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Telepharmacy in Digital Pharmaceutical Care: Economic Effects, Access, and Service Continuity

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Abstract. Purpose. This study examines the economic effects of telepharmacy, its contribution to access, and its role in maintaining pharmaceutical services, with particular attention to Ukraine under wartime disruption. Methods. A targeted integrative literature review and thematic synthesis combined systematic reviews, economic evaluations, primary studies, institutional documents and official Ukrainian sources. Searches were updated on 16 September 2026, and evidence was interpreted by study design, evaluation perspective and reported limitations. Results. Economic findings vary by perspective. Four of six economic evaluations reviewed by De Guzman et al. reported lower costs, although provider costs could increase when pharmacist time was reimbursed. Patient savings were most evident where telephone or video care avoided travel and time costs. Clinical evidence supports selected benefits for adherence and blood pressure, but equity remains poorly measured. During disruption, pharmacists can continue counseling, medication review, monitoring and advice on medicine availability through digital communication. Ukraine already has a national e-prescription and reimbursement system, and current law requires online pharmacies to offer pharmacist consultation during medicine ordering. Conclusions. Telepharmacy can reduce selected access costs and support service continuity, but its economic value depends on staffing, reimbursement, digital inclusion and the extent to which remote contacts replace existing resource use.

Keywords: telepharmacy; e-prescription; cost-effectiveness; digital divide; continuity of care; Ukraine

1. Introduction

Digital health has moved selected consultations, monitoring activities and prescription processes beyond traditional clinical settings. In pharmacy, this includes professional services delivered when the pharmacist and patient are in different locations. The World Health Organization (WHO, 2025) emphasizes that digital health must be integrated with financial, organizational, human and technological resources. The International Pharmaceutical Federation (FIP, 2023) similarly describes digital pharmacy as a combination of professional services and technologies, including telepharmacy, e-prescribing, electronic records, remote monitoring and digitally supported collaboration.

Telemedicine covers remote medical care in general; this study concerns care provided at a distance by pharmacists. E-prescribing, e-dispensation and online sales of medicines are examined in Section 3.1 as systems and retail functions on which telepharmacy may rely. Recent work in Global Prosperity has linked telemedicine to economic development and

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regional resilience in Ukraine (Khilukha & Riabkov, 2026; Lipych et al., 2026). The present study narrows the focus to pharmacist-led care and asks how it changes costs, access and continuity of pharmaceutical services.

Evidence on telepharmacy expanded rapidly during and after the COVID-19 pandemic. Reviews cover outpatient, hospital and community services and report effects on access, continuity, medication management and patient convenience, although service models and outcomes remain heterogeneous (Dat et al., 2023; Snoswell et al., 2025; Chong et al., 2025). Economic evidence is especially limited and varies with the perspective and cost components used (De Guzman et al., 2024). Access also depends on digital capability, affordability and the organization of local care. During supply disruptions, pharmacist communication can help patients respond to medicine shortages, but stock availability remains determined by manufacturing, procurement, warehousing and distribution (WHO, 2023).

Economic effects are assessed from the perspectives of patients, providers, payers or health systems, and society. Travel, time and productivity losses are specific cost components within these perspectives. Access is interpreted through the patient-centered framework of Levesque et al. (2013) and the distinction between potential and realized access developed by Aday and Andersen (1974). Household costs, regional inequality in access and continuity of essential services link these questions to economic welfare.

The study aims to examine telepharmacy in digital pharmaceutical care, focusing on economic effects, access and continuity of services, and to interpret the findings in the context of Ukraine's e-prescription system under wartime constraints. Three questions guide the analysis: what economic effects are reported from patient, provider, health-system and societal perspectives; under what conditions can telepharmacy improve access to pharmaceutical care and medicines; and which pharmaceutical functions can be maintained when geographic, logistical or crisis-related disruptions limit face-to-face care?

2. Research Design and Sources

The study uses a targeted integrative literature review with thematic synthesis, following the five-stage logic described by Whittemore and Knafl (2005): problem identification, literature search, data evaluation, data analysis and presentation. The analytical focus was defined in advance around three domains: economic effects by evaluation perspective, access mechanisms and barriers, and continuity of pharmaceutical functions during disruption. Heterogeneous designs and outcomes were synthesized narratively.

Searches were last updated on 16 September 2026. PubMed/MEDLINE was the principal bibliographic database, supplemented by targeted searches of publisher platforms, backward citation checking from recent systematic reviews, and direct searches of WHO, FIP, the European Commission/eHealth Network and official Ukrainian legal and eHealth portals. The core PubMed search combined terms for the service (telepharmacy OR "remote pharmaceutical care" OR "remote pharmacy services") with terms for the outcomes of interest (economic* OR cost* OR cost-effectiveness OR access* OR equity OR continuity OR resilience OR "digital divide"). Additional searches used "digital pharmaceutical care", e-prescribing, e-dispensation, Ukraine, medicine access, distance trade and war-related service disruption. Literature from 2022-2026 was prioritized; earlier sources were retained for established conceptual frameworks, review methodology and economic evidence not replaced by newer studies.

Eligibility required direct relevance to pharmacist-led care delivered at a distance, pharmaceutical access, economic evaluation or continuity of pharmaceutical services. Systematic reviews, economic evaluations, randomized trials and observational or descriptive service studies were eligible. Telemedicine studies without a pharmacist-led component, papers limited to online medicine retail, and purely technical reports without an economic, access or continuity outcome were excluded from the core synthesis. Institutional, legal and administrative sources supplied definitions, regulatory status, national system data and

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wartime access evidence. Screening and extraction used a single-reviewer workflow. A structured matrix recorded country, service, population, design, economic perspective, cost components, access or continuity outcomes, principal findings and major limitations. Interpretive weight reflected design, comparator structure, sample size, evaluation perspective and completeness of cost and outcome reporting. Economic studies were read with reference to the Consolidated Health Economic Evaluation Reporting Standards (CHEERS) 2022 (Husereau et al., 2022), including perspective, time horizon, cost categories, outcomes and uncertainty. Institutional and legal sources were checked for provenance, currency, jurisdiction and directness. The final reference set comprised 30 sources; seven studies or reviews with directly reported economic, access or continuity outcomes are summarized in Table 2. Ukrainian regulatory statements were updated to September 2026.

3. Results

3.1. Telepharmacy within digital pharmaceutical care

Sugita et al. (2026) define telepharmacy as pharmacist-led care delivered at a distance by telephone, video or digital platforms. FIP (2023) groups telepharmacy with e-prescribing, electronic records and remote monitoring within digital pharmacy practice. The common feature is professional pharmaceutical care provided when the pharmacist and patient are not in the same location.

An e-prescription records and transmits a medication order; e-dispensation records the dispensing process; an online pharmacy is a retail and distribution channel. Remote monitoring and medication-management tools may form part of telepharmacy when pharmacists use them to assess or manage medicine-related needs. Studies of e-prescribing show that interoperability, information quality, workflow design, technical support and user acceptance affect pharmacy practice (Hareem et al., 2023). The eHealth Network's Release 3.1 guideline likewise treats ePrescription and eDispensation as interoperable health-data exchange functions (eHealth Network, 2024).

Telepharmacy depends on secure patient identification, reliable communication, access to relevant medication and clinical information, interoperable records and clear professional responsibility. These conditions allow the pharmacist to use information obtained through digital contact in routine care.

Table 1. Digital pharmaceutical services, professional functions and relevance to Ukraine

Service	Core professional function	Economic/access relevance	Ukraine: status as of September 2026
Telepharmacy	Pharmacist-led counseling, medication review or management, monitoring and coordination at a distance	Can reduce travel and time burden and extend access to pharmacist expertise	National e-prescription and reimbursement systems support distributed care; online pharmacies must offer a pharmacist consultation option during medicine ordering
e-Prescription	Digital creation and transmission of prescription data; supports dispensing verification	Reduces paper-related administrative work and supports distributed access	By 8 September 2026 >120 million e-prescriptions had been issued and almost 100 million dispensed; the Ministry reported the payment mix as 95.7% reimbursement, 4.1% patient-funded and 0.2% local-budget programs
e-Dispensation	Electronic processing and	Supports traceability,	Integrated with the national eHealth and reimbursement

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	recording of dispensing	reimbursement and continuity of prescription data	system
Online pharmacy / distance retail	Remote ordering, sale and delivery of medicines under retail rules	Changes distribution convenience and access to retail services	Permitted under Article 19 as amended by Law No. 904-IX and detailed by Resolution No. 929; online sellers must offer pharmacist consultation, and prescription-only delivery requires an e-prescription under Ministry of Health rules; Law No. 2469-IX takes effect from 1 January 2027
Remote medication monitoring / management	Follow-up of medicine use, adherence, symptoms or medicine-related problems when pharmacist-led	Can reduce selected visits and support continuity for chronic patients	Can be delivered through existing digital systems; financing depends on the pharmacy or provider service arrangement

Note. The Ukraine column draws on the Ministry of Health of Ukraine (2026), Cabinet of Ministers Resolution No. 929, Law No. 904-IX, Law No. 2469-IX and the 2026 reimbursement framework.

3.2. Economic effects of telepharmacy

Economic claims about telepharmacy depend on which costs are counted and who bears them. De Guzman et al. (2024) identified six economic evaluations of non-cancer telepharmacy services: four reported lower costs than usual care and two reported cost-effectiveness against a stated threshold. One cost-minimization study found higher community-pharmacy cost, mainly because pharmacist time was reimbursed. The six studies therefore show that telepharmacy can shift costs among patients, providers and payers as travel, productivity, staff time, technology and reimbursement are included or excluded. In the broader telemedicine literature, Bell-Aldeghi et al. (2023) reviewed 156 evaluations; 73.7% reported an efficient intervention, but favorable findings were less frequent in cost-effectiveness analyses and larger randomized trials.

Table 2. Selected evidence on economic, access and continuity effects of telepharmacy

Study / country	Service and population	Design / perspective	Domain and main finding	Key limitation / quality comment
De Guzman et al. (2024) / multi-country	Non-cancer telepharmacy services	Systematic review of 6 economic evaluations; mainly provider/system perspectives	Four evaluations reported lower cost and two reported cost-effectiveness at a stated threshold; one cost-minimization study within the review found higher community-pharmacy cost because of pharmacist work/reimbursement	Systematic review, but only six heterogeneous economic evaluations, all published in 2006-2019; perspectives and included costs varied
Lertsinudom et al. (2023) / Thailand	Video telepharmacy for adults with	Prospective descriptive study; patient perspective	Travel represented 67.7% of direct non-medical costs; modeled saving 6,511 ± 4,996 Thai baht	Single-center descriptive study (80 patients) with a modeled usual-care

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	epilepsy		per year (54.75% of usual-care cost in the authors' analysis)	comparison and high variability; the estimate illustrates travel and time costs rather than a transportable effect size
Mozu et al. (2023) / Ghana	Phone-based telepharmacy added to usual hypertension care	Randomized controlled trial; clinical/access orientation	Six-month randomized trial reported better adherence and blood-pressure control with pharmacist telephone follow-up; the intervention group's controlled blood pressure increased from 39.0% to 66.1%	Clinical randomized controlled trial rather than an economic evaluation; small two-hospital sample and single-country context limit transferability
Morillo-Verdugo et al. (2023) / Spain	Coordinated telematic pharmaceutical care linking hospital and rural pharmacies	Prospective multicenter cohort; 4 hospitals, 29 rural pharmacies; 48-week follow-up; patient/service perspective	Coordinated hospital-rural telepharmacy improved patient experience and satisfaction and increased pharmaceutical interventions adapted to patient needs	No concurrent control group; outcomes centered on patient experience and satisfaction; framed as a proof of concept
Snoswell et al. (2025) / multi-country	Synchronous telephone/video telepharmacy for adult outpatients	Systematic review; multiple service perspectives	Broad evidence of feasible remote pharmacy models with variable clinical, service and user outcomes	Systematic review with broad service coverage; substantial model and outcome heterogeneity limits pooled economic inference
Sugita et al. (2026) / multi-country	Telepharmacy for ambulatory patients with non-communicable diseases	Cochrane review; clinical outcomes with limited economic evidence	21 trials (5,440 participants): low-certainty evidence for adherence (standardized mean difference 0.32) and lower systolic blood pressure (mean difference -6.82 mmHg); moderate-certainty evidence of little or no effect on HbA1c; economic endpoints in two trials, not pooled	Cochrane review; no mortality or telepharmacy-attributable adverse-event data, and equity-related evidence was lacking
Cen et al. (2022) / 17 countries	eHealth-enabled pharmaceutical care	Systematic review; service continuity	Continuity of care, fewer hospital visits and improved work accuracy or efficiency were the	Systematic review of heterogeneous interventions, many descriptive and

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	during COVID-19	perspective	most frequently reported benefits across 43 studies in 17 countries	pandemic-specific

Note. The table presents selected studies and the main design limitation relevant to interpretation.

From the patient perspective, the clearest source of savings is avoided travel and the time required for a physical visit. Lertsinudom et al. (2023) studied 80 adults with epilepsy at one center in Thailand. Travel accounted for 67.7% of direct non-medical costs, and the authors estimated annual savings of 6,511 ± 4,996 Thai baht (THB), equivalent to 54.75% of usual-care costs in their model. The standard deviation was close to the mean and the comparison with usual care was modeled rather than observed. Even with these limitations, the study shows why evaluations that omit travel, accommodation and lost working time can miss a substantial part of the patient burden.

At provider level, staff time, digital platforms, integration, training, technical support, data protection and quality assurance can offset operational savings. Snoswell et al. (2025) found wide variation in synchronous telepharmacy models, and Dat et al. (2023) reported services designed to address pharmacist shortages and maintain care where face-to-face access was constrained. Costs depend on scale and on whether telephone or video contacts replace, duplicate or add to existing visits. A service that adds technology and additional staff contacts without displacing other resource use can improve care and still increase provider expenditure.

For payers and health systems, the budget effect depends on service substitution and the cost of delivering telepharmacy. In the 2026 Cochrane review, economic endpoints were collected in only two trials and were not pooled: one indicated savings and the other found no difference in total or disease-related costs (Sugita et al., 2026). A cost-effective service can still raise total spending when the health gains justify the additional cost.

Household effects are most apparent where travel and time costs are high, whereas evidence on productivity and caregiver time remains limited. Public-budget effects are mixed across six heterogeneous economic evaluations, and current evidence does not support a single estimate of fiscal impact. Economic value therefore depends on the resources displaced by telepharmacy and on the perspective from which those resources are valued.

3.3. Access to pharmaceutical care and medicines

Levesque et al. (2013) conceptualize access through the relationship between service characteristics and people's abilities to perceive need, seek care, reach services, pay and engage. Telepharmacy can reduce travel and simplify access to specialized pharmacist expertise, particularly when repeated follow-up is needed. Use still depends on connectivity, suitable devices, digital literacy, trust and effective communication. Aday and Andersen (1974) distinguish potential access created by service availability from realized access expressed in actual use.

Dat et al. (2023) found telepharmacy applications directed at pharmacist shortages and geographically underserved populations. In Spain, Morillo-Verdugo et al. (2023) linked hospital pharmaceutical care with 29 rural pharmacies across four hospitals. Alfian et al. (2023) found that digital pharmaceutical-care interventions in low- and middle-income countries were strongly shaped by implementation context and by the ability of patients and providers to use the technology. These findings support integration with existing pharmacy services, especially where specialist pharmacist access is uneven.

In a six-month randomized trial in Ghana involving 118 patients, pharmacist telephone follow-up added to usual care was associated with better adherence and blood-pressure control (Mozu et al., 2023). At synthesis level, Sugita et al. (2026) included 21 trials with 5,440 participants. Low-certainty evidence suggested improved medication adherence (standardized mean difference 0.32, 95% confidence interval 0.10 to 0.55; 10 studies) and

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lower systolic blood pressure (mean difference -6.82 mmHg, 95% confidence interval -12.16 to -1.48; 5 studies), while moderate-certainty evidence indicated little or no effect on glycated hemoglobin (HbA1c). The included studies reported neither mortality nor adverse events attributable to telepharmacy, and equity outcomes were largely absent. Chong et al. (2025) likewise called for stronger comparative evidence on effectiveness, patient preferences and costs.

Lack of a suitable device, stable internet or digital skills can cancel gains from shorter travel and easier scheduling. E-prescribing studies also report workflow and information problems when systems are poorly integrated or technical support is weak (Hareem et al., 2023). Telepharmacy is therefore most likely to expand use among people whose main barriers are distance, mobility or local scarcity of pharmacist expertise; patients facing severe digital exclusion, high medicine prices or a need for physical examination and dispensing may benefit less.

3.4. Continuity of pharmaceutical services under disruption

During COVID-19, pharmacists used digital tools for education, consultation, monitoring and case management across hospital, community and specialist settings. Cen et al. (2022) found continuity of care, fewer hospital visits and improved work accuracy or efficiency among the most frequently reported benefits across 43 studies in 17 countries. FIP (2023) reports that the pandemic accelerated adoption of digital pharmacy services.

WHO's analysis of access to medicines during COVID-19 traces disruptions across manufacturing, procurement, importation, last-mile delivery, availability and affordability (WHO, 2023). During such disruptions, telepharmacy can provide counseling, medication review, prescription-related communication, monitoring, information about medicine availability, advice on permitted substitutes, referral and professional coordination. These activities help patients and professionals adapt to shortages, but they do not replenish medicine stocks or repair broken distribution routes.

During disruption, pharmacists can continue counseling, medication review and advice on available medicines by telephone or video. Their usefulness depends on links with local pharmacies, the e-prescription system and current stock information.

3.5. Ukraine: digital pharmaceutical infrastructure under wartime constraints

Ukraine combines a national e-prescription system with wartime disruption of transport, medicine supply and household incomes. By 8 September 2026, the Ministry of Health reported more than 120 million e-prescriptions issued and almost 100 million dispensed; more than 98 million prescriptions had been dispensed under reimbursement, covering 211 million packs of medicines. The Ministry described the payment mix of e-prescriptions as 95.7% reimbursement, 4.1% patient-funded and 0.2% local-budget programs (Ministry of Health of Ukraine, 2026). The e-prescription system records and transmits medication orders, while pharmacist consultation is a separate professional service.

Wartime disruption increases the value of continuity in chronic treatment. WHO documented infrastructure damage, logistics problems and workforce shortages in the first months of the full-scale invasion (WHO Regional Office for Europe, 2022). In the April 2025 household survey, 82% of sampled households faced problems obtaining medicines and 8% were unable to obtain medicines they needed. Among sampled households with a member with a chronic condition who sought treatment, 72% experienced at least one problem accessing health care; 59% identified the cost of medicines as the main challenge (WHO Regional Office for Europe, 2025). These findings show that digital contact operates within a setting where affordability and physical availability remain major constraints.

Financial protection was already weak before the full-scale invasion. WHO estimated that 17% of Ukrainian households experienced catastrophic out-of-pocket health spending in 2021, with medicines a principal driver among poorer households (WHO Regional Office for Europe, 2023). Telepharmacy can reduce non-medical costs such as travel and time, maintain

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pharmacist contact after displacement and help patients navigate availability and permitted substitutes. It does not reduce the price of medicines themselves.

As of September 2026, electronic retail trade in medicines is permitted under Article 19 of the current Law of Ukraine 'On Medicinal Products' No. 123/96-VR, as amended by Law No. 904-IX, and is regulated in detail by the Licensing Conditions approved by Cabinet of Ministers Resolution No. 929 (Verkhovna Rada of Ukraine, 2020; Cabinet of Ministers of Ukraine, 2016). The 2020 amendment requires online pharmacies to offer a pharmacist consultation option during medicine ordering and permits the use of medical information systems connected to the national eHealth system. Electronic sale and delivery of prescription-only medicines is prohibited except when they are dispensed against an electronic prescription under rules established by the Ministry of Health. The replacement Law No. 2469-IX, including dedicated provisions on electronic retail trade, is scheduled to take effect on 1 January 2027 subject to specified later-entry provisions (Verkhovna Rada of Ukraine, 2022).

The 2026 Program of Medical Guarantees reimburses listed medicines and medical devices through reimbursement contracts (Cabinet of Ministers of Ukraine, 2025). The resolution does not establish a separate national fee for pharmacist-led telepharmacy. Payment for pharmacist time therefore remains tied to existing pharmacy or provider arrangements unless a local contract or service model specifies otherwise. International experience indicates that wider implementation would also require pharmacist access to relevant clinical information, clear responsibility for medication management, interoperable records, service-quality standards and measures to reduce digital exclusion.

4. Discussion

Reimbursement can determine whether telepharmacy lowers costs for patients while raising provider expenditure. The economic evaluations reviewed by De Guzman et al. (2024) include a community-pharmacy model in which payment for pharmacist time increased provider cost, alongside studies reporting lower cost or cost-effectiveness. The broader telemedicine literature points in the same direction: favorable efficiency findings were less common under stronger economic designs (Bell-Aldeghi et al., 2023). Payment rules therefore influence both adoption and who ultimately bears the cost of pharmacist time.

Access gains are likely to be uneven. Distance, limited mobility and scarcity of pharmacist expertise favor telepharmacy, whereas poor connectivity, limited digital skills, communication barriers and medicine affordability reduce its usefulness. The Levesque et al. (2013) framework helps explain why availability of a digital service does not guarantee use. Because the 2026 Cochrane review found little equity-related evidence, future evaluations should report outcomes separately for rural, displaced and low-income patients rather than relying on average adoption rates.

For wartime Ukraine, telephone or video contact is most relevant to continuity for displaced patients and people with chronic conditions who cannot easily reach specialist pharmaceutical care. The national e-prescription system reduces paperwork and supports distributed dispensing, but effective telepharmacy also depends on local pharmacy capacity, current information on stock, secure access to patient data and clear responsibility for follow-up.

Policy evaluation should therefore examine whether telepharmacy contacts replace or add to face-to-face visits, how pharmacist time is paid, and how any travel or time savings are distributed across population groups. Interoperability and secure data access affect the quality of decisions, while digital inclusion determines who can use the service. For Ukraine, these questions are more informative than adoption rates alone.

The review has several limitations. Searches were centered on PubMed/MEDLINE with targeted supplementary searching, and screening and extraction used a single-reviewer workflow. Terminology, populations, service models and outcomes varied across studies;

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economic evaluations remain few, societal-perspective evidence is especially limited, and many studies were conducted during or soon after COVID-19. Quality weighting was narrative and design-based, and the academic literature reviewed was primarily English-language. The Ukrainian analysis relies heavily on administrative, legal and institutional sources. Household and fiscal effects of telepharmacy for Ukraine were not estimated. Prospective studies are needed to examine reimbursement, equity, service substitution and implementation in routine pharmacy practice.

5. Conclusions

Telepharmacy's economic value depends on which resources it replaces and who bears the costs. Available studies support lower non-medical access costs for some patients, particularly where travel and time burdens are high, while provider and payer effects vary with staffing, technology and payment arrangements. Evidence also supports selected benefits for medication adherence and blood-pressure control, although equity remains largely unmeasured. Ukraine already combines a national e-prescription system, medicine reimbursement and legal requirements for pharmacist consultation in online pharmacy. The next step is to evaluate how pharmacist-led services should be paid, whether they replace or add to existing visits, and how benefits and costs are distributed across rural, displaced and lower-income groups.

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