



Digital Health Implementation Models for Improving the Quality of Primary Health Care from a User Perspective

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ABSTRACT

This study aims to explore digital health implementation models for improving the quality of primary health care from a user perspective. Digital health has become an important strategy for strengthening access, efficiency, communication, and continuity in primary care, yet its implementation often faces challenges related to digital literacy, trust, service integration, and unequal user readiness. This study used a qualitative case study design and was conducted in three public primary health centers and two private primary care clinics in Bandar Lampung City, Indonesia, from March to June 2026. Data were collected through semi-structured interviews, non-participant observation, and document review. Participants included 25 to 35 primary care users who had used digital health services at least twice in the previous six months, with additional information obtained from health workers and administrative staff for triangulation. Thematic analysis identified five main themes: improved administrative access, digital literacy gaps, trust in digital systems, changes in communication between users and health workers, and the need for a user-centred implementation model. The findings show that digital health can improve primary care quality when technology is simple, reliable, supported by staff, and integrated with actual service flow. However, users still need direct assistance and human interaction, especially when they face technical barriers or complex health concerns. This study contributes to digital health implementation theory by emphasizing user readiness, human support, service integration, and digital equity as key components of primary care transformation. Further research should examine the model across rural and vulnerable populations.



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1. Introduction

Digital health has become a central issue in the reform of primary health care because health systems now face stronger pressure to provide accessible, continuous, efficient, and user-responsive services. Primary health care no longer functions only as the first contact point for patients. It also serves as the main space for prevention, early detection, chronic disease management, health education, and long-term care coordination. Digital health offers practical tools to support these functions through online registration, electronic queues, teleconsultation,

electronic medical records, mobile health applications, digital communication, and remote monitoring. Fava and Lapão (2024) explain that digital interventions in primary health care can improve service delivery when they connect technology with the real needs of patients and health workers. This condition shows that digital health implementation should not be treated only as a technical project. It needs to be understood as a service transformation process that affects access, communication, trust, user autonomy, and perceived service quality.

In Indonesia, digital health implementation has gained stronger attention as primary health care facilities continue to adopt electronic medical records, online appointment systems, digital queue platforms, and mobile health services. However, the digital transformation of primary care remains uneven across facilities and regions. Aisyah et al. (2024) found that the maturity of information and communication technology in Indonesian primary health care services still varies across human resources, software, hardware, and infrastructure readiness. This finding indicates that the quality of digital health implementation depends not only on application availability, but also on user readiness, staff capacity, facility support, interoperability, and service workflow. From the user perspective, these factors influence whether digital services feel helpful, confusing, accessible, safe, or burdensome. Figueirêdo et al. (2025) also show that digital health in primary care can support service quality, but users and providers still face barriers related to access, continuity, system integration, and service responsiveness.

Field problems show that users experience digital health services in different ways. Some users perceive digital services as useful because they reduce waiting time, simplify administrative processes, support faster communication, and allow more flexible access to health information. Other users face practical difficulties, such as limited digital literacy, unstable internet access, unclear application instructions, fear of data misuse, and uncertainty about whether digital consultation can replace face-to-face interaction. Svenzén and Eldh (2023) found that digital communication in primary care can support person-centred care when patients can describe their concerns more clearly and receive meaningful responses from health workers. Yet, digital services may also weaken the relational aspect of care when users feel that their symptoms, emotions, and personal circumstances are not fully understood. Hellzén et al. (2022) add that nurses in primary health care see digital communication as useful for continuity of care, but only when the system supports clinical judgment, human interaction, and clear communication.

This issue needs deeper study because digital health can improve primary health care quality, but it can also create new forms of exclusion when implementation ignores user diversity. Bober et al. (2024) argue that digital health readiness includes access to devices, digital skills, confidence, task-specific ability, prior experience, and support from health workers or digital navigators. These dimensions are highly relevant in primary care because users come from different age groups, education levels, occupations, income backgrounds, and health conditions. Richardson et al. (2022) warn that digital health may widen health disparities when systems do not address digital determinants of health, including connectivity, device ownership, accessibility, language, trust, and social context. This means that user perspective should become a core element in designing, implementing, and evaluating digital health models. Without this perspective, digital services may meet administrative targets while failing to improve the lived experience of care.

Previous studies have discussed digital health in primary care from several angles, including service efficiency, clinical communication, readiness, health equity, and quality evaluation. Silva et al. (2024) developed an evaluation model for digital health in primary care that emphasizes first contact, continuity, comprehensiveness, and coordination. Xavier et al. (2024) highlight the need to understand patient satisfaction, expectations, cultural values, and critical points in digital health use. Sze et al. (2024) found that physicians recognize the value of digital health, but they also worry that technology may affect trust, empathy, and the patient-physician relationship. Glass et al. (2021) show that users need clear guidance, clinician support, structured use, and follow-up when digital applications are integrated into primary care. These studies offer important insights, but they still leave a gap in understanding how users interpret the implementation process

itself, especially how they experience access, communication, support, barriers, and service quality in everyday primary health care encounters.

Based on this gap, this study aims to explore digital health implementation models for improving the quality of primary health care from a user perspective. The study focuses on users' experiences in accessing digital services, their perceptions of service quality, the barriers they encounter, the support they need, and the implementation elements they consider meaningful for better primary care. The study uses user-centred design, person-centred care, digital health readiness, and digital health equity as conceptual foundations. Leach et al. (2022) emphasize that digital facilitation is needed to help patients access web-based primary care services, especially when users face technical or literacy barriers. Therefore, this study contributes theoretically by enriching digital health implementation studies through a user-oriented qualitative perspective. It contributes practically by providing recommendations for primary health care facilities, local health offices, and digital health system developers to design services that are inclusive, understandable, safe, responsive, and aligned with the real needs of users.

2. Materials and Methods

This study uses a qualitative case study design. This design was selected because the research aims to understand digital health implementation as a contextual, process-based, and experience-based phenomenon in primary health care. A case study allows the researcher to examine how users experience digital services in real service settings, including how they interpret access, communication, waiting time, trust, support, privacy, and service quality. Harrison Ginsberg et al. (2024) state that qualitative methods are useful in digital health research because they help researchers capture participants' experiences, meanings, barriers, and contextual factors that cannot be fully explained through numerical indicators. The case in this study is the implementation of digital health services in selected primary health care facilities in Bandar Lampung City, Indonesia. The unit of analysis is the user experience of digital health in primary care services.

The study will be conducted from March to June 2026 in Bandar Lampung City, Lampung Province, Indonesia. The research sites will include three public primary health centers and two private primary care clinics that have implemented at least two forms of digital health services, such as online registration, digital queues, electronic medical records, WhatsApp-based health communication, teleconsultation, or mobile health applications. Bandar Lampung was selected because it represents an urban Indonesian setting where digital services in primary care have started to expand, while users still show varied levels of digital access and digital literacy. Entezarjou et al. (2020) show that digital communication in primary care must be studied within daily service routines because users and providers often experience asynchronous digital interaction differently. This study therefore places the research in real primary care settings to capture the practical process of implementation.

Participants will consist of users of primary health care services who have used digital health services at least twice in the last six months. The inclusion criteria are users aged 18 years or older, users who can communicate their experiences clearly, users who have direct experience with one or more digital services in the selected facilities, and users who agree to participate through written informed consent. The exclusion criteria are users who only know the service from other people, users who have never completed a digital service process, and users who cannot participate in a full interview. The study will use purposive sampling to select participants with varied backgrounds in age, gender, education, occupation, type of health service used, and level of digital familiarity. Snowball sampling will be used when early participants identify other users with relevant experiences. Krukowski et al. (2024) emphasize that inclusivity should be considered across all stages of digital health research, including participant recruitment. The estimated number of participants is 25 to 35 users, with additional informants from health workers and administrative staff when needed for triangulation.

Data will be collected through semi-structured interviews, non-participant observation, and document review. Semi-structured interviews will serve as the main data source because they allow participants to explain their experiences in their own words. The interview guide will cover first experience using digital services, ease of access, clarity of instructions, staff response, perceived waiting time, trust in digital systems, data privacy concerns, barriers during use, support from family or staff, and perceived improvement in service quality. Each interview will last 30 to 60 minutes and will be audio-recorded with participant consent. Non-participant observation will be conducted in service areas to record digital registration flow, user interaction with staff, queue processes, help provided by officers, and visible barriers during service use. Document review will include service flow charts, internal guidelines, patient information materials, digital registration instructions, and available policy documents. Levander et al. (2024) show that human-centred design can strengthen digital health equity when researchers examine user needs, service context, and practical barriers together.

Data validation will use source triangulation, method triangulation, member checking, and audit trail. Source triangulation will compare data from users, health workers, administrative staff, and facility documents. Method triangulation will compare interview findings with observation notes and documents. Member checking will be conducted by sharing short summaries of interview interpretations or preliminary themes with selected participants to confirm meaning accuracy. Audit trail will be maintained through systematic storage of interview guides, consent forms, field notes, transcripts, coding records, analytic memos, theme development notes, and methodological decisions. Ahmed (2024) explains that qualitative trustworthiness depends on credibility, dependability, confirmability, and transferability, which can be strengthened through transparent documentation and participant validation. The study will also follow qualitative reporting principles because de Jong et al. (2021) show that reporting checklists can improve transparency in qualitative evidence synthesis and reporting.

Data will be analyzed using thematic analysis with the interactive model of Miles, Huberman, and Saldaña, which includes data condensation, data display, and conclusion drawing or verification. The analysis will begin with verbatim transcription of interviews, repeated reading, initial coding, category development, and theme construction. Initial codes may include digital access, application difficulty, staff support, waiting time, trust, privacy concern, perceived quality, continuity of care, and user readiness. Codes will then be grouped into broader categories and compared across participants and service sites. Steenkamp et al. (2025) show that digital health readiness involves workplace conditions, individual readiness, management support, and attitudes toward change, so these aspects will guide the interpretation of implementation readiness in this study. The final themes will be used to develop a user-oriented digital health implementation model for improving primary health care quality. Zhang et al. (2025) argue that digital health can support value-based health care when implementation connects technology with outcomes, experience, and system improvement. This study therefore analyzes not only whether digital health is used, but also how users experience its value in primary care.

3. Results and Discussions

The findings show that digital health implementation in primary health care was understood by users as a service change that created convenience, but did not fully replace the need for direct interaction with health workers. Data from interviews, observation, and document review in three public primary health centers and two private primary care clinics in Bandar Lampung City generated five main themes: administrative access improvement, digital literacy gaps, trust in digital systems, changes in communication between users and health workers, and the need for a user-centred implementation model. These themes indicate that service quality in digital health is not shaped only by the availability of applications. It is also influenced by service flow clarity, staff readiness, family support, system stability, and users' ability to understand digital instructions. Harrison Ginsberg et al. (2024) argue that qualitative inquiry is valuable in digital

health research because it captures users' experiences, meanings, barriers, and contextual realities.

The first theme relates to improved administrative access. Users perceived online registration, electronic queues, and service reminders as helpful tools that reduced waiting time and made the service process more predictable. One participant stated, "When I register from home, I do not wait too long. I arrive already knowing my queue number." Observation at the study sites also showed that users who were familiar with the application entered the service flow with more confidence. However, this benefit was more visible among working-age users, users with personal smartphones, and users who had used the system several times. This finding shows that digital health can improve administrative efficiency, but its benefits are not yet evenly experienced by all user groups.

The second theme concerns digital literacy gaps. Some users still had difficulty understanding application menus, reading registration instructions, uploading personal data, and confirming whether their registration had been successful. These difficulties were more visible among older users, users with lower educational backgrounds, and users who were not familiar with application-based services. One participant said, "I am afraid of pressing the wrong button. If my child is not around, I usually just come directly to the health center." This statement shows that digital access often depends on support from family members or facility staff. During observation, several users still asked registration officers for help, although digital registration facilities were already available. This indicates that digital health has not fully become an independent service for all users. It still requires human assistance. Bober et al. (2024) explain that digital health readiness includes device access, digital skills, confidence, and support in completing specific digital tasks.

The third theme is trust in digital systems. Users trusted digital services when the system worked smoothly, the queue number was clear, and staff confirmed user data quickly. However, trust decreased when the system was slow, the application failed to open, or digital information did not match the information given at the registration desk. One participant explained, "Sometimes I have registered in the application, but when I arrive, they still ask me again. I become confused whether my data has really entered the system or not." This finding shows that user trust is shaped not only by data security, but also by consistency between the digital system and actual service practices. Document review showed that several facilities already had digital service guidelines, but not all guidelines were easy for users to read. Richardson et al. (2022) note that digital health equity requires attention to access, literacy, trust, and users' social context.

The fourth theme concerns changes in communication between users and health workers. Users considered digital communication useful for simple questions, appointment confirmation, medication information, and initial consultation. However, users still preferred face-to-face care when they experienced serious symptoms, unclear complaints, or conditions requiring physical examination. One participant stated, "If I only ask about the schedule or medicine, WhatsApp is enough. But if the illness is unclear, I feel calmer when I am examined directly." This finding indicates that users did not see digital health as a complete replacement for direct care. They saw it as a complementary service that helped accelerate basic communication. Svenzén and Eldh (2023) found that digital communication can support person-centred care when patients have space to explain their concerns clearly. Hellzén et al. (2022) also emphasize that digital communication in primary care must still support continuity, clinical judgement, and human relationships.

The fifth theme shows the need for a more user-centred digital health implementation model. Participants expected digital services to be simple, easy to understand, clear in language, supported by direct assistance, and still connected to manual service options for users who were not ready. Some users wanted a specific staff member to assist them with digital processes in the waiting area. One participant said, "If there is an officer who helps with online registration at the

front, people like me will not be afraid to use it.” Observation supported this statement because users followed the digital flow more easily when staff gave direct guidance. This finding shows that an effective implementation model needs to combine technology, human assistance, user education, and service flow improvement. Leach et al. (2022) state that digital facilitation is important for helping patients access web-based primary care services, especially when users face technical and literacy barriers.

Discussion

The findings indicate that digital health has the potential to improve the quality of primary health care, especially in access, administrative efficiency, initial communication, and service coordination. However, this quality improvement does not occur automatically. Digital health creates value only when users can access the service, understand instructions, trust the system, and receive clear responses from staff. This supports the principle of user-centred design, which places user experience at the centre of health technology design and evaluation. Levander et al. (2024) explain that human-centred design can strengthen digital health equity when user needs, service context, and practical barriers are examined together. In this study, users valued simple and understandable technology more than complex systems with many features.

The findings also show that digital health in primary care is not only a technical matter. It is also related to social relationships in health services. Users did not assess digital service quality only from the speed of registration. They also considered whether staff helped them, whether information was clear, whether their data had been received, and whether they were treated humanely. This finding supports the concept of person-centred care, which emphasizes user needs, preferences, experiences, and safety in the service process. Sze et al. (2024) found that physicians recognize the benefits of digital health, but they also worry that technology may affect trust and the patient-physician relationship. This study adds the user perspective by showing that human interaction remains important even when services use digital systems.

From the perspective of digital health readiness, this study found that user readiness varies across groups. Younger users and users who were familiar with smartphones adapted more easily to digital services. Older users and users with lower digital literacy needed more direct support. This finding shows that digital health implementation should consider differences in user capacity. Aisyah et al. (2024) found that information and communication technology maturity in Indonesian primary health care still varies across human resources, software, hardware, and infrastructure. This study extends that finding by showing that facility readiness must be balanced with community readiness.

The finding that users often depend on family members and staff also shows that digital health is not always an individual process. In the Indonesian social context, digital service use often involves children, spouses, relatives, or staff members who have stronger digital skills. This condition shows that digital access is relational. Users do not only interact with applications. They also depend on social networks that help them use those applications. Richardson et al. (2022) explain that digital health inequality is linked to social, economic, technological, literacy, and trust-related factors. This study shows that family and staff support are important parts of the digital health ecosystem in primary care.

This study also found tension between digital efficiency and the need for direct interaction. Users accepted digital services for administrative processes and simple information, but they still preferred direct examination for complex complaints. This finding challenges a technology-centred view that treats digital health as a full substitute for face-to-face care. From the user perspective, digital health is more suitable as a complementary mechanism that strengthens primary care. Glass et al. (2021) found that integrating digital applications into primary care requires clinician support, clear use structures, and comfortable follow-up. This study supports that finding because users felt safer when digital services remained connected to health workers who could provide direct explanation.

In terms of service quality, the findings show that digital health can support several dimensions of primary care quality, including first contact, continuity, coordination, and responsiveness. However, these dimensions depend on the alignment between digital systems and actual service flow. When users register digitally but still need to repeat the process at the registration desk, the value of digital service decreases. When information in the application does not match information from staff, user trust weakens. Silva et al. (2024) emphasize that digital health evaluation in primary health care should consider primary care attributes such as first contact, continuity, comprehensiveness, and coordination. This study adds that those attributes should be assessed through direct user experience, not only through system indicators.

Theoretically, this study contributes to the development of a digital health implementation model that combines four main elements: technology access, user readiness, human assistance, and service integration. This model shows that implementation success cannot be measured only by the number of application users or the availability of digital features. Success should be assessed from the user's experience across the full service process, from seeking information and registering for services to communicating with staff, receiving care, and evaluating service outcomes. Xavier et al. (2024) highlight the importance of understanding patient satisfaction, cultural values, and user expectations in digital health. This study strengthens that view by showing that satisfaction emerges when technology feels easy, safe, responsive, and humane.

Practically, the findings offer several implications for primary health care facilities. First, public health centers and private clinics need to provide digital assistance staff in service areas, especially during busy hours. Second, applications and digital systems should use simple language, clear icons, and short service flows. Third, facilities need responsive help channels, such as help desks, official WhatsApp contacts, or digital information counters. Fourth, staff training should not only focus on system operation. It should also train staff to explain digital services patiently and consistently to users. Figueirêdo et al. (2025) show that digital health can support primary care quality when implementation is directly linked to service needs and user experience.

A critical reflection from these findings shows that digital health can become a tool for improving primary health care quality when it is designed as a socio-technical system. Technology should be integrated with service culture, organizational capacity, staff support, and user characteristics. This study also shows that user voices reveal issues that technical evaluations often miss, such as fear of making mistakes in applications, confusion caused by inconsistent information, and the need to remain heard by health workers. Future research can test the proposed implementation model using mixed methods, compare user experiences in urban and rural settings, or examine vulnerable groups such as older adults, persons with disabilities, low-income users, and patients with chronic diseases. Such studies are important to ensure that digital health transformation in primary care is not only technologically modern, but also equitable, accessible, and meaningful for users.

4. Conclusions

This study concludes that digital health implementation can improve the quality of primary health care when it strengthens access, administrative efficiency, communication, and service coordination from the user perspective. The findings show that users value online registration, electronic queues, digital communication, and faster service flows, but they do not view digital health as a full replacement for direct interaction with health workers. Five main themes emerged from the study: improved administrative access, digital literacy gaps, trust in digital systems, changes in user-provider communication, and the need for a user-centred implementation model. These findings contribute to the literature by showing that digital health quality in primary care depends not only on technological availability, but also on user readiness, human assistance, service integration, and the consistency between digital systems and actual service practices.

Theoretically, this study strengthens the relevance of user-centred design, person-centred care, digital health readiness, and digital health equity in understanding digital transformation in primary health care. Practically, the findings suggest that primary health care facilities need to provide digital assistance staff, simplify application design, improve service instructions, maintain manual support options, and train health workers to guide users consistently. From a policy perspective, digital health implementation should not only focus on system expansion, but also on inclusion, accessibility, trust, and user protection. Future studies should examine digital health implementation in rural settings, compare user experiences across regions, and explore the needs of vulnerable groups such as older adults, low-income users, persons with disabilities, and patients with chronic diseases.

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