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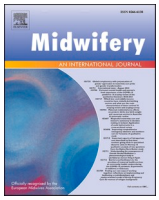

"*Moving through Uncertain Pathways*": Health Professionals' perspectives on novel technologies for continuing care in high-risk pregnancy using the technology acceptance model

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ABSTRACT

Background: High-risk pregnancies contribute disproportionately to maternal and perinatal mortality, particularly in low- and middle-income countries (LMICs). Digital health technologies (DHTs), including mobile applications and web-based platforms, have emerged as tools to enhance continuity and personalization of care. Yet, little is known about how healthcare professionals in resource-constrained settings perceive and adopt these innovations, particularly in the context of continuing care for high-risk pregnancy (HRP). This study aimed to explore healthcare professionals' perspectives on the acceptability and adoption of DHTs to support continuing care in HRP.

Methods: This qualitative descriptive approach was guided by the Technology Acceptance Model (TAM) and conducted in four tertiary hospitals in Lao PDR. In-depth, semi-structured interviews were held with 16 participants (obstetricians, nurses, and midwives). Data were analyzed using reflexive thematic analysis. Rigor was ensured through COREQ-based procedures.

Results: Four major themes emerged: (1) Perceived Usefulness—digital tools facilitated early detection, holistic monitoring, and communication; (2) Perceived Ease of Use—participants found mobile platforms familiar but cited device limitations and digital literacy gaps; (3) Attitude Toward Use—providers appreciated patient-centered benefits but expressed concern over workload; and (4) Behavioral Intention to Use—adoption was conditional on leadership endorsement, workflow alignment, and training availability.

Conclusions: Healthcare professionals viewed digital platforms as promising tools for supporting continuing care in high-risk pregnancies. However, sustained adoption will depend on addressing infrastructure barriers, institutional readiness, and professional development. These findings underscore the need for context-sensitive implementation strategies that integrate user experience with systemic support.

Introduction

High-risk pregnancies, characterized by an increased probability of adverse maternal and fetal outcomes, remain a major global health concern, particularly in low- and middle-income countries (LMICs), where access to specialized care is often limited. According to the World Health Organization, approximately 15–20% of all pregnancies are considered high-risk due to pre-existing medical conditions, obstetric complications, or socio-demographic vulnerabilities (Khan et al., 2006). These pregnancies contribute disproportionately to maternal and perinatal morbidity and mortality worldwide, with LMICs accounting for 94% of global maternal deaths, largely from preventable causes (Say et al., 2014). In regions such as Southeast Asia and Sub-Saharan Africa, conditions like hypertensive disorders, gestational diabetes, and

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preterm labor are prevalent and often poorly managed due to systemic barriers in healthcare delivery (Chawanpaiboon et al., 2019; Bauserman et al., 2015). In the Lao People's Democratic Republic (Lao PDR), maternal health challenges are particularly pronounced. The maternal mortality ratio (MMR) was reported at 197 per 100,000 live births in 2015, reflecting significant progress from previous decades but still indicating substantial risk (World Bank, 2015). A study analyzing female deaths in Laos found that nearly 75% of maternal deaths were directly related to obstetrical complications during pregnancy or childbirth, many of which could have been prevented with appropriate obstetric care (Sychareun et al., 1995). Addressing the burden of high-risk pregnancies in these settings is essential to achieving Sustainable Development Goal (SDG) 3.1, which aims to reduce the global maternal mortality ratio to less than 70 per 100,000 live births by 2030 (United Nations, 2015).

DHTs are defined by the World Health Organization as the use of digital, mobile, and wireless technologies to support the achievement of health objectives, including tools such as mobile health (mHealth), telemedicine, electronic medical records, remote monitoring devices, and decision-support systems (WHO, 2019). In the context of HRP care, these technologies have emerged as transformative tools to support maternal health, enhance clinical decision-making, and improve perinatal outcomes. DHTs facilitate real-time monitoring of vital signs and enable early detection of complications such as gestational hypertension, preeclampsia, and gestational diabetes (Kim et al., 2025). A systematic review by Güneş Öztürk et al. (2024) revealed that telemonitoring interventions significantly reduced emergency cesarean section rates and improved glycemic control among women with high-risk pregnancies. mHealth platforms have also improved antenatal attendance and self-management behaviors, particularly in underserved settings (Hsieh et al., 2025; Feroz et al., 2022). Additionally, Shah et al. (2023) found that wearable biosensors enhanced individualized risk stratification and timely referral in hypertensive disorders of pregnancy. Despite these benefits, concerns remain regarding data privacy, user training, and system interoperability (Venkatesh et al., 2022). Addressing these issues is essential to ensure equitable and effective implementation of DHTs in maternal health systems globally.

Health professionals' attitudes toward DHTs play a crucial role in determining the successful adoption of innovations in HRP care. Studies have shown that mobile health (mHealth) solutions, such as remote monitoring platforms, are generally perceived as useful for enhancing patient engagement, improving clinical efficiency, and facilitating timely interventions, particularly in contexts where continuing and individualized care is needed (Nayak et al., 2023; Alami et al., 2024). Nurses and midwives have reported that digital platforms offer opportunities to monitor patients longitudinally, support behavioral health coaching, and tailor communication to individual needs, which aligns well with models of personalized maternity care (Ghimire et al., 2023). Nevertheless, concerns about data security, platform reliability, and poor system integration continue to undermine confidence in digital health tools, especially in low-resource environments (Zhou et al., 2023). Moreover, the successful implementation of digital health interventions is contingent on adequate training, leadership support, and perceived organizational readiness (Wang et al., 2024). Therefore, while health professionals generally recognize the potential of digital technologies to support continuing care for high-risk pregnancies, their acceptance is moderated by both technological and institutional factors that require strategic attention.

While DHTs have demonstrated potential in enhancing maternity care worldwide, research on their applicability and acceptance in the Lao People's Democratic Republic remains limited. Although recent national initiatives have aimed to improve maternal health outcomes, the integration of digital platforms into routine care for high-risk pregnancies is still in its early stages. Previous studies have explored the adoption of smartphone applications among high-risk pregnant women in Lao PDR (Nuampa et al., 2025); however, there is a notable gap regarding the perspectives of healthcare professionals. In particular, it is important to understand how nurses and midwives perceive and engage with technology-supported, individualized, and continuous care models within their specific cultural and healthcare contexts. To guide this inquiry, the Technology Acceptance Model (TAM) (Davis, 1989) was employed as a theoretical framework. TAM posits that perceived usefulness and perceived ease of use influence users' attitudes toward technology, which subsequently affect their intention to adopt it. This model has been extensively utilized in health informatics to explain healthcare professionals' acceptance of digital systems (Holden & Karsh, 2010). Accordingly, this study aims to explore health professionals' perceptions and acceptance of emerging DHTs for continuing care in HRP, using the TAM as a guiding framework.

Method

This study employed a qualitative descriptive design using in-depth semi-structured interviews (Sandelowski, 2000; Sundler et al., 2019), which the part of main study "Exploring the situation and acceptability of digital technology system for continuing care in high-risk pregnant women at Vientiane Prefecture, Lao People's Democratic Republic: Mixed-methods study", but focus on the perceptions of nurses, midwives, and obstetricians in Lao PDR toward a digital system for continuing care in HRP. The approach was informed by the Technology Acceptance Model (TAM) (Davis, 1989) and guided by the Consolidated Criteria for Reporting Qualitative Research (COREQ) checklist to ensure rigor, transparency, and trustworthiness throughout data collection and analysis (Tong et al., 2007).

Setting and participants

This study was conducted in Vientiane Capital, the primary urban hub of the Lao PDR, where HRP care is centralized across several public tertiary hospitals. Four tertiary hospitals were purposively selected for their role in providing referral services for maternal and newborn health: Mahosot Hospital, Mother and Child Hospital, Mittaphab Hospital, and Sethathirath Hospital.

In Lao PDR, care for high-risk pregnant women is primarily provided by obstetricians, who are responsible for diagnosis, treatment, and patient education regarding potential complications. Nurses and midwives mainly play coordinating and referral roles between antenatal clinics and hospital wards. Routine follow-up of symptoms through remote or digital means is not yet established; women are generally expected to return to the hospital when they experience abnormal signs or symptoms. Consequently, continuity of care largely depends on women's self-recognition of danger signs and their ability to access health services. This conventional structure underscores the potential value of integrating digital health systems to support proactive and continuous monitoring in HRP management.

A total of 16 participants were recruited using purposive sampling to ensure professional diversity and institutional representation. From each hospital, four health professionals were selected: one obstetrician and three nurse-midwives. This sampling strategy enabled the inclusion of both medical and nursing perspectives in each clinical context, while also maintaining balance across the sites. The nurse-midwives included both frontline staff and midwifery supervisors, reflecting a range of clinical and administrative responsibilities. All participants met the following inclusion criteria: they were full-time healthcare professionals working in obstetric units with at least one year of experience in maternal health, and had provided care for high-risk pregnancies during the antenatal, intrapartum, or postpartum period. This ensured that participants had sufficient clinical knowledge and contextual understanding to reflect critically on the integration of digital health technology into routine practice.

Digital health technology for high-risk pregnant women

The digital health technology described in this study is part of the project entitled "*Intensive Training for a Continuing-Care System for High-Risk Pregnancy*," implemented in Vientiane Capital, Lao PDR. The project targets high-risk pregnant women, particularly those diagnosed with preeclampsia, gestational diabetes mellitus (GDM), or anemia, and aims to strengthen the knowledge and clinical competency of nurses and midwives in managing these conditions (Sirisomboon et al., 2024). As part of the intervention, the project introduces integrated digital platforms designed to enhance both patient self-management and provider-led care.

The mobile application "Care for Mom" is tailored for use by high-risk pregnant women. It includes a range of features such as daily symptom and fetal movement tracking, access to educational articles, mental health screening (e.g., stress tests), self-care interventions, and interactive communication with healthcare providers. The app also allows women to contact their assigned nurse directly. Complementing this, the web-based platform "Support High-Risk Pregnancy" is designed for obstetric nurses and midwives. This platform is integrated with the mobile application and facilitates tele-nursing services, clinical feedback, and remote consultation. The overall structure and interaction between these digital components are illustrated in Fig. 1.

Data Collection

Data were collected between January and April 2024 through face-to-face interviews conducted in private rooms at each hospital. Interviews were guided by a semi-structured topic guide developed based on the TAM framework (Davis, 1989), covering four domains: perceived usefulness, perceived ease of use, attitudes toward use, and behavioral intention to use DHTs. Interviews were conducted in Thai and Lao language by a trained bilingual researcher, audio-recorded with consent, and lasted between 45 to 60 minutes. All participants provided written informed consent before participation.

Three instruments were developed by the research team for this study: 1) Demographic and Work Information Form; this structured form comprised eight closed-ended items developed from a review of relevant literature. It captured participants' age, gender, job characteristics, years of experience, confidence in managing high-risk pregnancies, experience with digital health tools, and acceptance of technology use in clinical practice; 2) In-Depth Interview Guide; the semi-structured interview guide included 14 open-ended questions aimed at exploring health professionals' perceptions, attitudes, and needs related to the use of DHTs in the care of high-risk pregnant women. The questions addressed both personal and professional experiences with digital platforms, such as mobile applications and web-based systems designed for individualized and continuing care. Interviews followed a flexible order based on participant narratives and lasted approximately 45–60 minutes. Probing questions were used as needed to elicit detailed responses. Sample items included: "How do you perceive your role in supporting high-risk pregnant women through digital health tools?" "What are your views on using mobile health applications for monitoring patients?" "What factors would support the use of this platform among healthcare professionals?" "What barriers might limit its use in your practice, and why?"; and 3) Field Note Form; this note was capture contextual observations and reflective insights during and immediately after each interview (Holloway & Wheeler, 2010).

Data analysis

Data were analyzed manually using Reflexive Thematic Analysis (RTA) following the six-phase framework proposed by Braun and Clarke (2021). This method allowed for a flexible yet rigorous exploration of participants' perspectives by identifying and interpreting patterned meaning across the dataset. The analysis was primarily deductive, guided by the four core constructs of the Technology Acceptance Model (TAM) (Davis, 1989), with openness to inductive insights that emerged during the interpretive process. Field notes were used to record contextual details and non-verbal cues during interviews and were later reviewed alongside transcripts to enrich interpretation and support theme development.

The first phase involved familiarization with the data through repeated reading of all interview transcripts. Each transcript was reviewed in its original Lao language, and analytic notes were recorded in the margins to capture early impressions. In the second phase, initial codes were generated manually by the first and second authors, who independently annotated hard-copy and digital transcripts to identify meaningful text segments relevant to perceived usefulness, ease of use, attitudes, and behavioral intentions. In the third phase, codes were collated into candidate themes and subthemes that reflected both the TAM constructs and emerging concepts from the data. These candidate themes were reviewed and refined in phase four by checking for internal consistency and representativeness across diverse participant roles (midwives vs. obstetricians) and hospital contexts. Phase five involved defining and naming the final themes to ensure clarity and conceptual distinction. In the final phase, illustrative quotes were selected, translated into English, and organized to support the narrative structure of

Fig. 1. Website "Support High-risk pregnancy".

the findings. Throughout the process, the research team maintained an audit trail of coding decisions and theme development to enhance analytic transparency. Reflexive discussions among co-authors helped to ensure trustworthiness and interpretative coherence.

This study ensured trustworthiness including credibility, dependability, confirmability, and transferability (Lincoln & Guba, 1985). Credibility was enhanced through member checking with all participants to verify the researchers' understanding of their experiences. Data collection followed a qualitative descriptive approach using audio recordings and field notes, allowing for repeated review and deep reflection on participants' meanings. Peer debriefing among the research team further supported analytic consistency and confirmability. Although transferability is limited in qualitative research, the findings may be applicable to settings with similar contexts and healthcare roles.

Reflexivity

Reflexivity was embedded throughout the analytic process in accordance with COREQ recommendations. All members of the research team were experienced qualitative researchers (with a minimum of five years' experience) and actively engaged in clinical or academic roles related to HRP care. Their professional backgrounds provided deep contextual understanding but also potential for bias toward preventive and nurse-led care models. To mitigate this, reflexive practices were integrated into multiple analytic steps, including independent coding by the first and second authors, peer debriefing, and iterative team discussions to challenge assumptions and ensure balanced interpretation. Field notes were used to capture contextual reflections and analytic decisions after each interview, supporting transparency and self-awareness during theme development.

Results

Part 1: Demographic information

The health professionals who participated in this study had a mean age of 38.06 years (SD = 8.25), ranging from 27 to 56 years. Their average experience in obstetric care was 14.68 years (SD = 8.26), with a range of 3 to 31 years. Experience specifically related to the management of high-risk pregnancies averaged 12.50 years (SD = 8.92), ranging from 1 to 31 years. Detailed participant characteristics are provided in Table 1.

Table 1
Participants demographic information (N = 16).

Position	Setting	Age (years)	Work experiences (years)	High-risk pregnancy management experiences (years)
LR Nurse 1	LR	41	16	16
LR Nurse 2	LR	30	3	3
LR Nurse 3	LR	30	8	8
LR Nurse 4	LR	29	6	6
Midwife 1	LR	35	13	13
Midwife 2	LR	41	17	17
Midwife 3	LR	56	31	31
Midwife 4	LR	38	19	1
ANC Nurse 1	ANC	44	21	21
ANC Nurse 2	ANC	27	3	3
ANC Nurse 3	ANC	39	18	15
ANC Nurse 4	ANC	43	21	21
OB Physician 1	OB	30	8	8
ANC Physician 2	ANC	34	10	10
OB Physician 3	OB	40	13	2
OB Physician 4	OB	52	28	25

Note: LR = labour room; ANC = antenatal care clinic; OB = obstetric ward.

Part 2: Thematic analysis

This study explored health professionals' perspectives on the use of DHTs for continuing care in HRP, guided by the Technology Acceptance Model (TAM). Four major themes aligned with TAM domains: Perceived Usefulness, Perceived Ease of Use, Attitude Toward Use, and Behavioral Intention to Use. A summary of the themes and subthemes is presented in Table 2.

Table 2
Themes and subthemes developed from reflexive thematic analysis.

Themes	Subthemes
1. Enhancing Monitoring and Continuity of Care	1.1 Convenience and Ease of Access 1.2 Early Detection and Safety Monitoring 1.3 Channels for Continuous Communication 1.4 A Comprehensive Tool for Holistic Maternity Care
2. Access Barriers and Facilitators	2.1 Simplicity and Familiarity through Mobile Platforms 2.2 Connectivity, Device Limitations, and Digital Literacy Gaps
3. Balancing Workload and Benefit	3.1 Positive Sentiment Toward Patient-Centered Impact 3.2 Concerns Over Added Responsibility Without Structural Support 3.3 Conditional Acceptance Based on Experience and Exposure
4. Conditions for Sustained Adoption	4.1 Willingness to Use If Endorsed by Leadership and Integrated into Workflow 4.2 Motivation Rooted in Patient Safety and Maternal-Child Health Outcomes 4.3 Desire for Practical Training and User Support

The thematic relationships identified in this study reflect the theoretical structure of the Technology Acceptance Model. This interrelation underscores the importance of designing user-friendly systems to enhance perceived value and long-term adoption is presented in Fig. 2.

Theme 1. Enhancing Monitoring and Continuity of Care

Health professionals perceived DHTs as valuable tools to enhance the continuity and quality of care for women with high-risk pregnancies. Their perceptions centered around the system's potential to support timely monitoring, facilitate communication, and integrate multiple aspects of maternal care.

Subtheme 1.1. Convenience and Ease of Access

Several participants emphasized the convenience of using mobile-based applications, particularly for patients residing in rural or remote areas. The system allowed patients to consult with healthcare providers without the burden of frequent hospital visits. As one midwife noted:

> "…having this kind of app would be very beneficial. It provides convenience in monitoring high-risk pregnant women without the need for them to always see a doctor, especially in cases where they live far from the hospital." (Midwife 4)

> "…some of them are shy or hesitant to ask questions, especially if it's their first time. If we can guide them with basic instructions through the app, that would be very helpful." (ANC Nurse 1)

However, one problem is that currently, some users may not be able to fully access the previous app in time, or they may not know how to use

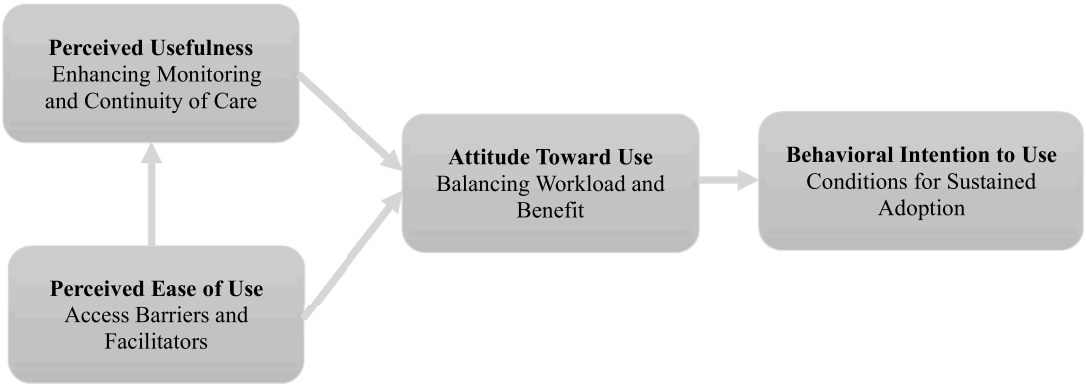

Fig. 2. Thematic Relationships Based on the Technology Acceptance Model in the Context of High-Risk Pregnancy Care.

it. This makes it difficult for the app to function as intended.

Subtheme 1.2. Early Detection and Safety Monitoring

Participants appreciated the system's capacity to detect abnormal symptoms early through integrated monitoring and alert features. This allowed for prompt responses to high-risk conditions. For example, one nurse described how community health workers used the system to identify risk:

> "When the village health volunteer tracks and records symptoms, they notify us that this mother might be at risk..." (LR Nurse 3)

> "I like the alert feature... If we have that kind of alert, we can provide care and give proper advice right away." (ANC Physician 2)

Subtheme 1.3. Channels for Continuous Communication

The availability of real-time communication between healthcare providers and pregnant women was seen as an important advantage. Participants highlighted how this function enabled ongoing care beyond scheduled appointments:

> "It helps patients follow up better—better than us not talking to them at all until the next appointment" (OB Physician 1)

> "As a nurse, I felt good about being able to follow up with patients and provide information—especially when they don't understand something." (Midwife 2)

Subtheme 1.4. A Comprehensive Tool for Holistic Maternity Care

Some participants expressed a desire for the system to integrate features beyond physical monitoring, such as psychological support and fetal movement tracking. One nurse emphasized the broader impact on maternal wellbeing:

> "If we follow the protocol properly, monitoring helps both the physical and emotional health of the mother" (ANC Nurse 3)

> "The ability to assess stress and monitor the baby or the condition is very important. With this system, they can self-assess and our staff can follow up on their status. That's a good thing." (ANC physician 2)

Theme 2. Access Barriers and Facilitators

Health professionals' perceptions of how easy or difficult the digital health platform would be to use played a central role in shaping its acceptability. Their responses reflected both enabling and constraining factors tied to usability, accessibility, and technological infrastructure

Subtheme 2.1. Simplicity and Familiarity through Mobile Platforms

Participants consistently emphasized the convenience of using mobile phones as the primary mode for interacting with the system. Many noted that nurses and patients alike were already familiar with smartphones, making the platform more intuitive and accessible. The mobile platform allowed for more flexible and responsive interactions. One participant expressed:

> "Using it on a mobile phone should be no problem… but if we have to walk to the computer every time, that might be an issue." (LR Nurse 1)

Others pointed out that digital communication via mobile chat functions could streamline patient monitoring and reduce delays in accessing support:

> "It's convenient for patients if we have this kind of app… they don't need to come to the hospital just to ask something." (ANC Nurse 4)

Additionally, participants appreciated the potential for the app to guide users step-by-step. The use of the local language and familiar health terminology in the app was also seen as critical to user-friendliness.

Subtheme 2.2. Connectivity, Device Limitations, and Digital Literacy Gaps

Despite the noted benefits, participants also highlighted several barriers that could hinder usability. A primary concern was unreliable internet access, particularly in remote or rural areas where many high-risk patients live. As one nurse explained:

> "It depends on whether they have internet at home… some live far away where there's no signal." (Midwife 2)

In addition, nurses described disparities in digital literacy among patients:

> "Some women—especially older or ethnic minority mothers—don't know how to use apps or phones at all." (OB Physician 4)

Even among healthcare workers, confidence with digital tools varied. For some, navigating a new system for the first time was expected to be confusing, though they expressed willingness to learn:

> "The first time using it might be confusing, but overall I think it's a good idea. With training, we could manage." (LR Nurse 2)

These barriers underscored the need for design that accommodates varying levels of digital proficiency, and for implementation strategies that provide ongoing technical support and training for both staff and patients.

Theme 3. Balancing Workload and Benefit

Participants acknowledged the benefits for both patients and providers, they also voiced concerns about practical implementation, particularly when it came to workload management and institutional

readiness.

Subtheme 3.1. Positive Sentiment Toward Patient-Centered Impact

Many participants shared optimistic views, noting that the system could enable better continuity of care and empower nurses and midwives to provide timely support. They expressed a sense of professional satisfaction in being able to offer advice and follow-up care independently. One midwife described this sense of value:

> "I felt good about being able to follow up with patients and provide information, especially when they don't understand something…If we have this app, they wouldn't need to go to the doctor, we could provide that information ourselves." (Midwife 1)

Others highlighted the benefit of improving patient outcomes:

> "If it's good for patients and makes it easier for them to be monitored, then I'm happy to do it, even if it adds to our workload." (ANC Nurse 2)

Subtheme 3.2. Concerns Over Added Responsibility Without Structural Support

Despite the perceived benefits, there was clear apprehension about how the system would affect current workloads. Participants worried that without designated roles or additional human resources, the responsibility for digital monitoring would fall entirely on an already overstretched workforce. One nurse working in the labor ward shared:

> "We're already short-staffed. If this app is introduced, there needs to be someone assigned to manage it—otherwise, it becomes more work on top of everything else." (LR Nurse 3)

Another nurse emphasized the lack of clarity in operational plans:

> "We couldn't make any decisions yet about how to assign the work. Who will be in charge? Will it be part of routine care? That's still unclear." (ANC Nurse 4)

This subtheme illustrates a conditional attitude where willingness to use the technology was dependent on the presence of supportive systems, policy guidance, and institutional buy-in.

Subtheme 3.3. Conditional Acceptance Based on Experience and Exposure

Some were cautiously open to the idea but had not yet seen the system in action within their own work environment. Others voiced interest but emphasized the need for hands-on training before real-world application. For instance, one participant noted:

> "I went to the training long ago in another app, but I haven't had the chance to use it with patients yet….your app sounded useful, but I'm not sure how it would work in practice." (Midwife 1)

These responses suggest that familiarity through structured exposure, along with supportive onboarding processes, are critical in shaping positive attitudes toward adoption.

Theme 4. Conditions for Sustained Adoption

Participants' intention to use was conditional, nuanced, and grounded in the realities of their work environments. Nurses and midwives considered factors such as institutional leadership, their personal values toward maternal safety, and the practical need for training and support systems.

Subtheme 4.1. Willingness to Use If Endorsed by Leadership and Integrated into Workflow

Institutional support, particularly from unit leaders, was a decisive factor in shaping participants' behavioral intention. Nurses shared that when innovations are backed by leadership and embedded into routine workflows, the sense of legitimacy and collective responsibility increases.

> "If the head nurse supports it and assigns a responsible person, I'll follow. It's a good idea if there's a system." (LR Nurse 4)

This sentiment reflects the broader organizational culture in which nurses work. Participants were not resistant to change, but rather cautious of unstructured implementation that might result in fragmented responsibilities or blame without clear guidance. Another participant explained:

> "We can't do it alone. If this becomes a part of daily routine—with someone to manage it and clear guidance—then yes, I'm willing." (Midwife 3)

Subtheme 4.2. Motivation Rooted in Patient Safety and Maternal-Child Health Outcomes

A strong internal motivator among participants was the desire to improve maternal and neonatal outcomes. Nurses and midwives who work closely with high-risk pregnancies demonstrated an ethical commitment to preventing complications and viewed the technology as a potential tool in doing so.

> "We're already dealing with high-risk cases, and I wouldn't want to miss signs of danger. If the app helps prevent that, then I want it." (ANC Nurse 3)

> "If it helps even a little to reduce risk or catch early signs, then I think it's worth using." (OB Physician 3)

Subtheme 4.3. Desire for Practical Training and User Support

While many participants had received theoretical training, few had hands-on experience with the app or system. Their intention to use was strongly linked to the availability of practical, context-specific training that reflected real clinical scenarios.

> "I'd feel more confident if we had real training—hands-on, not just theory. Otherwise, we wouldn't know how to use it correctly." (ANC Nurse 2)

Participants also highlighted the importance of ongoing support beyond initial training. They envisioned a model where staff could troubleshoot issues or receive updates without interrupting workflow, possibly through mentoring, in-app guidance, or a designated digital health focal person.

Discussion

This study explored health professionals' perceptions regarding the adoption of digital health technology for continuous care in high-risk pregnancies in Lao PDR. Our findings aligned closely with the four core TAM constructs (Davis, 1989), Perceived Usefulness, Perceived Ease of Use, Attitude Toward Use, and Behavioral Intention to Use, and highlight how contextual factors influence technology adoption in low-resource maternal health settings.

The theme of Perceived Usefulness was strongly supported. Participants recognized the digital health platform as a valuable tool for improving the continuity and quality of care for high-risk pregnant women. The system's capabilities in facilitating timely monitoring, enabling remote consultations, and integrating various aspects of maternal care were highlighted. Such perceptions align with previous studies indicating that digital health interventions can enhance maternal health outcomes by providing timely information and support (Halila et al., 2025; Sondaal et al., 2016). However, challenges were noted, particularly concerning patients from diverse ethnic backgrounds and varying educational levels, who might face difficulties in using the application effectively. This underscores the need for culturally sensitive designs and user-friendly interfaces to ensure equitable access and

utilization (Asadollahi et al., 2025).

Perceived Ease of Use was demonstrated through participant comments on the simplicity of mobile platforms, the familiarity of smartphones, and user-friendly features like local language integration. This is consistent with findings that mobile health (mHealth) applications are generally well-received due to their accessibility and user-friendly nature (Lee et al., 2024). Nevertheless, barriers such as unreliable internet connectivity, device incompatibility, and varying levels of digital literacy among patients were identified. These challenges are common in low-resource settings and highlight the importance of addressing infrastructural and educational gaps to ensure successful implementation (Asadollahi et al., 2025; Halila et al., 2025). These findings affirm TAM's proposition that ease of use directly influences perceived usefulness and attitude to use (Davis, 1989).

Attitude Toward Use among participants was generally positive, particularly when the technology was seen to empower midwives and nurses in their roles, particularly in enhancing patient-centered care and enabling timely support. The ability to provide continuous care and monitor patients remotely was seen as an extension of compassionate care, aligning with their professional values (Sondaal et al., 2016). However, concerns were raised about the additional workload and the lack of structural support for integrating the system into existing workflows. The apprehension about increased responsibilities without adequate resources reflects findings from other studies emphasizing the need for organizational readiness and support in adopting new technologies (Alalwan et al., 2017; Free et al., 2013). This positive orientation, in turn, was closely linked to a willingness to integrate the system into their practice, particularly when enabling factors such as leadership endorsement and workflow alignment were present. This pathway aligns with the original TAM proposition that attitude serves as a mediating factor between perceptions and behavioral intention (Davis, 1989; Venkatesh & Davis, 2000).

Behavioral Intention to Use was strongly linked to environmental and organizational enablers. Participants expressed a clear willingness to adopt the platform if endorsed by leadership and embedded into workflow. Motivations rooted in patient safety and ethical responsibility further reinforced intent. Yet, this intention was dependent on training and ongoing support, as illustrated by subthemes on practical training and hands-on experience. This aligns with the understanding that organizational support and clear implementation strategies are critical for the sustained use of digital health interventions (Venkatesh et al., 2003; Halila et al., 2025). Moreover, the desire for hands-on training and ongoing support was emphasized, highlighting the importance of capacity-building initiatives to enhance confidence and competence among health professionals (Asadollahi et al., 2025). These findings support TAM's concept that intention arises from positive attitudes, but also correspond with extended TAM models that recognize the role of facilitating conditions (Venkatesh & Davis, 2000).

Theoretically, this study reinforces the applicability of TAM in the field of maternal health in LMICs. All four TAM domains were clearly expressed by participants, affirming the model's relevance in explaining acceptance among frontline providers. Moreover, by grounding TAM constructs in real-world clinical experiences, the study adds nuance to the theory, especially in terms of structural constraints and institutional influences on behavioral intention. While basic TAM focuses on individual attitudes and beliefs, our findings emphasize that adoption also requires systemic support, aligning with calls in health informatics literature to contextualize TAM in complex environments (Holden & Karsh, 2010). These insights can inform context-sensitive implementation strategies for digital health in maternal care.

Strengths and limitations

This study has several strengths. First, the inclusion of both midwives and obstetricians from four major referral hospitals allowed for the triangulation of perspectives across roles and institutions. Second, the study was grounded in a well-established theoretical model (TAM), providing a structured framework for understanding adoption behavior. Third, the use of manual thematic analysis allowed for in-depth engagement with the data. However, the study also has limitations. Its focus on urban hospitals in Vientiane Capital may limit the generalizability of findings to rural settings, where infrastructure and staffing constraints are often more severe. In addition, while the sample size was adequate for qualitative depth, it may not fully capture broader system-level challenges such as policy barriers or funding limitations. While analysis was guided by TAM constructs, an open and reflexive coding process allowed inductive insights beyond the framework. This minimized risk of overlooking participant meanings and ensured findings reflected authentic narratives.

Implications

This study offers several implications for the design and implementation of DHTs in maternal care: 1) Co-designing digital health tools with end users including nurses and midwives can improve system usability and clinical relevance; 2) Structured, hands-on training is essential to build user confidence and foster effective utilization; 3) Institutional policies should formally integrate digital health systems into routine workflows, with clear role definitions and leadership support; 4) Investments in internet infrastructure and technical support are needed to bridge digital divides in both urban and rural settings; and 5) Policymakers should consider embedding digital maternal health tools within broader health system strengthening initiatives, ensuring alignment with national goals and resource availability. These insights are particularly relevant for LMICs seeking to scale up digital health strategies for maternal and newborn care in resource-constrained environments.

Conclusion

Digital health technology offers an opportunity to strengthen continuity of care for high-risk pregnant women in Lao PDR. Health professionals perceive such tools as useful and acceptable, but successful adoption depends on addressing barriers to usability, institutional support, and clinical integration. Applying the Technology Acceptance Model, this study provides insight into readiness for digital transformation in maternal care and identifies key conditions for sustained implementation.

Ethics approval and consent to participate

In this study, after coordination with the relevant authorities and obtaining the consent and approval of the participants, the data collection process was conducted. There was also confidentiality observed. All participants also provided written informed consent. The authors confirm that all data collections were performed in accordance with relevant guidelines and regulations. The authors confirm that the research protocols were approved by the Ethics Committee of Institutional Review Board Faculty of Nursing Mahidol University, Thailand (Ethical Code: COA No.IRB-NS2023/807.1409) and National Ethics Committee for Health Research, Ministry of Health, Lao People's Democratic Republic (Ethical Code: 76/NECHR) which under the main project of "Exploring the situation and acceptability of digital technology system for continuing care in high-risk pregnant women at Vientiane Prefecture, Lao People's Democratic Republic: Mixed-methods study".

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Data availability

The datasets used and/or analyzed during the current study are available from the corresponding author upon reasonable request.

CRediT authorship contribution statement

Metpapha Sudphet: Writing – review & editing, Validation, Data curation, Conceptualization. **Sasitara Nuampa:** Writing – original draft, Visualization, Validation, Supervision, Software, Resources, Project administration, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization. **Sudaporn Payakkaraung:** Writing – review & editing, Validation, Methodology, Formal analysis, Data curation, Conceptualization. **Manassawee Srimoragot:** Writing – review & editing, Visualization, Methodology, Formal analysis, Data curation, Conceptualization. **Lamngeun Silavong:** Writing – review & editing, Validation, Resources, Data curation, Conceptualization. **Soukdavone Souksavath:** Writing – review & editing, Validation, Resources, Data curation.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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