Viegas et al., 2024	Narrative review by the International Pharmaceutical Federation	Global
15	Mane et al., 2025	Review of opportunities, challenges, and future scope	Global / community pharmacy
16	Rabbani et al., 2022	Systematic scoping review of COVID-19 implementation	Multinational
17	Chong et al., 2025	Systematic review of reviews (18 reviews) of telehealth in pharmacy	Singapore / global
18	Crilly & Kayyali, 2020	Systematic review of RCTs of community-pharmacist telehealth	Multinational
19	Gaziel-Yablowitz et al., 2021	Hospital telehealth adoption and reimbursement policy	USA
20	Global Market Insights, 2024	Industry market-size and growth analysis	Global

3. Concept and Operational Models of Telepharmacy

Typically, telepharmacy entails coordination of the work of a central or "hub" pharmacy and a remote or "spoke" pharmacy. In the former, a licensed pharmacist carries out his/her tasks, while in the latter, there is a technician, nurse, or an automated dispensing system [1]. A prescription is sent to a hub either electronically or using fax/image-capture technology; next, it is reviewed for doses, interactions, allergies and appropriateness by the remote pharmacist and after this preparation is done at the spoke. Finally, it goes through video/audio-based verification by the pharmacist [4]. Afterward, the counseling takes place via synchronous audio/video communication and the medicine is handed over to the patient [1]. The generalized workflow of telepharmacy operation is illustrated in Figure 1, with the added aspect of chronic disease follow-up becoming common in contemporary practice.

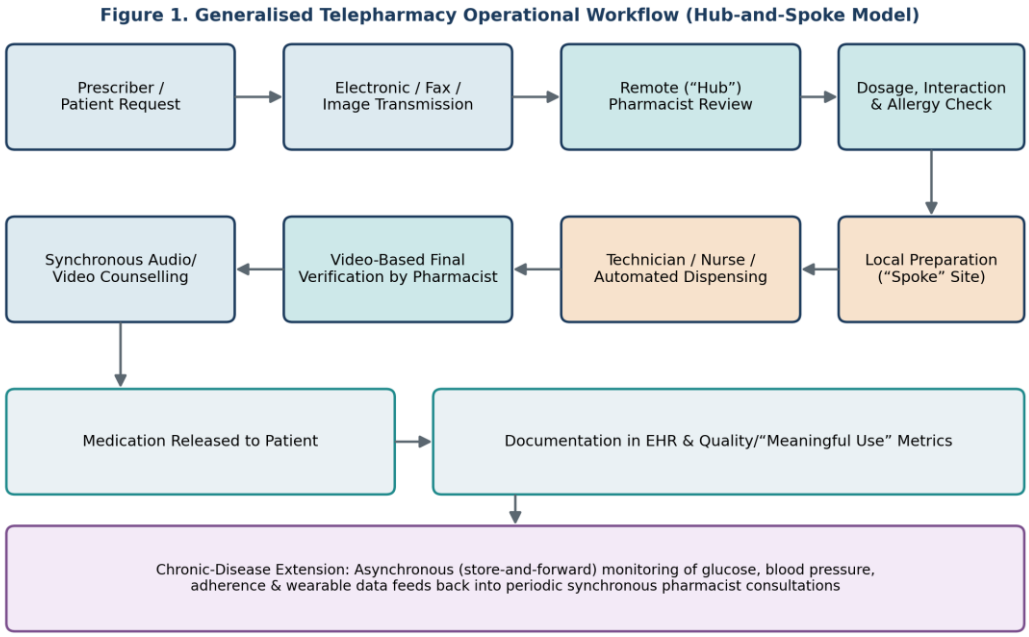


Figure 1. Generalized telepharmacy operational workflow (hub-and-spoke model).

Typically, there are four basic operational models: inpatient/remote order-entry review – a remote pharmacist checks medication orders for hospital inpatients and allows 24-hour coverage without the presence of an on-site pharmacist [1]; remote dispensing (retail, outpatient, or discharge) – a central pharmacist oversees a technician or automated dispensing machine working at a remote outlet [1]; IV admixture review – sterile compounding is checked remotely using an imaging workflow to reduce time spent by pharmacists in aseptic areas [4]; and remote patient counselling – live video or audio sessions for medication education, chronic disease monitoring and discharge counselling in various community, hospital, oncology, HIV and mental health settings [1].

Synchronous, asynchronous (store-and-forward), and hybrid models have also been identified for telepharmacy use in chronic diseases management. In synchronous telepharmacy, interaction is provided through video, phone, or live chat, and it is appropriate for acute or urgent counselling. Asynchronous telepharmacy transfers patient data to the remote pharmacist for future review and is well-suited for regular medication reviews and adherence monitoring. Hybrid models utilize synchronous interaction for initial assessment and asynchronous one for follow-up [5]. A systematic review of reviews including eighteen studies identified the grouping of telehealth-enabled pharmacist interventions into four main domains – teleconsultation, telecollaboration, telesupport, and telemonitoring and highlighted that telephone-based service remains the most popular mode of delivery, followed by mobile and web apps [17].

4. Current Trends

4.1 Expansion into chronic-disease management via mHealth

Pharmacist-led mHealth applications have already been identified for various chronic conditions, especially diabetes mellitus. According to a 2026 scoping review of six studies (632 patients) from Japan, Pakistan, Malaysia, Thailand, China, and Indonesia, the role of pharmacists included acting as digital coach, educational facilitator, clinical consultant, and therapeutic monitor in mobile applications, which resulted in lowering of HbA1c level by up to 0.79% along with improvement in blood pressure, medication adherence and quality of life [13]. The most common applications features are integration of electronic health record, counselling dashboard, medication reminder system, adherence and quality of life assessment tools, and lifestyle tracker [13]. There are family support and caregiver education models for elderly with type 2 diabetes and clinical pharmacist-led applications for insulin dose adjustment and adherence monitoring for gestational diabetes [5].

4.2 Artificial intelligence and predictive analytics

Overviews published in recent years noted the inclusion of AI agents and machine-learning algorithms into telepharmacy workflow for automatic medication adherence monitoring, real-time drug interactions screening, and medication reconciliation [4]. Hospital telepharmacy industry experts noted the additional layer of AI-based error checking and "zero trust" cybersecurity architecture added to remote-verification telepharmacy services along with AI-powered chatbots providing continuous patient support and adherence reminders [4]. Telepharmacy and AI and predictive analytics in combination were identified in reviews on the hospital pharmacist workforce shortage as complementary strategies for increasing efficiency of work when the supply of pharmacists cannot match the clinical demand [4]. Although not yet widespread in routine practice, this trend signifies the move of telepharmacy from the simple tool of remote dispensing to AI-integrated ecosystem, allowing proactive and data-driven consultation; in scoping review, the absence of personalization was identified as one of the limitations of current pharmacist-led digital interventions, and the application of programs personalized on the basis of behavioral data with the help of AI would bring better results than general applications [13].

4.3 Interoperability with electronic health records and wearables

Modern telepharmacy models often include EHRs connected with wearable health technology and allow continuous monitoring of physiological parameters like glucose, blood pressure, weight, and step counts and proactive pharmacist involvement [4]. The retrospective evaluation of hub-and-spoke rural hospital network showed that structured electronic recording of remote pharmacist interventions enables collection of quality-of-care measures and "meaningful use" incentives related to EHR adoption, and interventions in hospitals having both an on-site and a remote pharmacist are significantly more patient-centered and contain more actionable recommendations for medication management [12].

4.4 Pandemic-driven regulatory flexibility and its persistence

COVID-19 has triggered relaxation of privacy and licensing requirements in several nations allowing the use of commonly available videoconferencing platforms to enable pharmacists to conduct remote consultations, home medication delivery, and remote triaging [7]. In a recent scoping review of thirty-three articles, virtual consultations, home delivery, and patient education were the most frequently reported initiatives in the pandemic era while digital accessibility and lack of digital literacy were the most common barriers [7]. A more extensive systematic review of thirty-nine articles on telepharmacy field application has similarly shown that telepharmacy played an important role in solving problems of pharmacists' shortages and ensured the safety of medication delivery in disadvantaged areas during the pandemic era. Moreover, remote dispensing and counseling decreased the risks of infections [6]. Many of the regulatory changes adopted during the pandemic continue to be reviewed, and surveys of pharmacist perception from New Zealand show that the respondents support the need for permanent regulation reform, proper payment models, and staff training to ensure the continuity of telepharmacy after the pandemic is over; according to the same study, about 70% of pharmacists surveyed were community-based, and they mostly see telepharmacy as a convenient and useful tool for improving access to medications, but they still consider insufficient remuneration and legislation as barriers to telepharmacy [9]. Similar results have been observed in surveys of community pharmacists from Indonesia, whose patient expectations from digital pharmaceutical services increased greatly during and after the pandemic in relation to the patients with COVID-19, chronic diseases, HIV, cancer, cystic fibrosis, and anticoagulation therapy [8].

4.5 Evolving regulatory and supply-chain oversight

In the United States, the Drug Enforcement Administration announced an advance notice of proposed rulemaking in 2021 to consider federal rules related to the remote dispensing of controlled substances in the context of telepharmacy across state boundaries to ensure greater uniformity of regulations with expanding geographical network of telepharmacies [2]. Temporary DEA waivers adopted in 2023 and further extended have relaxed certain restrictions on remote dispensing of Schedule III-V medications in federally designated shortage areas in case of real-time pharmacist oversight [4]. At the same time, legislative efforts to increase the transparency and traceability of medications that are dispensed via telepharmacy networks were also reported [4]. International regulations in the area include directives of national pharmaceutical associations in Europe that allow for remote consultations by telephone, video, and email and electronic documentation in the UK that helps to manage online consultations and monitor medication deliveries **[13]** – thus, regulatory harmonization of telepharmacy continues to be developed unevenly across regions.

4.6 Measurable market growth and commercial expansion

Finally, apart from clinical and regulatory information, industry market analysis offers another perspective on the telepharmacy development. According to Global Market Insights Inc., the global telepharmacy market was valued at about USD 9.9 billion in 2023 and is expected to grow at CAGR

of about 10.4% through 2032 to reach the level of USD 23.6 billion, with software segment (which includes remote consulting platforms, prescription management system and monitoring) considered to be the fastest-growing segment [20]. The illustration of this growth trend is provided in Figure 2. Hospital pharmacies are reported as the major end-users of telepharmacy products, which can explain the early adoption of telepharmacy technology in inpatient settings and hospital network pharmacies mentioned elsewhere in the review [12].

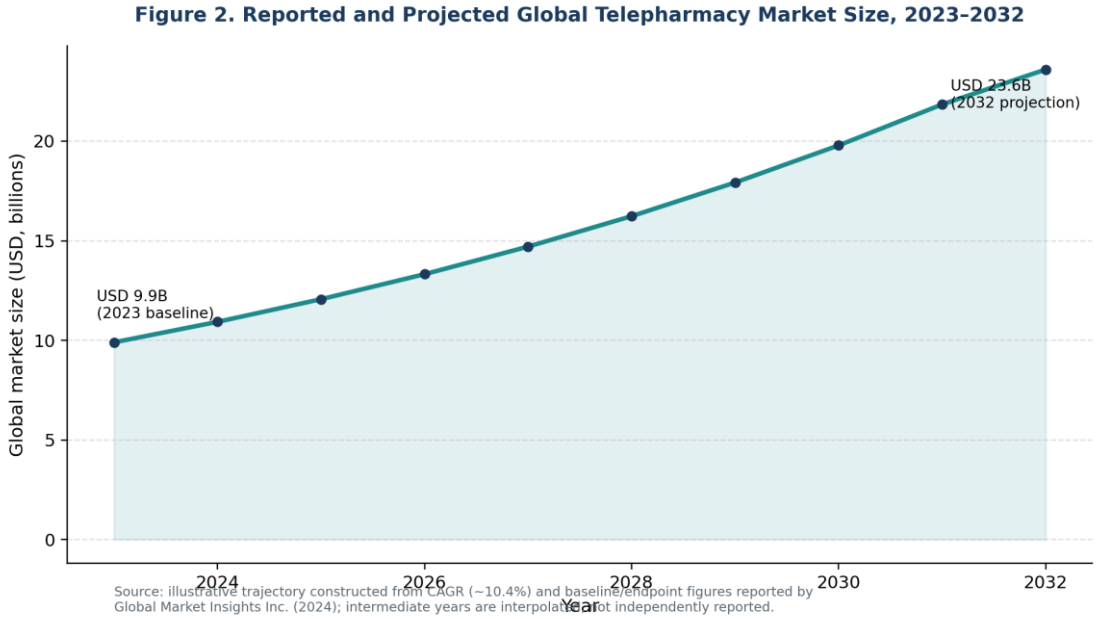


Figure 2. Projected size of the global telepharmacy market, 2023-2032, based on the reported baseline and endpoint figures and CAGR, Global Market Insights Inc. [20].

4.7 Growth of community, specialist, and cross-border applications

Besides hospital and chronic disease settings, telepharmacy technology is increasingly used in independent community pharmacies, employer and campus health services, senior living facilities, and clinics providing specialist patient services such as oncology, HIV, and hepatitis services [4]. Telepharmacy is currently being used to overcome language barriers in healthcare, as it connects the patients, including the sign-language speakers, with pharmacists who can provide interactive video counseling [4]. Rapid expansion of commercial platforms combining teleconsultation and e-pharmacy fulfillment reflects the transition to patient-centered, direct-to-consumer model of pharmaceutical care [4].

5. Case Examples and Regional Perspectives

Several commercial and institutional programs demonstrate practical application of these models. For example, in the USA, hub-and-spoke hospital networks such as Nebraska Medical Center's Remote Pharmaceutical Care Service deploy pharmacists working part-time and remotely via secure virtual-

private-network connection to carry out prospective order review, order entry and order verification for critical-access rural hospitals [12]. Platforms supplied by vendors make remote prescription verification and video counseling possible in order to enable rural communities access to pharmacists when it is impossible to keep a full-time pharmacist onsite [4]. In the field of consumer-oriented digital healthcare, telehealth platforms transfer prescriptions directly from remote consultations to the preferred pharmacy, while the service of pre-sorted and timed medication packaging makes it possible to communicate with pharmacists around the clock via phone, email, or chat [4]. E-pharmacy platforms in India combine medication delivery and teleconsultations in order to ensure that registered pharmacists review and verify prescriptions before dispensing them [4].

However, the regional adoption patterns of telepharmacy vary considerably. In the USA, a cohort study of twelve states revealed that states with less restrictive telepharmacy policies between 2016 and 2019 had a statistically significant reduction in pharmacy deserts and the population in them compared to control states; the emergence of a telepharmacy in a pharmacy desert meant that 37.5% of these areas ceased to meet the desert criterion the following year, while this rate was only 1.8% in the case of an absence of a telepharmacy opening in the area [10]. The geospatial study further specified the geography of pharmacy deserts in the USA and highlighted that telepharmacies were much more likely to open in regions of high medical need [11]. The rapid uptake of telepharmacy in New Zealand became pronounced in the context of the pandemic, however, pharmacists still face the problem of resource limitations, lack of compensation and legislative gaps that prevent the introduction of telepharmacy in everyday practices [9]. In Europe, the issue of remote consultations has usually been covered by directives from national pharmaceutical associations regarding the use of telephones, videos, and emails, while in the United Kingdom, electronic documentation systems were used to manage online consultations and medication delivery [13]. These regional differences show that technical capabilities cannot determine the speed of implementation of telepharmacy; regulation, reimbursement, and preparedness of the workforce become equally important factors [4].

6. Reported Benefits

The reviewed literature demonstrates the presence of several common themes of benefit. Access becomes available for rural, remote and underserved communities as well as specialized clinics and senior-living centers without the need to have an onsite pharmacist in all these places [1]; this conclusion is supported by the pharmacy desert cohort study, where the reduction of desert population after the adoption of telepharmacy policies has been demonstrated [10]. The clinical quality improves at hospitals that combine an onsite and remote pharmacist, providing significantly greater number of patient-centered and actionable interventions than at hospitals with remote pharmacist alone [12]. Improvements of chronic disease outcomes, including reductions of HbA1c by up to 0.79%, improvement of blood pressure and increased adherence to medications, have been demonstrated in diabetic cohorts receiving pharmacist-led mHealth interventions [5]. Potential cost savings have been

demonstrated in multihospital telepharmacy implementations and medication therapy management for elderly patients, while sustained growth of the telepharmacy software market serves as additional evidence of economic value [1]. High patient satisfaction and continuity of care have been reported in survey of telepharmacy consultations, especially in situations when travel to a distant pharmacy was required [1]. Moreover, work efficiency increases due to remote order entry review and IV admixture verification that reduces processing time and frees up pharmacist time for more complex tasks [1]. Figure 3 shows the breadth of literature support of different domains of telepharmacy benefits reported in the sources considered here.

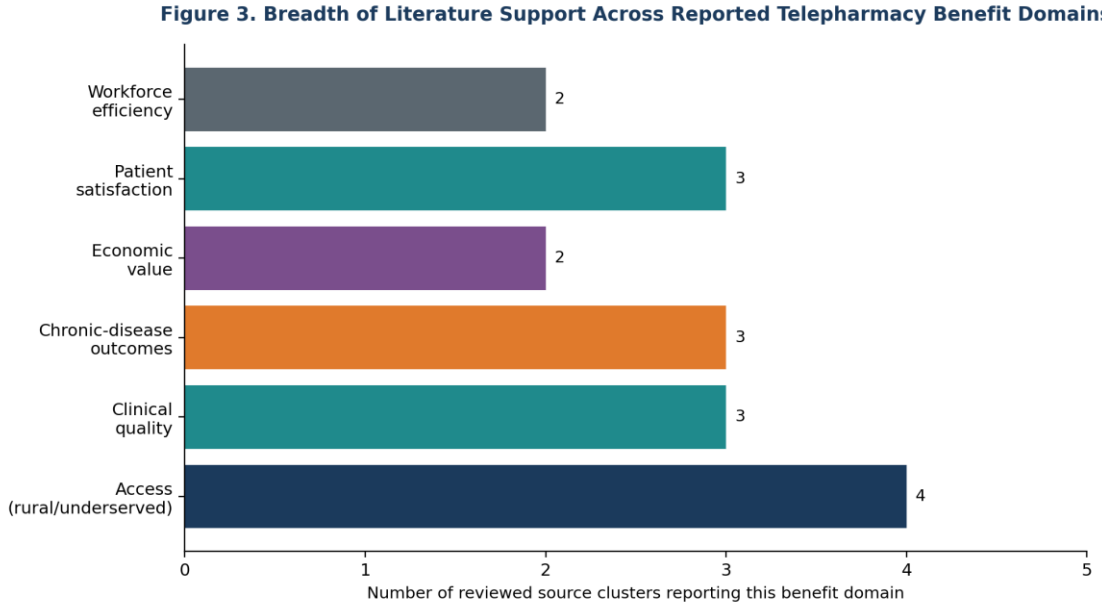


Figure 3. Breadth of literature support across reported telepharmacy benefit domains, based on the number of distinct source clusters in this review that report each domain.

These results suggest that telepharmacy provides benefits in several domains of access, clinical, economic, and workforce domains at the same time without tradeoffs among them, which explains its continuous development in spite of initial pandemic-driven growth [1].

7. Persistent Challenges and Barriers

- Regulatory barriers: there is a wide variability among different states and countries in terms of pharmacist licensure, technologies that are allowed, and frequency of on-site visits needed to set up a telepharmacy network in multiple states or countries [1].
- Start-up cost and technology: high initial costs for technological infrastructure, including hardware, software, video conferencing tools, and connectivity pose an important barrier to implementation in rural hospitals [1].
- Limited digital literacy: elderly patients, as well as those who have low digital literacy and poor internet connections, find it especially difficult to use telepharmacy tools [5].

- Privacy, security, and payment: transfer of sensitive personal information is a privacy issue, and the lack of reimbursement options varies significantly among payers [1].
- Long-term patient engagement: several mHealth studies show decreasing motivation of patients to continue using applications that do not provide real-time feedback [13].
- Workforce and training: pharmacists need to be professionally trained in matters of remote consultation etiquette, digital coaching skills and disaster preparedness [7].

Some of the above barriers are interconnected; specifically, mHealth services on a subscription basis that might address costs of developing these programs could exacerbate the socioeconomic inequality by favoring patients with more financial resources available. Language limitations inherent to some mobile apps could make their use inaccessible to certain populations who stand to benefit the most from using remote consultation [13]. Eligibility criteria in individual studies such as the exclusion of diabetic patients from family-support trials reduce the generalizability of benefits [13].

7.1 Technological infrastructure requirements

Successful telepharmacy implementation is based on the use of an effective technology stack. One of the main requirements is reliable high-speed Internet, as lack of it deteriorates the quality of audio and video, making clinical review and patient counseling impossible [5]. Since telepharmacy services involve the transfer of private health data, it is necessary to implement secure and encrypted communication channels which are compliant with the relevant data protection legislation. It is important to ensure that the system is well-protected through implementing access restrictions and adequate staff training in privacy issues [5]. Integration with electronic health records will allow accessing patient's treatment history and plan and therefore help with clinical decision-making and avoiding medication errors [5]. It is also necessary to provide appropriate hardware and software to pharmacists and patients alike, along with professional training, especially for elderly people and those who are not used to technology [5]. Additional platform design considerations include the collaboration of the pharmacist, prescribing physician and care manager in the case of telepharmacy services and the use of hybrid video engines that offer fallback network capabilities for patients calling from locations with poor or non-existent connectivity [19].

8. Regulatory and Reimbursement Landscape

Regulatory and reimbursement policy has proven to be the decisive and quantifiable force behind telepharmacy adoption rather than a mere constraint. In the US, around half of the states have specific telepharmacy statutes whereas others depend either on general pharmacy practice regulation or have more restrictive legislation related to remote dispensing and supervision [4]. The cohort study by Urick et al. provides one of the most clear causal-style evidences of the impact of policy design on access outcome, as it showed that less restrictive legislation was followed by a statistically significant decrease in the number and population of pharmacy deserts, especially in the cases when a new

telepharmacy appeared in a location where there was previously a lack of pharmaceutical services [10]. This claim is corroborated by geospatial mapping that revealed disproportionate impact of pharmacy deserts on socially vulnerable populations [11], thus reinforcing the equity argument for the regulatory reform.

Reimbursement policy operates as another lever. Hospital-level telehealth adoption evaluations conducted in the US demonstrated that state-level reimbursement policy ceased being an independent predictor of telehealth adoption in the context of other variables, indicating that reimbursement barriers are gradually diminishing to align with telehealth reimbursement regulations as they evolve [19]. At the federal level, updates to the Medicare Part D requirements for medication therapy management recognized video-based comprehensive medication review as clinically appropriate, increasing the scope of services and eligible population [4]. Controlled substance dispensing continues to be a separate and more conservative regulatory area as the waiver of limited remote dispensing of Schedule III-V substances in designated shortage areas is renewed gradually without making it permanent due to concerns about potential substance diversion [4]. Internationally, the trend is identical in direction if not in mechanisms: pandemic-related flexibilities in regulation of telepharmacy services in New Zealand, Europe and parts of Asia persist in their updated form, but the need for statutory change, remuneration schemes and telepharmacy competence recognition in training is still being called for by pharmacists in multiple jurisdictions [8].

9. DISCUSSION

Based on the evidence outlined above, the concept of telepharmacy appears to have evolved significantly beyond the initial notion of temporary relief from pharmacist shortage in rural areas. Its demonstrated advantages span not only acute inpatient order review but chronic disease co-management and specialized counselling; the technology underlying the practice has moved from basic fax-telephone systems to EHRs, wearable devices, and AI systems; finally, the economic implications of the practice have grown into a multi-billion global market [4]. On the other hand, the continuing problems with regulatory fragmentation, reimbursement issues, and low digital literacy across almost all of the reviewed sources suggest that those are the structural problems, rather than transitional ones, unlikely to disappear without policy changes [1]. Finally, the uniformity of benefits and barriers reported by pharmacists in the reviewed literature suggests that the key problems with telepharmacy implementation are organizational and regulatory rather than technological despite ongoing technology developments [8].

Second, there appears to be a trend in the reviewed literature towards the redefinition of the role of a pharmacist under the new conditions of telepharmacy practice. Unlike in the traditional dispensary practice, pharmacists in the reviewed studies were functioning not as dispensers but as digital coaches, educators, consultants, therapy monitors, and educators of families and caregivers of the patients [13]. The implication of this trend is a need to reconsider the issue of professional identity,

scope-of-practice legislation, and pharmacy curriculum as the competencies, required for the new tasks, are not always covered by the current pharmacy programs [7].

Third, there is a tension in the reviewed literature between the need for standardization and the need for local adaptation. Standardized protocols are essential for consistent and legally defensible practice; however, at the same time, the success of most interventions for chronic diseases was determined by the presence of the locally adapted aspects, like applications in local language or family-oriented treatment approaches in certain cultural context [1]. Fourth, the addition of policy and market analysis sources to the analysis in this paper makes apparent the convergence of policy and economics in relation to the clinical practice – loosening the telepharmacy regulations results in reduction of pharmacy deserts, and commercial market of telepharmacy products is growing at double-digit compound annual growth rate [10]. Finally, the economic evidence, while supported by the market data, is thin on the issue of cost-effectiveness analysis; only a few reviewed clinical sources report formal cost-effectiveness modelling or reimbursement models for sustainable per-encounter cost structure [1].

10. Future Scope

Based on the current trends, there are several directions that are likely to define the next phase of telepharmacy development. They are outlined in Figure 4 below as the indicative roadmap of further development.

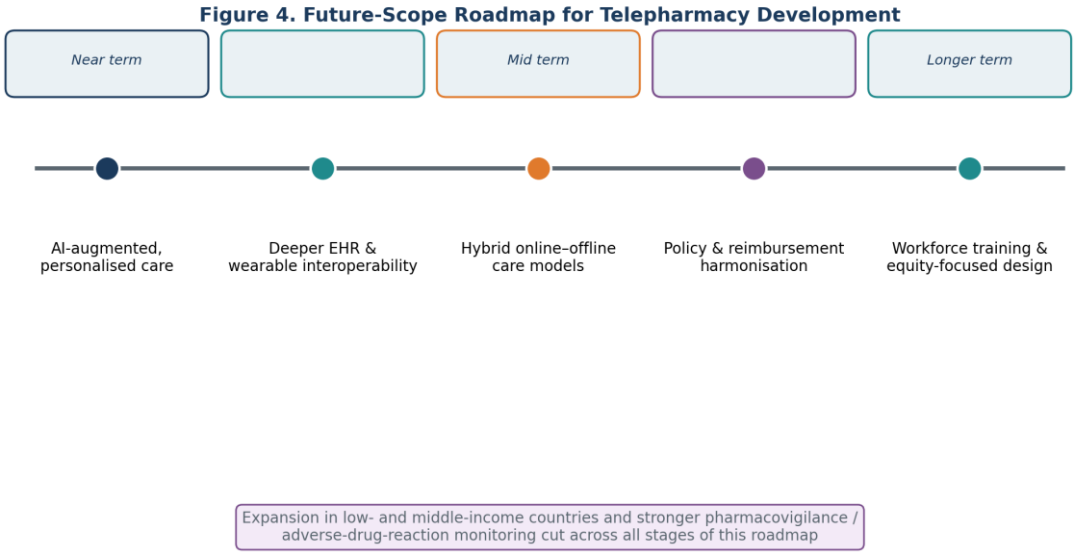


Figure 4. Indicative future-scope roadmap for telepharmacy development, synthesised from the reviewed literature [1].

- Personalized care facilitated by AI and the pharmacist: future platforms will leverage AI to analyze behavioral data and will have a pharmacist involved to personalize medication and lifestyles advice since current telepharmacy solutions often lack personalization [4].
- Enhanced interoperability: the continuation of the connection of telepharmacy platforms with EHR, wearables, and hospital information systems will allow for proactive and data-driven consultations as opposed to reactive dispensing [4].
- The hybrid online-offline service model: the combination of synchronous video consultations and asynchronous store-and-forward monitoring will be an emerging practice in the management of chronic conditions, offering a compromise between convenience and regular visits [5].
- Harmonization of regulations and changes in reimbursement policies: the continuing call for the harmonization of telepharmacy regulations, the adoption of certain regulations during pandemics as well as changes in reimbursement policies will play a key role in making telepharmacy more accessible due to previous connections found between liberalization of telepharmacy and pharmacy deserts [1].
- Workforce training: a new trend may include continuing education programs and the certification of pharmacists in telepharmacy skills [7].
- Equity considerations for design: future development needs to take into account the issues of digital literacy, language barriers, and costs incurred from subscription fees, all of which could increase health inequalities due to the digital divide, especially in LAMIC [5].
- Scaling up in LAMIC: mHealth interventions by pharmacists provide an appropriate avenue to addressing the issue of inaccessible medical treatment as a result of lack of sufficient physicians and other barriers in accessing specialized medical services in LAMIC [13].
- Drug safety and monitoring: intelligent telehealth platforms are anticipated to have increasing applications in the area of detecting adverse drug reactions and drug safety monitoring in telepharmacy platforms [13].
- Commercial expansion: if compound annual growth rates remain constant, the global telepharmacy software and services market is forecast to more than double by the early 2030s, leading to innovations by vendors in remote dispensing kiosks, video platform, and e-pharmacy fulfillment [20].

11. Limitations of the Current Evidence Base

Several limitations exist with respect to the evidence informing this review. First, most of the included evidence is not systematic reviews but scoping reviews. Moreover, there is very little primary studies included in each scoping review, for instance, six studies included in one scoping review focused on diabetes [13]. Some primary studies included clinically significant exclusion criteria including insulin-treated patients [13]. Second, there is significant publication bias in the sense that the literature included is from a small number of health care systems that may not necessarily generalize to others with different conditions of regulations, economics, and infrastructure [9]. Strongest evidence of the

causal link between policies and health is from one U.S. cohort study spanning over 12 states in three years, and despite being robust it may not be applicable in other jurisdictions with different regulations [10]. Figures regarding market size in the telepharmacy industry are derived from forecasts of proprietary companies and cannot be treated as peer-reviewed scientific evidence [20]. Finally, most outcome data is of short- to medium-term follow-ups with very few of long-term results [7].

12. CONCLUSION

The evolution of telepharmacy as a response to rural pharmacist shortages has made way for a broader, more advanced, and commercially viable integration into disease management and pharmaceutical care. There is now consistent evidence of better access, including fewer pharmacy deserts following policy liberalisation, as well as increased patient satisfaction and health outcomes, especially where pharmacists are integrated into multidisciplinary mHealth-based healthcare teams. However, uneven regulation, cost, lack of digital literacy, and reimbursement uncertainty remain barriers to the widespread adoption of telepharmacy. The future of telepharmacy will be driven by personalisation through AI, greater interoperability with EHRs and wearable devices, hybrid delivery approaches, market expansion, and policy reform – factors which, collectively, may lead to telepharmacy being the standard rather than an add-on delivery channel for pharmaceutical care.

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