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A Systematic Review: *Factors Influencing Patient Utilization of Telepharmacy Services*

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Abstract **The advancement of telepharmacy has significantly transformed the delivery of pharmaceutical services, particularly in regions with limited healthcare access. This systematic review aims to identify key factors influencing patients' utilization of telepharmacy services. A comprehensive literature search was conducted across PubMed, ScienceDirect, and Google Scholar, following PRISMA guidelines. Inclusion and exclusion criteria were applied to select relevant studies published between 2015 and 2025. Thematic synthesis of five eligible studies revealed five key factors affecting telepharmacy adoption: perceived practicality, efficiency, education level and age, knowledge, and trust. These factors align with the Technology Acceptance Model (TAM), highlighting the roles of perceived usefulness, ease of use, and psychological readiness. Strengthening digital literacy, infrastructure, and trust-building interventions is essential to enhance telepharmacy utilization, especially in developing countries like Indonesia. The findings provide valuable insights for designing patient-centered telepharmacy policies and services.**

Key words: **Telepharmacy, utilization factors, patient acceptance, Technology Acceptance Model, healthcare access.**

I. INTRODUCTION

The rapid advancement of digital technology in the past decade has driven profound transformations in global healthcare systems, reshaping how care is delivered and accessed across diverse populations. One of the most notable innovations in this context is telepharmacy, a form of remote pharmacy service that enables pharmacists to provide pharmaceutical care such as drug information, medication counseling, and therapeutic monitoring without requiring face-to-face interaction. These services are facilitated through various information and communication technologies, including mobile applications, video conferencing, and instant messaging platforms [1] [2]. As a technology-driven approach, telepharmacy not only breaks down geographic barriers but also promotes the continuity and flexibility of pharmaceutical services, thus supporting a more patient-centered model of care.

Globally, telepharmacy has emerged as an essential strategy to expand access to pharmaceutical services, especially in rural or underserved areas and during emergency situations such as natural disasters or pandemics [3] [4]. Its relevance became even more prominent during the COVID-19 pandemic, which necessitated the adoption of remote healthcare modalities to minimize physical contact and reduce infection risk [5]. Evidence has shown that telepharmacy can improve medication adherence, reduce the incidence of adverse drug events, enhance chronic disease management, and deliver significant time and cost efficiencies for both patients and healthcare systems [6] [7]. These findings underscore the potential of telepharmacy not merely as an emergency response solution but as a sustainable and integral component of comprehensive, integrated healthcare delivery systems.

Recent studies have further demonstrated the ability of telepharmacy to improve clinical outcomes through personalized, continuous patient engagement. For instance, remote pharmacy consultations significantly decrease medication errors by facilitating frequent follow-ups and tailored patient education [6]. Telepharmacy interventions have contributed to improved control of chronic conditions such as diabetes and hypertension, while also strengthening patient empowerment and self-management capacities [5]. Moreover, high levels of patient satisfaction have been consistently reported, attributed to the convenience, accessibility, and perceived quality of care [7]. Telepharmacy offers a promising solution to address health disparities in low-resource settings by bridging service gaps and reaching patients who would otherwise remain underserved [3].

Despite these clear benefits, the adoption and utilization of telepharmacy remain suboptimal, particularly in developing countries such as Indonesia. Various systemic and individual-level barriers persist. Limited digital literacy, infrastructural deficiencies, inconsistent internet connectivity, and the high cost of devices represent significant structural impediments to widespread implementation [8] [9]. Additionally,

psychological and socio-cultural factors including trust in pharmacists and technology, health beliefs, social influence, and perceptions of service quality profoundly shape patients' readiness to engage with telepharmacy services[10] [11]. In Indonesia, studies suggest that awareness of telepharmacy remains low among the general population, and many patients continue to prefer in-person interactions due to perceived relational and emotional benefits.

To better understand these adoption challenges and guide effective interventions, the Technology Acceptance Model (TAM) offers a robust theoretical framework. Initially developed by Davis (1989), TAM posits that two primary constructs—perceived usefulness and perceived ease of use—determine individuals' attitudes and intentions toward adopting new technologies. In the context of healthcare, TAM has evolved to incorporate additional factors such as trust, social influence, perceived risk, and facilitating conditions, reflecting the complex interplay of cognitive, emotional, and environmental determinants [13]. Specifically in telepharmacy, understanding how these factors influence patient engagement is critical to informing policy design, service delivery models, and educational strategies.

In Indonesia, research focusing on patient perspectives toward telepharmacy is still limited, and most existing studies have emphasized the views of pharmacists or health professionals rather than end-users. Addressing this gap is crucial for achieving equitable and sustainable telepharmacy implementation. Understanding patient-level determinants such as demographic characteristics, knowledge, technological confidence, and trust as well as system-level enablers such as infrastructure availability, service accessibility, and regulatory support can provide valuable insights for targeted policy and practice improvements.

Thus, this systematic review aims to synthesize recent evidence regarding the factors influencing patients' decisions to use telepharmacy services, by identifying and classifying individual, psychological, and systemic determinants that shape their acceptance and utilization behavior. This review seeks to explore how demographic factors, psychological readiness, perceptions of technology, and infrastructural elements interact and converge to impact patient engagement with telepharmacy. By comprehensively mapping these factors, the study intends to refine the theoretical underpinnings of TAM within the context of pharmaceutical care, while also offering practical insights for the design of patient-centered telepharmacy strategies in Indonesia and similar settings. Ultimately, this review aspires to support the development of evidence-based policies, enhance patient empowerment and satisfaction, and promote the advancement of modern pharmacy practice in an increasingly digital healthcare landscape.

II. Methodology

A. Data Search Strategy

The literature search strategy was conducted systematically through three major scientific databases, namely PubMed, ScienceDirect, and Google Scholar, selected for their extensive coverage and credibility in providing both national and international scientific publications. To ensure comprehensive and reproducible search results, the search utilized a structured combination of keywords following standard systematic review guidelines. The keywords applied were: ('Effectiveness' OR 'Usage' OR 'Factors') AND ('Telepharmacy' OR 'Telepharmacy Technology') AND ('Community' OR 'Society'). This keyword arrangement was designed to capture all relevant articles addressing the influencing factors of telepharmacy utilization within diverse community settings, both at the national and global levels.

B. Inclusion and Exclusion Criteria

Inclusion criteria were established to ensure the relevance and quality of the publications analyzed. Included articles were scientific publications published between 2015 and 2025. Only primary studies that were quantitative or qualitative in nature and explicitly addressed telepharmacy utilization factors were included in the analysis. In addition, the selected articles had to be in Indonesian or English and published in national or international journals. Inclusion and exclusion criteria were defined to ensure the quality and relevance of the selected studies. The inclusion criteria comprised: (1) original research articles published between 2015 and 2025; (2) articles written in either Indonesian or English; (3) studies that explicitly discussed factors influencing patient utilization of telepharmacy services; (4) studies employing either quantitative, qualitative, or mixed-method designs; (5) studies published in national or international peer-reviewed journals with accessible full-text. Exclusion criteria included: (1) review articles, editorials, conference abstracts, or opinion pieces; (2) studies unrelated to telepharmacy utilization factors; (3) studies that did not provide sufficient methodological details or outcome data; (4) articles not available in full-text format. The application of these criteria is summarized in Table I, providing a transparent overview of the included and excluded studies to enhance the methodological rigor and replicability of this review.

C. Study Selection Procedure

Study selection was conducted in stages through a screening process that included reviewing the title, abstract and full text of each article. The aim of this process was to ensure that each selected publication was appropriate to the focus of the systematic review. The selection steps were transparently displayed using a PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) diagram, which depicts the flow of study identification, screening, eligibility, and inclusion in flowchart form.

D. Data Analysis Procedure

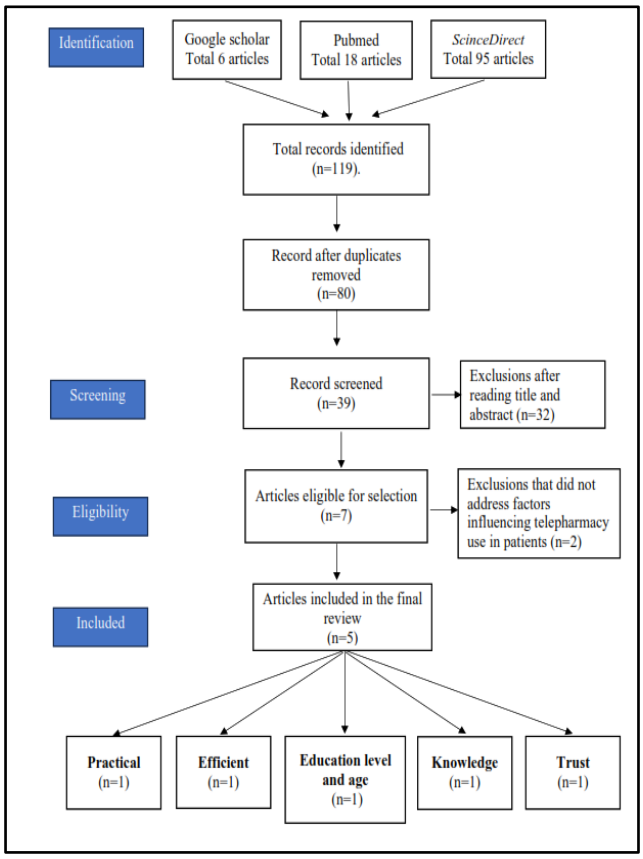

Fig. 1. Prism Diagram of Search and Screening Results

The PRISMA flow diagram presented above illustrates the systematic process of literature search, screening, eligibility assessment, and final inclusion of studies in this review. During the identification stage, a comprehensive search was conducted across three major databases, namely Google Scholar, PubMed, and ScienceDirect. A total of 119 records were retrieved, consisting of 6 articles from Google Scholar, 18 articles from PubMed, and 95 articles from ScienceDirect.

Following the initial search, a duplicate removal process was carried out to ensure that only unique records were considered for further analysis. After removing duplicates, a total of 80 records remained and were subsequently prepared for screening. In the screening stage, the titles and abstracts of these 80 articles were evaluated for relevance based on the predefined eligibility criteria. As a result, 41 articles were excluded—32 articles were excluded after title and abstract screening due to misalignment with the research objectives, while the remaining 39 articles proceeded to the full-text assessment phase.

During the eligibility assessment, full-text versions of the remaining 7 articles were carefully reviewed. Two of these articles were excluded because they did not explicitly address factors influencing patients' utilization of telepharmacy services, which was the primary focus of this systematic review. Consequently, 5 articles satisfied all inclusion criteria and were retained for in-depth analysis and synthesis.

At the inclusion stage, a thematic synthesis was performed on the selected studies, resulting in the identification of five key factors associated with telepharmacy adoption among patients. These factors were: practicality, efficiency, education level and age, knowledge, and trust. It is important to note that not all factors emerged collectively from each article; rather, each factor was derived from at least one of the included studies based on the specific themes addressed in their findings. This structured and transparent process ensured that the data included in this review were relevant, reliable, and provided a multidimensional understanding of the determinants of telepharmacy utilization among patient populations. This structured review process ensured transparency, consistency, and methodological rigor in selecting evidence relevant to the research focus.

A more detailed explanation regarding how each of the five key factors emerged from the reviewed articles is essential to ensure the transparency and validity of this systematic review. The identification of these factors was carried out through a thematic analysis of the findings and discussions presented in each article that met the inclusion criteria. The factors of practicality and efficiency were consistently highlighted in two studies, [14] [15]. Both studies explicitly reported that ease of access, time efficiency, and service flexibility were the main reasons patients preferred using telepharmacy services. These findings strongly support the construct of perceived usefulness within the Technology Acceptance Model (TAM), which emphasizes that practical benefits play a significant role in driving the adoption of health technologies.

The demographic factor, specifically education level and age [17]. This research demonstrated that individuals with higher educational attainment and those in younger age groups showed a greater likelihood of accepting and utilizing telepharmacy services. This is in line with previous studies suggesting that digital literacy and prior technological exposure significantly influence perceived ease of use, which in turn shapes intention and actual behavior in the use of digital health services [17].

The factor of knowledge was specifically derived from the study which revealed that the level of public knowledge regarding telepharmacy is closely associated with the utilization of such services. Limited knowledge was identified as a major barrier, particularly among individuals who had not previously been exposed to telepharmacy information. These findings underscore the importance of structured educational interventions to improve public awareness and understanding, thereby supporting the broader adoption of telepharmacy services [18].

The psychological aspect of trust also emerged as a critical determinant in the reviewed literature. This factor was clearly addressed in the study which was conducted in Thailand. The study demonstrated that patients' trust in the

telepharmacy platform, the system itself, and the competence of pharmacists played a significant role in shaping their attitudes and intentions to use the service. Concerns regarding the security of personal health data, reliability of remote consultations, and the quality of information provided were identified as key considerations for patients when deciding to engage with telepharmacy services [21].

It is important to emphasize that these five factors were not universally explored in every included article. Instead, each factor was identified based on the specific focus and empirical evidence provided by individual studies. This approach resulted in a cumulative and multidimensional understanding of the factors influencing telepharmacy utilization among patients. The thematic mapping process employed in this review ensured that the analysis remained grounded in empirical data while providing a clear, systematic, and transparent explanation of how each factor emerged. Consequently, the findings of this review contribute to a comprehensive understanding of telepharmacy adoption and offer valuable insights for the development of targeted interventions to increase service utilization in diverse healthcare settings.

III. Theoretical Framework

The Technology Acceptance Model (TAM) is one of the most widely used models to explain and predict individual acceptance of information technology. The model was first developed by Davis (1989) as an adaptation of the Theory of Reasoned Action (TRA), and has been widely implemented in various fields, including digital health services such as telemedicine and telepharmacy [22].

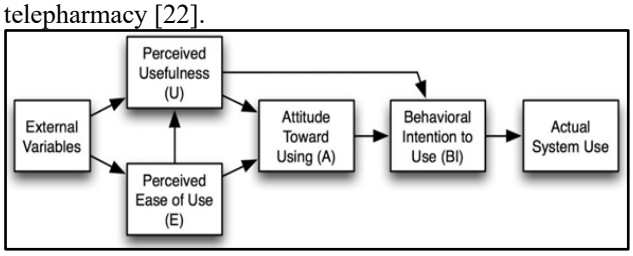

Fig. 2. Basic Model of Technology Acceptance Model (TAM)

TAM states that there are two main constructs that influence user acceptance of technology, namely perceived usefulness (PU) and perceived ease of use (PEOU). PU refers to the extent to which a person believes that using a system will improve their performance, while PEOU refers to the extent to which a person believes that the system is easy to use [12]. These two constructs will form an attitude towards the use of technology, which then affects behavioral intention to use, and finally leads to actual system use behavior.

In the context of telepharmacy, perceived usefulness can be interpreted as the extent to which patients feel that the use of technology-based pharmacy services can help meet their treatment needs efficiently and effectively. Meanwhile, perceived ease of use can include the ease of accessing the platform, navigating the application, and interacting with pharmacists online. Additional factors such as trust i n the system and pharmacist, digital literacy, and social support are also often added as external variables in the development of extended TAM models [23] [8].

IV. Results

A total of five primary studies conducted between 2022 and 2024 were included in this systematic review. These studies were carried out in various regions, including Indonesia (Sumatera Utara, Bali, Bandung, and national-level samples) and Thailand. All included studies applied cross-sectional survey designs using structured questionnaires to explore factors influencing patients' decisions to use telepharmacy services. The quality of the studies was assessed using a standardized appraisal tool, with scores ranging from 7 to 9 out of a maximum of 9, indicating moderate to high methodological rigor.

Data from these studies were systematically extracted and analyzed using thematic synthesis. This process involved coding quantitative survey responses and qualitative open-ended answers to identify recurring patterns and key themes. Variables related to patient perceptions, demographic characteristics, service accessibility, and psychosocial considerations were examined and then grouped into higher-order categories to facilitate cross-study comparison.

From this analysis, five main factors consistently emerged as influencing patients' decisions to use telepharmacy services:

1. Perceived practicality

   Reported in four of the five studies, practicality referred to patients' appreciation of the ability to receive pharmaceutical services without the need to visit a pharmacy physically. This factor included elements such as reduced travel time, minimized physical effort, and increased flexibility in receiving consultations and medication counseling, especially relevant during pandemic-related restrictions or in geographically remote areas.
2. Efficiency

   Three studies highlighted efficiency as a significant factor, particularly in terms of time savings and financial benefits. Patients expressed positive responses regarding reduced waiting times, lower transportation costs, and the ability to multitask or continue daily activities while receiving pharmaceutical care.
3. Education level and age

   Demographic characteristics, especially education level and age, were identified as determinants of patients' readiness and confidence in using telepharmacy services. Higher education levels were associated with better digital literacy, while younger patients generally reported greater comfort with digital health platforms. One study conducted in

Bandung specifically quantified this, indicating that over 70% of respondents with higher education levels felt confident using telepharmacy services [17].

4. Knowledge

Patient knowledge, including awareness and understanding of telepharmacy services, was emphasized in two studies. The studies reported that a lack of information regarding telepharmacy availability and procedures was a barrier to utilization. Conversely, patients who had been exposed to educational campaigns or received information from healthcare providers demonstrated higher uptake.

5. Trust

Trust was reported as a major psychological factor in two studies, involving patients' confidence in both the pharmacists and the digital system. This included trust in the accuracy of medication information, the security of personal health data, and the perceived credibility of virtual consultations.

In addition to these main factors, several studies documented supporting data on infrastructural and contextual variables, such as internet connectivity, availability of telepharmacy services in certain regions, and user interface design. Although these were not the central focus of all studies, they were noted as additional considerations affecting accessibility and user experience.

Moreover, all studies included in this review predominantly used descriptive statistical analyses to report frequencies and percentages of patient responses, and did not involve longitudinal or inferential methods to establish causal relationships. For instance, included a large sample size of 420 respondents in Thailand and presented a high level of internal consistency in their survey instrument (Cronbach's alpha >0.80), which strengthened the reliability of the findings [21]. Meanwhile, surveyed 172 respondents across Indonesia and reported high response rates (above 85%), indicating strong representativeness within the sampled population [16].

A summary of the characteristics of the included studies, sample sizes, and identified influencing factors is presented in Table 1.

TABLE I. SUMMARY OF ARTICLES USED IN THE ANALYSIS

No	Author (Year)	Country	Sample	Identified Influencing Factors	Quality Score
1	Leelang and Kerdprathum., 2024	Thailand	420 respondents	Beliefs which have the greatest direct influence on the decision to use telepharmacy.	9/9 (high)
2	Arisia *et al*., 2023	Bali, Indonesia	100 respondents	Knowledge.	7/9 (moderate)
3	Retnowati *et al*, 2024	Sumatera Utara, Indonesia	100 respondents	Practical and efficient.	7/9 (moderate)
4	Firdanthi *et al*, 2023	Indonesia	172 respondents	Practical.	7/9 (moderate)
5	Tjiptoatmadja and Alfian, 2022	Bandung, Indonesia	203 respondents	Age and education level.	7/9 (moderate)

V. DISCUSSION

The findings of this systematic review highlight five primary factors perceived practicality, service efficiency, demographic characteristics (education level and age), knowledge level, and trust that significantly influence patients' decisions to utilize telepharmacy services. These results align with the core components of the Technology Acceptance Model (TAM), particularly perceived usefulness and perceived ease of use, while also reflecting broader social, cultural, and infrastructural dynamics.

Perceived practicality and efficiency consistently emerged as dominant drivers across the included studies. The ability to consult pharmacists remotely, avoid long travel distances, and minimize waiting times represents tangible benefits that are highly valued by patients, particularly in regions with limited access to healthcare facilities [15] [14]. This is consistent with international findings; for example, a study in Saudi Arabia demonstrated that telepharmacy significantly improved medication adherence and reduced missed doses by removing logistical barriers [24]. Additionally, during the COVID-19 pandemic, the flexibility and practicality of telepharmacy became critical for ensuring continuity of pharmaceutical care amidst movement restrictions [5] [6].

The role of demographic factors, particularly age and education level, further underscores the importance of digital literacy in telepharmacy adoption. Younger patients and those with higher educational attainment demonstrated greater readiness to engage with digital health platforms, reflecting better adaptation to technology [17]. A recent study in Malaysia found similar patterns, where digital health services were more readily accepted among younger, urban populations [19]. These findings emphasize the need for targeted digital literacy programs to reduce disparities among older adults and rural communities, aligning with global calls to strengthen equitable digital health transformation [20].

Knowledge about telepharmacy services, including understanding their purpose, processes, and safety protocols, was also a critical factor influencing adoption. Inadequate knowledge often led to skepticism and reluctance to use telepharmacy services [18]. This resonates with findings from other digital health contexts; for instance, in Pakistan, lack of awareness was identified as a significant barrier to telehealth utilization, highlighting the necessity of community-based educational interventions [25].

Trust, both in the technology and in pharmacists, was another crucial psychological determinant. Concerns regarding data security, the accuracy of remote consultations, and overall credibility can deter patients from utilizing telepharmacy, despite acknowledging its practical benefits [21]. Trust has been widely recognized as a fundamental component in the adoption of digital health technologies [13] [7]. Moreover, culturally rooted values and prior experiences with healthcare systems can significantly shape trust dynamics, making localized communication strategies essential for promoting telepharmacy acceptance.

Beyond individual-level factors, this review also brings attention to systemic and infrastructural variables that indirectly influence adoption. Issues such as internet accessibility, technological infrastructure, and policy support are critical for enabling telepharmacy services, especially in geographically dispersed or resource-limited areas [8] [9]. For example, in Indonesia, disparities in internet connectivity across provinces create unequal opportunities for telepharmacy access, limiting its potential as a nationwide solution. Integration of telepharmacy into national health policies, as well as alignment with ongoing digital transformation strategies outlined by the Ministry of Health, is necessary to address these systemic challenges and support sustainable scale-up.

From a theoretical perspective, while TAM provides a robust foundation for explaining individual acceptance of telepharmacy, this review suggests that additional constructs such as trust, social influence, and facilitating conditions should be incorporated to reflect the complexity of real-world adoption behaviors. The Unified Theory of Acceptance and Use of Technology (UTAUT), which extends TAM by integrating these constructs, offers a more comprehensive framework and may be better suited for future studies examining telepharmacy in diverse cultural and infrastructural contexts [23].

The implications of these findings are significant for healthcare policymakers, practitioners, and technology developers. For telepharmacy to effectively enhance pharmaceutical care in Indonesia and similar settings, a multidimensional approach is needed. This includes:

1. Strengthening community outreach and public education to improve awareness and digital literacy
2. Training pharmacists in digital communication skills and virtual care protocols
3. Ensuring reliable and equitable technological infrastructure
4. Developing clear regulatory frameworks to support quality assurance and data protection.

By addressing these components in an integrated manner, telepharmacy can fulfill its potential as a transformative model for expanding access to pharmaceutical services, improving medication adherence, and enhancing patient-centered care delivery.

Nevertheless, this review has several limitations that must be acknowledged. The predominance of cross-sectional and descriptive study designs restricts the ability to infer causality or understand long-term behavioral trends. In addition, variations in study methodologies, definitions of constructs (e.g., perceived usefulness, trust), and measurement tools challenge the generalizability of the findings and preclude meta-analytic synthesis. The exclusive focus on peer-reviewed literature also introduces potential publication bias, as grey literature and unpublished program evaluations were not included despite potentially containing valuable insights on implementation challenges and user experiences.

Future research should prioritize longitudinal and experimental study designs to explore causal relationships and assess the effectiveness of interventions aimed at improving telepharmacy uptake. Additionally, mixed-methods approaches combining quantitative and qualitative data can provide richer, more nuanced understandings of patient experiences, preferences, and context-specific barriers. Expanding the scope of inquiry to include perspectives from diverse stakeholder groups such as family caregivers, community health workers, and policymakers may also yield important insights for shaping more inclusive and context-adapted telepharmacy models.

In conclusion, this review reinforces the relevance of technology acceptance theories in explaining patient adoption of telepharmacy, while simultaneously emphasizing the critical roles of contextual and systemic factors. By leveraging these insights to inform policy and practice, stakeholders can work collaboratively to advance equitable and effective telepharmacy services, supporting the broader goals of digital health transformation and universal health coverage.

VI. Conclusion

Based on the synthesis of five included studies, this review identified and confirmed five main factors influencing patients' adoption of telepharmacy: perceived practicality, service efficiency, demographic characteristics (age and education level), knowledge and digital literacy, and trust in the service and pharmacy personnel. These factors are strongly aligned with the Technology Acceptance Model (TAM), particularly the constructs of perceived usefulness and perceived ease of use, while also emphasizing the significant roles of trust and contextual external factors such as digital infrastructure and policy support.

Perceived practicality and efficiency were found to be the strongest drivers, as patients valued the ability to access pharmaceutical care without time and travel constraints. This aligns with global findings indicating that logistical advantages are central to patients' acceptance of telehealth services. Knowledge level and digital literacy acted as important enablers by enhancing patients' confidence in using digital platforms, while demographic factors shaped readiness and capacity to adopt new technologies. Trust emerged as a critical psychological factor, influencing patients' attitudes and intentions through perceived safety, credibility, and reliability of telepharmacy services.

These findings suggest that in order to increase the adoption of telepharmacy services in Indonesia, a multifaceted strategy is required. This should include community education initiatives to improve public knowledge and digital literacy, targeted training for pharmacists to strengthen virtual communication skills and build patient trust, equitable expansion of technological infrastructure to address regional disparities, and the development of integrated policies that support safe and accessible telepharmacy practices at the national level.

Furthermore, to deepen the understanding of these relationships, future research should employ longitudinal designs and mixed-method approaches, allowing for exploration of causal pathways and long-term patient behavior changes. Inclusion of diverse patient demographics and context-specific variables will also be critical to inform policy and practice.

In conclusion, this review highlights the significant potential of telepharmacy to improve access and quality of pharmaceutical care in Indonesia, provided that strategic efforts are undertaken to address technological, educational, and socio-psychological barriers. By strengthening these foundational elements, telepharmacy can become a sustainable component of patient-centered and digitally enabled health services in the future.

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