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Barriers, Facilitators and Stakeholder Roles in Telepharmacy Implementation in Malaysia: A Consolidated Framework for Implementation Research (CFIR)-Informed Qualitative Study

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Original Article

Barriers, Facilitators and Stakeholder Roles in Telepharmacy Implementation in Malaysia: A Consolidated Framework for Implementation Research (CFIR)-Informed Qualitative Study

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Keywords: telepharmacy, consolidated framework for implementation research, stakeholder perspectives, qualitative research, Malaysia

Running Title : Stakeholder Roles in Telepharmacy

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Abstract

Objective: Telepharmacy has emerged as a promising digital health approach to improve access to pharmaceutical care, particularly for underserved and remote populations. However, its implementation remains complex and context-dependent, requiring a clear understanding of stakeholder roles, system readiness, and implementation conditions. This study explored the stakeholder initiatives, barriers, and facilitators influencing telepharmacy implementation in Malaysia using the Consolidated Framework for Implementation Research (CFIR).

Material and Methods: A qualitative study was conducted using semi-structured interviews with ten key stakeholders, including academic and industrial pharmacists in Malaysia. Interviews were carried out via Google Meet between April and June 2023. Data were transcribed verbatim and analysed thematically using NVivo software. Identified themes were mapped to CFIR domains to support structured interpretation.

Results: Stakeholders highlighted key implementation initiatives, including telepharmacy education, research collaborations, and pilot service models. Major barriers included inadequate digital infrastructure, regulatory uncertainty, and limited organisational readiness. Facilitators and improvement strategies focused on strengthening technological support, enhancing workforce competencies, fostering interprofessional collaboration, and establishing enabling policies. These findings demonstrate the interaction of multilevel factors across CFIR domains, influencing telepharmacy adoption.

Conclusion: Telepharmacy implementation in Malaysia is shaped by interconnected challenges at individual, organisational, and policy levels, particularly digital literacy gaps, regulatory uncertainty, and financial constraints. Regulatory clarity and sustainable reimbursement models were identified as critical for long-term adoption. Addressing these factors through coordinated policy development, workforce training, and infrastructure strengthening is essential to support the sustainable integration of telepharmacy into routine healthcare delivery and improve equitable access to pharmaceutical care.

Keywords: telepharmacy, consolidated framework for implementation research, stakeholder perspectives, qualitative research, Malaysia

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Introduction

Telepharmacy refers to the delivery of pharmaceutical care through geographically separated areas and patients utilizing information and communication technology (ICT)[1]. Telepharmacy includes a broad range of activities and services, including drug review and monitoring, dispensing, medication therapy management, patient assessment, counseling, clinical consultation, and drug information[2]. By utilizing telepharmacy, pharmacists can provide pharmaceutical care services to people living in remote areas who have limited access to healthcare[3]. This innovation bridges geographic gaps, supporting health equity in underserved communities. Importantly, telepharmacy eliminates the need for face-to-face interactions, facilitating convenient and efficient care delivery[1].

Despite the growing interest in telepharmacy, its implementation remains complex and context-dependent. Successful implementation is influenced not only by technological readiness but also by organizational structures, regulatory environments, individual competencies, and stakeholder engagement[4]. Understanding these interacting factors is essential to ensure sustainable and effective telepharmacy services.

A key factor in addressing these issues is understanding the role of stakeholders. A stakeholder is defined as an individual or group that can affect an issue or is affected by an issue[5]. According to Freeman (1994), an organization or initiative shall be managed in stakeholder interests in the community. Incorporating stakeholders' perspectives enhances organizational responsibility by addressing challenges and other issues[5].

To address this complexity, the implementation of science frameworks offers structured approaches to examine how healthcare innovations are adopted in real-world settings. The CFIR provides a comprehensive lens by integrating five key domains: intervention characteristics, outer setting, inner setting, characteristics of individuals, and implementation process[6]. CFIR has been widely applied in telehealth and digital health research to identify multilevel barriers and facilitators influencing implementation outcomes[6].

In addition, Stakeholder Theory emphasizes that successful implementation depends on addressing the interests, influence, and roles of key stakeholders[7]. In telepharmacy, academic pharmacists and industrial pharmacists represent critical yet underexplored stakeholder groups. Academic pharmacists contribute through education, curriculum development, and research, while

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industrial pharmacists offer operational and patient-facing insights from industry practice. Their perspectives shape decision-making, adoption, and the sustainability of telepharmacy services[8,9]. Furthermore, user acceptance remains a core determinant of telepharmacy uptake. The Technology Acceptance Model (TAM) provides a useful explanatory framework to understand how perceived usefulness, perceived ease of use, and attitudes toward technology influence acceptance of telepharmacy among healthcare providers and patients[10].

Guided by CFIR as the primary framework, and supported by Stakeholder Theory and TAM, this study explored telepharmacy initiatives, implementation challenges, and improvement strategies from the perspectives of academic and industrial pharmacists in Malaysia. By adopting a theory-informed qualitative approach, this study aimed to generate findings that are transferable and relevant to policy, education, and practice.

Material and Methods

Study design and theoretical framework

This qualitative study employed semi-structured interviews to explore telepharmacy implementation from the perspectives of academic pharmacists (APs) and industrial pharmacists (IPs). The study was guided by the Consolidated Framework for Implementation Research (CFIR) as the primary analytical framework. CFIR informed us of the development of the interview guide and the interpretation of findings across multiple levels of implementation.

Stakeholder Theory guided the identification and inclusion of APs and IPs as key informants due to their influence on education, policy, and operational delivery of telepharmacy services. In addition, constructions from the Technology Acceptance Model (TAM) were used to support the interpretation of findings related to technology adoption, user acceptance, and resistance to telepharmacy.

Ethics approval

This study was conducted in accordance with the ethical standards of the Universiti Teknologi MARA Research Ethics Committee. Ethical approval was obtained prior to data collection (Reference: (REC)(PH)/UG/049/2023). All informants provided informed consent, and confidentiality was maintained throughout the research process in compliance with institutional and national ethical guidelines.

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Interview Guide Development

The semi-structured interview guide was developed in alignment with CFIR domains. Questions explored intervention characteristics (e.g., technology and service design), outer setting factors (e.g., regulatory and reimbursement issues), inner setting factors (e.g., organizational support and collaboration), characteristics of individuals (e.g., competencies and attitudes), and implementation processes (e.g., education, training, and stakeholder engagement).

Sample size and data collection

Purposive sampling and snowball sampling techniques were employed to recruit informants, ensuring that individuals with direct involvement or expertise in telepharmacy were included. An academic pharmacist with experience in teaching, research, and publication in telepharmacy was approached. Pharmacists from industry partnerships with experience in providing medicine management and medication reviews in telepharmacy were also recruited.
The interviews were carried out via online platforms (Google Meet) between April and June 2023. The research aimed to understand the initiatives, challenges, and improvement strategies related to telepharmacy from the perspectives of APs and IPs.

The study included a total of 10 informants, which was considered sufficient to achieve data saturation. Data saturation was reached at the ninth informant, where no new themes or insights emerged, and the tenth interview was conducted to confirm saturation. This approach is consistent with qualitative research principles, where sample size is determined by informational redundancy rather than numerical adequacy. Previous methodological studies have demonstrated that saturation in homogeneous samples can often be achieved within 9–12 interviews, supporting the adequacy of the sample size in this study[10].

Data Analysis

Interview transcripts were analyzed using thematic analysis supported by NVivo software. An initial coding framework was developed deductively based on CFIR domains, followed by inductive coding to capture emerging themes. Themes were refined through constant comparison and mapped to relevant CFIR domains. Triangulation with existing literature enhanced analytical rigor, and inter-coder reliability was ensured through consensus discussions among researchers.

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Results

Table 1 Demographic data of informants

The study included ten informants comprising eight APs and two IPs, with ages ranging from 38 to 66 years. The majority were female (n=7), and telepharmacy experience varied from less than one year to more than ten years. Most APs reported moderate to extensive experience (≥1 year), while IPs demonstrated practical exposure to telepharmacy service delivery. This diversity in experience provided a comprehensive perspective across educational and operational contexts.

Table 2 Stakeholder initiatives in telepharmacy

Overall, stakeholders described telepharmacy initiatives across four key areas: research, education, consultation, and collaboration. APs were predominantly engaged in research and curriculum development, reflecting their role in knowledge generation and training. In contrast, IPs emphasized direct patient care through remote consultations, illustrating the operationalization of telepharmacy services. Notably, collaboration between academics and industry emerged as a critical mechanism for translating theoretical knowledge into practical implementation.

Table 3 Challenges in telepharmacy implementation

Key challenges identified were multifactorial and spanned user, system, and policy levels. User-related barriers included low digital literacy among elderly patients and a preference for face-to-face interactions. At the system level, technological limitations and a lack of standardized platforms affected service delivery. Policy-related challenges, particularly regulatory ambiguity and reimbursement limitations, were consistently highlighted as major constraints affecting the scalability and sustainability of telepharmacy services.

Table 4 Improvement strategies for telepharmacy

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Stakeholders proposed several strategies to address these challenges, focusing on financial sustainability, workforce development, awareness, and collaboration. Financial support through funding and reimbursement mechanisms was identified as a key enabler. Additionally, integrating telepharmacy into pharmacy education and enhancing public awareness were viewed as essential to improving acceptance. Multidisciplinary collaboration was also emphasized as a strategy to strengthen service integration within the healthcare system.

Table 5 Mapping of study themes to CFIR domains

Mapping the findings into CFIR domains demonstrated that telepharmacy implementation is influenced by interconnected factors across multiple levels. Most themes were concentrated within the "Outer Setting" and "Inner Setting" domains, particularly in relation to regulatory, financial, and organizational readiness factors. This highlights the importance of a system-level approach in addressing implementation challenges rather than focusing on isolated components**.**

Figure 1 CFIR-informed conceptual framework for telepharmacy implementation in Malaysia

Discussion

This study explored telepharmacy implementation in Malaysia from the perspectives of APs and IPs, guided by the CFIR. The findings of this study highlight telepharmacy initiatives, challenges, and improvement strategies that operate across multiple CFIR domains, emphasizing the complexity of implementing digital pharmaceutical services in real-world contexts (Figure 1).

Stakeholder Initiatives in Telepharmacy (CFIR: Process and Inner Setting)

Stakeholder-led initiatives identified in this study, including research, education, clinical consultation, and industry–academia collaboration, primarily align with the CFIR Process domain, which emphasizes the planning, engagement, and execution of implementation activities. Academic pharmacists' strong involvement in telepharmacy research reflects their role in generating evidence to support implementation and scale-up. This aligns with CFIR's emphasis on reflective evaluation and continuous learning during implementation[6,12].

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Industry–academia collaboration further illustrates the importance of stakeholder engagement within the Inner Setting. Collaborative efforts such as co-developing training modules and experiential learning opportunities bridge theoretical instruction with practical application. Industrial pharmacists contribute operational insights that enhance curriculum relevance, while academic pharmacists ensure alignment with professional competencies. Such collaboration has been recognized as a critical enabler of healthcare innovation and workforce preparedness[4,13].

Telepharmacy consultation services, particularly remote patient assessment, were mainly discussed by IPs and correspond to both the Process and Intervention Characteristics domains. These services demonstrate how telepharmacy is operationalized in patient-facing contexts. Meanwhile, APs emphasized embedding telepharmacy education into undergraduate curricula, reflecting Inner Setting readiness and recognition of telepharmacy as an evolving standard of pharmacy practice. Informants with longer experience in telepharmacy expressed greater urgency to formalize these competencies, likely due to increased exposure to digital healthcare transformation[13].

Challenges in Telepharmacy Implementation (CFIR: *Characteristics of Individuals*, *Intervention Characteristics*, *Outer Setting*)

The barriers to telepharmacy implementation identified in this study span multiple CFIR domains, underscoring the multilevel nature of implementation challenges. User acceptance and adoption issues primarily align with the Characteristics of Individuals domain and are further explained by the Technology Acceptance Model (TAM). IPs highlighted that elderly patients often demonstrate low digital literacy and prefer face-to-face interactions, reflecting low perceived ease of use and concerns about perceived usefulness. These findings are consistent with previous research identifying trust, familiarity, and digital competence as key determinants of telehealth adoption[3,14].

Technological challenges, including the absence of standardized and secure telepharmacy platforms, fall under Intervention Characteristics. Stakeholders noted that fragmented tools and inconsistent systems negatively affect service quality, training simulations, and patient experience. APs involved in curriculum development emphasized that the lack of standardized platforms limits the realism and effectiveness of telepharmacy education[2,3].

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Regulatory and legal uncertainties correspond to the Outer Setting domain. Concerns related to data privacy, confidentiality, and unclear legal frameworks were particularly emphasized by the IPs responsible for compliance and operational governance. These findings reflect a misalignment between rapid technological advancement and slower regulatory adaptation, highlighting the need for policy reform to support safe and scalable telepharmacy services in Malaysia[2].

Financial barriers also map to the Outer Setting, particularly in relation to reimbursement models and funding structures. Both APs and IPs acknowledged that high infrastructure costs and inadequate reimbursement discourage long-term investment. This aligns with prior evidence showing that sustainable financing mechanisms are critical for telehealth adoption and continuity[3]. While previous studies have similarly identified digital literacy and technological barriers as key challenges in telepharmacy implementation[3,14], the present study extends these findings by highlighting the interaction between these barriers and regulatory uncertainty within the Malaysian context. Unlike studies conducted in more mature telehealth systems, where regulatory frameworks are established, stakeholders in this study emphasized policy ambiguity as a primary constraint. This suggests that implementation challenges in Malaysia are not solely technological but are also deeply rooted in systemic and governance-related limitations.

Strategies for Improvement (CFIR: *Process* and *Inner Setting*)

Proposed improvement strategies reflect stakeholders' attempts to strengthen the implementation processes and organizational readiness. Financial sustainability, emphasized mainly by IPs, relates to the Outer Setting and Process domains. Clear reimbursement mechanisms and funding allocations were viewed as essential to support the adoption and scaling of telepharmacy services. Integrating telepharmacy into national insurance or reimbursement frameworks may enhance provider participation and patient access[3].

Professional education and training strategies correspond to the Inner Setting and Process domains. APs advocated for the structured integration of telepharmacy competencies into pharmacy curricula, including training in virtual communication, ethical decision-making, and patient-centered care in remote contexts. These recommendations align with the scientific literature regarding implementation, which emphasises workforce readiness as a prerequisite for digital health success[13].

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Marketing and awareness initiatives address both the Characteristics of Individuals and Process domains by influencing attitudes, trust, and the perceived usefulness of telepharmacy services. IPs highlighted the role of social media and targeted communication in improving acceptance, consistent with health promotion literature emphasizing digital literacy and community engagement[3,16].

Finally, multidisciplinary collaboration reflects strengthening the Inner Setting and Process. Stakeholders emphasized that telepharmacy implementation requires integration with broader healthcare systems, including physicians and allied health professionals. The absence of interoperable health information systems was viewed as a barrier to continuity of care, reinforcing the need for coordinated, team-based digital health frameworks[16,17].

Overall, the differing emphases of APs and IPs illustrate how stakeholder roles shape perceptions of the implementation challenges and solutions. While APs focus on systemic, educational, and research-oriented factors, IPs prioritize operational feasibility and patient engagement. Together, these perspectives offer a comprehensive understanding of telepharmacy implementation within the CFIR framework.

A key contribution of this study lies in its integration of CFIR with Stakeholder Theory and TAM to provide a multidimensional understanding of telepharmacy implementation. By capturing perspectives from both academic and industrial pharmacists, this study offers a more comprehensive view that bridges educational, policy, and operational domains, an area that remains underexplored in existing telepharmacy literature, particularly in low- and middle-income settings.

From a practical perspective, several actionable implications can be derived. First, policymakers should prioritize developing clear telepharmacy guidelines and reimbursement frameworks to support service sustainability. Second, pharmacy education providers should integrate telepharmacy competencies into curricula to prepare future pharmacists for digital practice environments. Third, healthcare organizations should invest in standardized, secure telepharmacy platforms to ensure consistency in service delivery. Finally, targeted public awareness initiatives are needed to improve digital literacy and acceptance among patients, particularly older populations.

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Conclusion

Guided by the CFIR, this study demonstrates that the implementation of telepharmacy in Malaysia is influenced by multilevel factors spanning individual, organizational, and policy contexts. Academic and industrial pharmacists play complementary roles as key stakeholders, contributing through research, education, clinical service delivery, and intersectoral collaboration. Despite these initiatives, persistent challenges related to user acceptance, technological infrastructure, regulatory uncertainty, and financial sustainability continue to hinder the advancement of telepharmacy. Mapping these challenges and strategies to CFIR domains highlights the need for coordinated, theory-informed interventions rather than isolated solutions. The findings provide actionable insights for policymakers, educators, and healthcare providers by identifying priority areas for regulatory reform, workforce development, stakeholder engagement, and system integration. By addressing these factors, telepharmacy can be more effectively implemented to enhance equitable access to pharmaceutical care, particularly for underserved populations in Malaysia.

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Conflict of Interest

There are no potential conflicts of interest to declare.

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Table 1 Demographic data of informants

Pseudonym	Age	Gender	Position	Experience with Telepharmacy
AP1	47	Female	Academic Pharmacist	<1 year
AP2	53	Male	Academic Pharmacist	1-4 years
AP3	49	Female	Academic Pharmacist	1-4 years
AP4	66	Male	Academic Pharmacist	5-10 years
AP5	57	Female	Academic Pharmacist	<1 year
AP6	48	Female	Academic Pharmacist	5-10 years
AP7	38	Female	Academic Pharmacist	5-10 years
AP8	43	Female	Academic Pharmacist	>10 years
IP1	60	Male	Industrial Pharmacist	1-4 years
IP2	45	Female	Industrial Pharmacist	>10 years

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Table 2 Stakeholder initiatives in telepharmacy

Theme	Subtheme	Illustrative Quote
Telepharmacy Research	Research Conducted in the Field of Telepharmacy	*"My major involvement will be on a research basis. I have done some research related to telepharmacy, and I have also supervised students who conducted research on telepharmacy" (AP6)*
Industry-Academia Collaboration	Collaboration Between Academic and Industry Partners	*"I also have a collaboration with a telepharmacy company to come up with programs and modules to train students and future pharmacists on telepharmacy." (IP1)*
Telepharmacy Consultation	Remote Patient Assessment and Monitoring	*"We use WhatsApp video calls and video conferences to contact patients and give consultations." (IP2)*
Telepharmacy Education	Curriculum Development and Training	*"I was involved in developing the module on the telepharmacy rotation for final-year students and also Objective Structured Clinical Examinations (OSCE) for telepharmacy." (AP7)*

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Table 3 Challenges in telepharmacy implementation

Theme	Subtheme	Illustrative Quote
User Acceptance and Adoption	Generational Differences in Healthcare Technology	*"If we want to interview especially elderly patients, they do not have that much literacy on how to use devices." (IP2)*
	Reluctance Towards Telepharmacy	*"They would prefer face-to-face, where they can be assured that when they are talking to the pharmacies, nobody else can hear." (AP3)*
Regulatory and Legal Issues	Data Privacy and Confidentiality	*"Because it is online, there's a possibility of third-party access, especially the service provider. You are using the platform." (IP1)*
Financial Barriers	Investment Required for Setup	*"Because it takes money… yeah, some amount of money to get all the infrastructure ready." (AP5)*
	Reimbursement Models and Compensation	*"Maybe we do not get much money compared to the normal traditional businesses." (AP8)*

Table 4 Improvement strategies for telepharmacy

Theme	Subtheme	Illustrative Quote
Financial Sustainability	Reimbursement Models and Funding Sources	*"If they have some allocation… yes, they can apply for funding to start their services; it will definitely help to boost telepharmacy." (IP1)*
Professional Development and Education	Enhancing Telepharmacy Education and Curriculum	*"It's important that we start educating our students on telepharmacy… the course itself should be included in the degree." (AP2)*
Marketing and Awareness	Promoting Telepharmacy to Stakeholders and Patients	*"Has to do the awareness campaign or any promotion putting ads on Facebook, or any social media…" (IP2)*
Collaborative Approaches	Enhancing Multidisciplinary Collaboration	*"Maybe we can collaborate with doctors in terms of a multidisciplinary approach… inviting educators, dietitians, and endocrinologists to join the telepharmacy consultation." (AP6)*

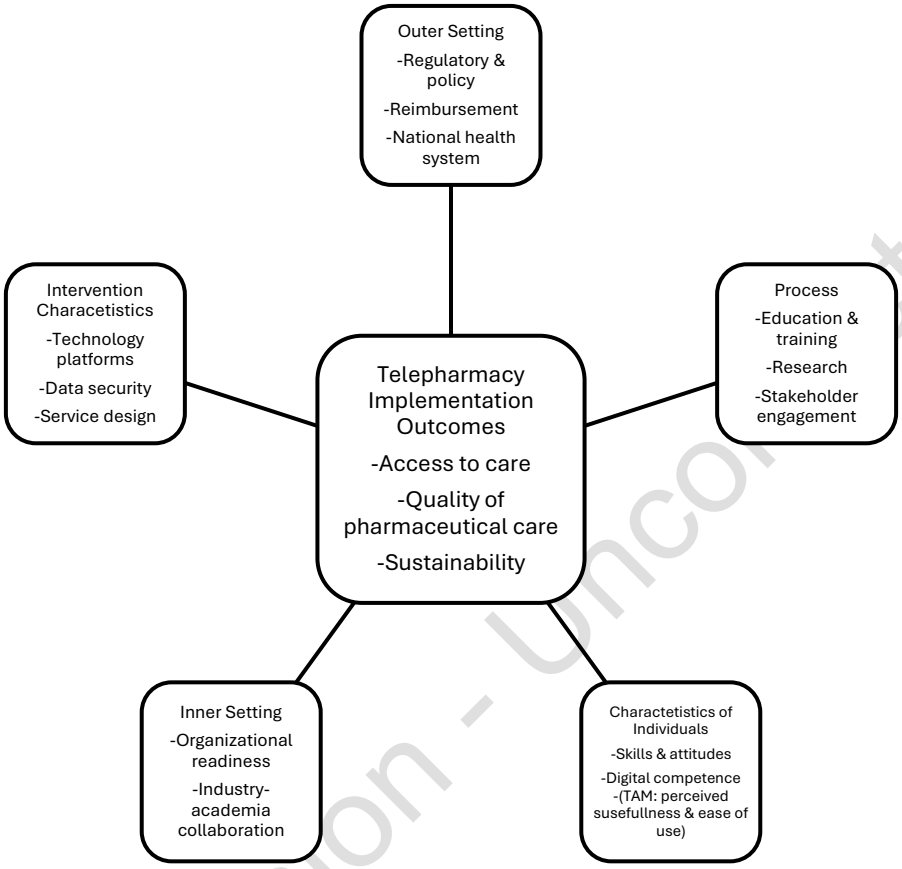
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Table 5 Mapping of study themes to CFIR domains

Study Theme	Subthemes	CFIR Domain
Stakeholder initiatives	Research, education, consultation, industry–academia collaboration	Process
Telepharmacy education & training	Curriculum development, OSCEs, student exposure	Inner Setting / Process
User acceptance & adoption	Digital literacy, preference for face-to-face care	Characteristics of Individuals (TAM-supported)
Technological barriers	Platform limitations, privacy concerns	Intervention Characteristics
Regulatory & legal issues	Data protection, lack of guidelines	Outer Setting
Financial barriers	Infrastructure cost, reimbursement issues	Outer Setting
Improvement strategies	Funding, collaboration, awareness campaigns	Process / Inner Setting

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Figure 1 CFIR-informed conceptual framework for telepharmacy implementation in Malaysia



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