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Evaluating Mobile Palliative End-of-Life Advanced Care Enhancement (M-PEACE) Usability and Technology Acceptance: Mixed-Methods Design

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Abstract

Palliative End-of-Life Care (PEoLC) is a process requiring timely assessment, effective communication, and person-centered decision-making to support patients and families. Although the process can be strengthened through digital health innovations such as Mobile Palliative End-of-Life Advanced Care Enhancement (M-PEACE), its use in PEoLC remains limited. Therefore, this study aimed to evaluate M-PEACE usability and technology acceptance through an explanatory sequential mixed-methods design and explore user experiences in describing quantitative results. The quantitative phase was conducted to assess usability through an adapted System Usability Scale (SUS), and technology acceptance was measured using a modified Technology Acceptance Model (TAM) questionnaire. A total of 106 respondents (median age = 46.5 years) who participated were selected using convenience sampling. The results showed that internal consistency of the modified instruments was excellent (Cronbach's α = 0.865–0.980). Quantitative analysis showed high agreement across usability, functionality, reliability, and transportability domains (median = 4). Perceived usefulness, ease of use, attitudes, behavioral intention, and trust were also high (median = 4–5). In line with the methodological procedures, the qualitative phase was conducted through semi-structured interviews with patients, family caregivers, and nurses to help explain and deepen the quantitative results. Thematic analysis identified three themes, namely (1) Positive Experience with the Application (user-friendly interface, easy access), (2) Perceived Benefits (motivation booster, better symptom monitoring, enhanced quality of life and dignity at end of life, improved self-care ability), and (3) Improvements Needed (reminders, simpler language, cross-platform access, additional tools, offline functionality). Overall, the integration of quantitative and qualitative results suggested that M-PEACE showed strong usability and acceptance, indicating substantial potential for incorporation into PEoLC service delivery.

Keywords: end-of-life care, mobile health application, palliative care, system usability scale, technology acceptance model

Abstrak

***Evaluasi Usabilitas dan Penerimaan Teknologi* Mobile Palliative End-of-Life Care Enhancement *(M-PEACE): Penelitian* Mixed-Methods.** Palliative End-of-Life Care *(PEoLC) memerlukan asesmen yang tepat waktu, komunikasi yang efektif, serta pengambilan keputusan berpusat pada pasien untuk mendukung pasien dan keluarga. Inovasi kesehatan digital seperti* Mobile Palliative End-of-Life Advanced Care Enhancement *(M-PEACE) berpotensi memperkuat proses tersebut, namun pemanfaatannya dalam layanan PEoLC masih terbatas. Studi ini menggunakan desain* mixed-methods sequential explanatory *untuk mengevaluasi usabilitas dan penerimaan teknologi M-PEACE serta memahami pengalaman pengguna yang menjelaskan temuan kuantitatif. Fase kuantitatif menilai* usability *menggunakan* System Usability Scale (SUS) *yang telah diadaptasi dan mengukur penerimaan teknologi menggunakan kuesioner* Technology Acceptance Model (TAM) *yang dimodifikasi. Sebanyak 106 responden (usia median = 46,5 tahun) berpartisipasi dalam penelitian ini dan dipilih menggunakan teknik* convenience sampling*. Konsistensi internal instrumen yang dimodifikasi sangat baik* (Cronbach's α = 0,865–0,980). *Hasil kuantitatif menunjukkan tingkat persetujuan yang tinggi pada domain* usability, functionality, reliability*, dan* transportability (median = 4). *Persepsi kegunaan, kemudahan penggunaan, sikap, niat perilaku, dan kepercayaan juga tinggi* (median = 4–5)*. Fase kualitatif dilakukan setelahnya melalui wawancara semi-terstruktur dengan pasien, keluarga, dan perawat untuk menjelaskan dan memperdalam hasil kuantitatif. Analisis tematik mengidentifikasi tiga tema utama: (1) Pengalaman Positif dengan Aplikasi (antarmuka mudah digunakan, akses mudah); (2) Manfaat yang Dirasakan (peningkatan motivasi, pemantauan gejala lebih baik, peningkatan kualitas hidup dan martabat di akhir hayat, peningkatan kemampuan perawatan mandiri); dan (3) Perlu Perbaikan (fitur pengingat, penyederhanaan bahasa, akses lintas platform, tambahan fitur, fungsi* offline*). Secara keseluruhan, temuan terintegrasi menunjukkan bahwa M-PEACE memiliki* usability *dan penerimaan yang kuat serta berpotensi besar untuk diintegrasikan ke dalam layanan PEoLC.*

Kata Kunci: *aplikasi kesehatan seluler, model penerimaan teknologi, perawatan akhir hayat, perawatan paliatif, skala kegunaan sistem*

Introduction

Chronic diseases are often associated with progressive physical limitations, reducing an individual's ability to perform daily activities independently, leading to dependence on long-term care (LTC) services (Agustini et al., 2025; Osei & Mashamba-Thompson, 2021). LTC refers to continuous supportive care provided to individuals with chronic conditions who require assistance with activities of daily living over an extended period. These conditions can generate feelings of helplessness and hopelessness, thereby reducing both quality of life and death. Although LTC and Palliative End-of-Life Care (PEoLC) focus on improving quality of life, both have distinctive features and complementary concepts. LTC primarily focuses on sustained functional support and assistance with daily living, while PEoLC emphasizes patient-centered care that prioritizes symptom management, autonomy, comfort, as well as the fulfilment of biopsychosocial and spiritual needs to support a dignified death (Prado et al., 2022). However, the delivery of PEoLC in many settings, including Indonesia, remains suboptimal due to the absence of empirically tested models and insufficient integration of cultural considerations. Cultural dimensions such as family authority in decision-making, religious beliefs, and culturally shaped perceptions of suffering and death also influence patient care preferences (Nuuyoma et al., 2024; Paiva et al., 2022). Despite the urgent need, clinical practice for chronic diseases and LTC continues to emphasize physical aspects, with limited attention on psychological, emotional, and cultural burdens.

Globally, only 14% of patients who need PEoLC receive the required care. This is extremely below the standard 76%, posing challenges to achieving the Sustainable Development Goals, particularly SDG 3 on universal access to essential health services (Connor et al., 2025). To address these challenges, digital health technologies have been developed to support symptom reporting and communication, with a potential increase in serious disease care. However, several applications show usability limitations, insufficient accessibility, and inadequate attention to operability, literacy, and emotional sensitivity (Darley et al., 2023). For example, the System Usability Scale (SUS) and the Technology Acceptance Model (TAM) often fail to capture emotional burden, cultural norms, caregiver stress, and family-driven decision-making that characterize PEoLC contexts (Adams et al., 2025; Dilhani et al., 2024; Saeed et al., 2025).

Although digital innovations have increasingly been introduced in palliative care, evaluations typically focus on feasibility or clinical outcomes rather than rigorously examining user experience through contextually adapted frameworks. In various healthcare settings, palliative nursing practice has not fully integrated cultural values into care models, contributing to gaps in patients' autonomy, communication, and culturally sensitive caregiving (Nuuyoma et al., 2024). The concern is also relevant in Indonesia, a culturally diverse country where family-centered decision making, spiritual beliefs, and sociocultural perceptions of suffering and death strongly shape end-of-life experiences. Despite these cultural influences, culturally responsive palliative care models remain limited, showing the need for methods that adequately integrate cultural values into nursing practice. In this context, the Mobile Palliative End-of-Life Advanced Care Enhancement (M-PEACE) has been developed to address critical needs in PEoLC, particularly in relation to symptom assessment, communication, caregiver guidance, and decision support.

In clinical practice, nurses play a central role in using digital health technologies to monitor pa-

tient symptoms, facilitate communication between patients, families, and multidisciplinary teams, and provide timely education and support for caregivers. Therefore, technology-based tools such as mobile health applications can enhance the ability to deliver coordinated, patient-centered palliative care while improving accessibility of care and continuity of support. However, the usability and acceptability of M-PEACE have not been evaluated through culturally adapted tools that show Indonesian caregiving norms, emotional experiences, and literacy levels. Recent studies show that conventional usability assessment methods often lack cultural responsiveness, which is insufficiently sensitive to the emotional and clinical complexities in PEoLC (Blanes-Selva et al., 2023).

To fill the knowledge gap in existing literature, this study is carried out by adapting and validating a culturally contextualized SUS and a modified TAM specifically designed for digital palliative care applications. The novelty of this study is in the incorporation of constructs not traditionally included in usability frameworks, such as caregiver readiness, digital sensitivity, perceived compassion support, and culturally embedded communication dynamics. By grounding the evaluation within a transcultural nursing framework, the analysis recognizes the influence of family systems, religious beliefs, and cultural perspectives on suffering and dignified death. Using an explanatory sequential mixed-methods design, expert adaptation, psychometric testing, and real-world field evaluation are integrated to establish a rigorous, context-sensitive model for assessing M-PEACE. The results are expected to contribute significantly to the development of culturally inclined, emotionally responsive, and clinically relevant digital innovations that enhance the quality of life and death, thereby supporting the vision toward Golden Indonesia 2045 through improved and holistic PEoLC.

Methods

Study Design. This study used an explanatory sequential mixed-methods design, where an initial quantitative phase was followed by a qualitative phase, as shown in Figure 1. The quantitative phase evaluated the usability and technology acceptance of M-PEACE. Mean-while, the qualitative phase explored users' experiences to further explain and enrich the quantitative outcomes. The results were reported in accordance with the Good Reporting of a Mixed-Methods Study (GRAMMS) guideline.

Setting and Participants. Respondents were recruited through convenience sampling from a hospital-based palliative care service in Bali, Indonesia, providing inpatient consultation, outpatient follow-up, and coordination of home-based support. Eligible respondents included palliative care patients, family caregivers, and nurses included in the provision of palliative services who had used M-PEACE at least once. Recruitment occurred during routine consultations and follow-up visits. Eligibility criteria were defined separately for the quantitative and qualitative phases of the explanatory sequential mixed-methods design. Inclusion criteria for the quantitative phase were (1) adults aged ≥18 years, (2) patients receiving palliative care, family caregivers, or nurses included in the services, (3) ability to communicate verbally, and (4) previous use of M-PEACE at least once. Exclusion criteria were patients with unstable clinical conditions that could interfere with participation or the inability to complete the questionnaire. Sample size estimation followed psychometric guidelines, recommending 5-10 respondents per questionnaire item for instrument evaluation. Due to feasibility constraints and the limited number of active users during the study period, 106 respondents were recruited, which was considered acceptable for preliminary reliability and validity testing. Since the primary design was to support patient and family engagement in palliative care management, most users were patients and family caregivers. Although nurses working in the service were invited to participate, only one nurse had actively used M-PEACE and met the inclusion criteria, leading to a final sample predominantly composed of patients and family caregivers. Low nurse participation

showed the early phase of implementation of the application, where the integration into routine clinical workflows was still evolving.

Eligible respondents comprised palliative care patients, family caregivers, and nurses included in service provision who had used M-PEACE at least once. Recruitment occurred during routine palliative care consultations and follow-up visits. The limited number of nurses did not compromise the primary objectives of this study, as the main outcomes, quality of life and death, were primarily assessed from patient and family caregiver perspectives. For the qualitative phase, 15 respondents were purposively selected from the quantitative sample to represent variation in user roles and experiences with the application. Inclusion criteria for the qualitative phase were (1) participation in the quantitative survey, (2) previous experience using M-PEACE, and (3) willingness to participate in a semi-structured interview.

Measurement. The questionnaire consisted of 42 items divided into two main domains, namely usability (24 items) and technology acceptance (18 items). Usability items were adapted from the SUS framework, covering six subdomains. These included usability (5 items), functionality (5 items), transportability (3 items), validity (3 items), reliability (3 items), and user views (5 items). Technology acceptance was assessed through a modified version of the TAM, including perceived usefulness (4 items), perceived ease of use (PEOU) (5 items), attitude toward using (3 items), behavioral intention (BI) to use (3 items), as well as trust, reliability, and acceptance (3 items). All items were measured with a five-point Likert scale ranging from 1 = strongly disagree to 5 = strongly agreed. Domain scores were calculated by summing the responses of the corresponding items. Higher scores showed better perceived usability and stronger technology acceptance of M-PEACE. For interpretation, higher median scores within each domain showed more positive user perceptions regarding system usability, functionality, reliability, and acceptance. Internal consistency reliability of each domain was assessed using Cronbach's alpha, with values ≥ 0.70 considered acceptable for psychometric instruments. Quantitative data was collected after participants had used M-PEACE through self-administered questionnaires. The data observed were analyzed descriptively and psychometrically, including reliability and validity testing. Subsequently, semi-structured interviews were conducted in the qualitative phase to explore users' perceptions, challenges, and expectations related to the application. Interviews were transcribed verbatim and evaluated through thematic analysis following the framework proposed by Braun and Clarke, which comprised six phases: familiarization with the data, generation of initial codes, searching for themes, reviewing themes, defining, and naming, as well as producing the final report. To ensure the rigor of the qualitative results, strategies for trustworthiness were applied following the criteria proposed by Lincoln and Guba, including credibility, dependability, confirmability, and transferability.

M-PEACE is an Android-based mobile health (mHealth) application developed to support patients receiving palliative care, family caregivers, and healthcare professionals in monitoring health conditions and facilitating end-of-life care planning. As shown in Figure 2, M-PEACE integrates several core modules. The symptom management module enables users to record and monitor physical symptoms and health conditions. The spiritual and family support module provides guidance and resources addressing psychosocial and spiritual needs. The end-of-life planning module supports advance care planning, helping patients and families reflect on care preferences and decisions. Furthermore, the quality-of-life monitoring module allows users to regularly assess perceived well-being during the palliative care trajectory. The quality-of-death assessment module enables evaluation of end-of-life experiences using a simplified rating scale. Information entered into the application can assist healthcare providers in monitoring patient conditions and facilitating communication with

patients and families. Through these integrated features, M-PEACE aims to strengthen communication, promote informed decision-making, and enhance quality of life and end-of-life care.

In this study, M-PEACE was designed to support person-centered and family-supported palliative care, particularly in settings with limited continuous face-to-face monitoring.

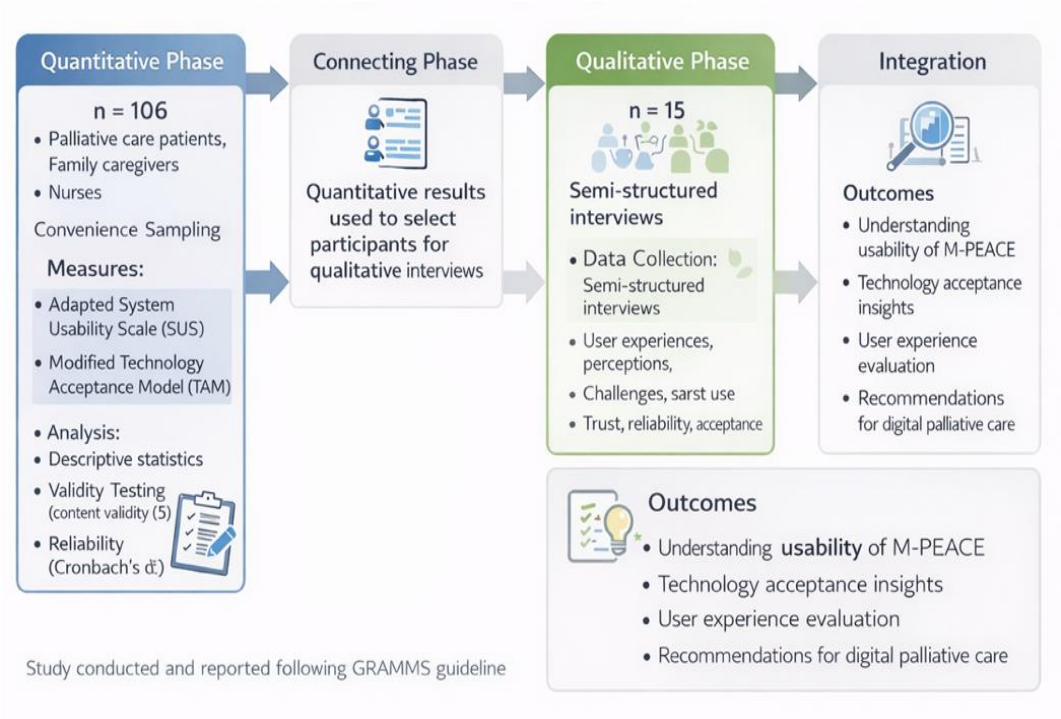


Figure 1. Explanatory Sequential Mixed-Methods Design

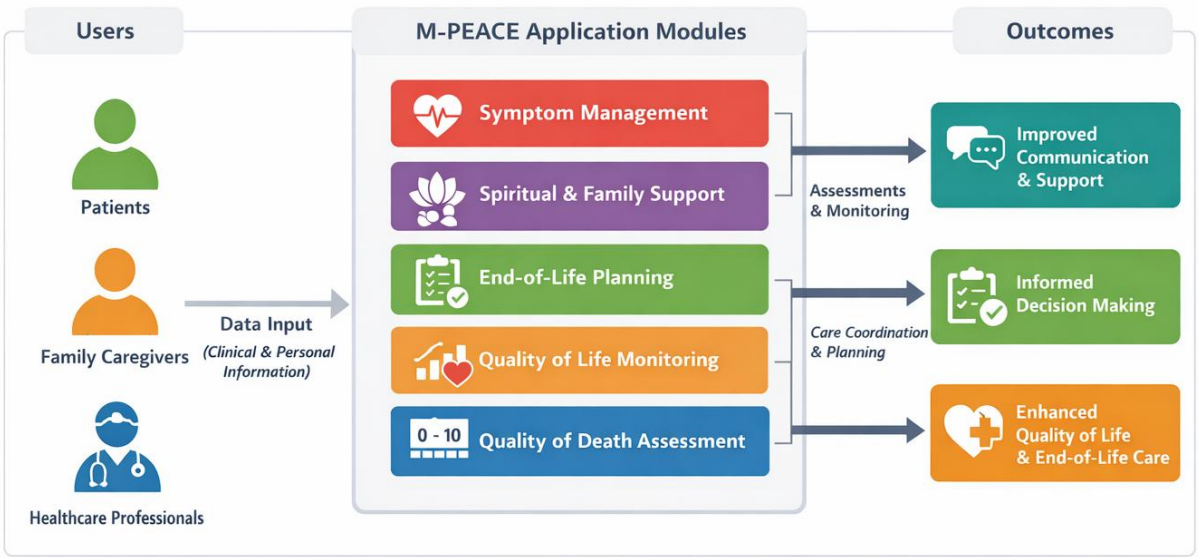
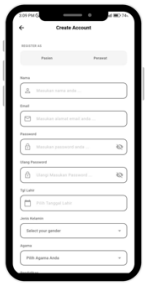
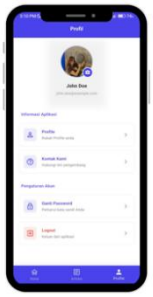


Figure 2. M-PEACE Workflow

Table 1. Features and Functions of M-PEACE

Feature/Interface	Description
Account Registration  	Users create a new account by entering basic information (full name, email address, phone number, and password) and selecting the user category (patient, family member, or healthcare provider). Account activation is completed through a verification code sent via SMS or email.
User Login  	Registered users access the application by entering their email address and password through the "Get Started Now" menu on the main page.
User Dashboard and Medical Information   	After login, users are directed to the dashboard where they enter clinical information, including diagnosis, date of diagnosis, current disease status, history of medical care (hospitalization, outpatient visits, emergency visits, and procedures), medication history, and allergy history.
Main Menu 	Provides access to the main application features, including Physical and Psychosocial Complaints, Spiritual Support, Family Support, Quality of Death, End-of-Life Planning, and Quality of Life Monitoring.
Profile Management	Allows users to edit their profile information, contact the development team, change passwords, and log out of the application.

Feature/Interface	Description
	
End-of-Life Planning 	Enables users to document preferences related to advanced care planning, spiritual needs, and funeral arrangements.
Quality of Life Monitoring 	Provides a structured rating scale to monitor and track the user's perceived quality of life and health status over time.
Quality of Death Assessment 	Includes a 0–10 rating scale designed to evaluate perceptions of quality of death and end-of-life experience.
Support Features	Dedicated pages provide guidance and support related to family inclusion, spiritual needs, and physical and psychosocial symptom management.

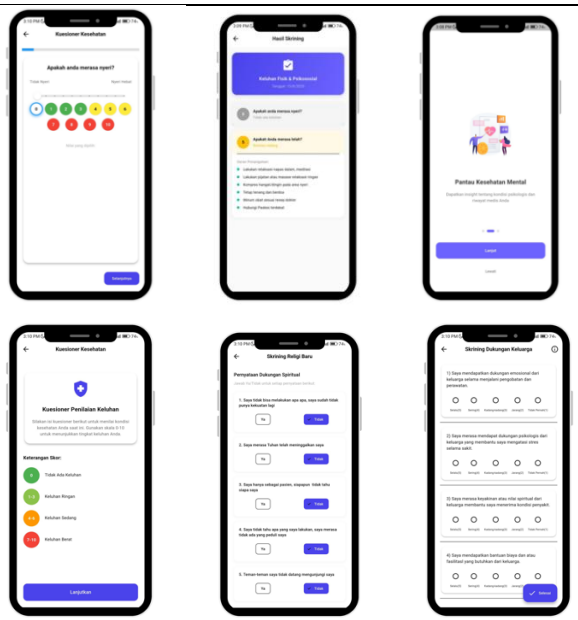
Feature/Interface	Description
	

Table 2. Internal Consistency of the Modified Questionnaire of Usability, Functionality, and Technology Acceptance of M-PEACE

Item	Number of items	Cronbach's Alpha
Usability	5	0.865
Functionality	5	0.895
Transportability	3	0.922
Validity	3	0.866
Reliability	3	0.907
User Views	5	0.924
Total Usability	24	0.967
Perceived Usefulness (PU)	4	0.935
Perceived Ease of Use (PEOU)	5	0.961
Attitude Toward Using (ATU)	3	0.930
Behavioral Intention to Use (BI)	3	0.913
Trust, Reliability & Acceptance	3	0.921
Total Technology Acceptance	18	0.980

Table 3. Demographic Characteristics of Participants Using M-PEACE

Characteristics	n	%
Age		
18-21	4	3.8
22-59	92	86.8
60+	10	9.4
Age as a numeric	Median (46.5)	Range (14-76)
Gender		
Male	44	41.5
Female	62	58.5
Education		
No formal school	1	0.9

Characteristics	n	%
Elementary school	10	9.4
Junior high school	13	12.3
Senior high school	52	49.1
University	30	28.3
Roles		
Nurses	1	0.9
Family	64	60.4
Patient	41	38.7

Table 4. Usability and Technological Acceptance Score of M-PEACE among Respondents

Items	Median (Range)
Score on the Usability	
Usability	20 (12-25)
Functionality	20 (9-25)
Transportability	12 (6-15)
Validity	12 (7-15)
Reliability	12 (6-15)
User Views	20 (9-25)
Score on Technological Acceptance	
Perceived Usefulness (PU)	16 (6-20)
Perceived Ease of Use (PEOU)	20 (6-25)
Attitude Toward Using (ATU)	12 (3-15)
Behavioral Intention to Use (BI)	12 (6-15)
Trust, Reliability & Acceptance	12 (6-15)

Ethical Consideration. Ethical approval was obtained from the Institutional Ethics Committee under approval number 096/EA/KEPK.RSBM. DISKES/2025. All respondents received verbal and written information on the study purpose, procedures, risks, and confidentiality protections. This was followed by the provision of written informed consent. Throughout both phases, participants' rights, including autonomy, voluntary participation, privacy, and the freedom to withdraw at any time, were strictly upheld.

Results

The adapted SUS and modified TAM showed excellent internal consistency, with Cronbach's α-values ranging from 0.865 to 0.980. Specifically, usability domains, including usability, functionality, reliability, and transportability, showed α-values between 0.865 and 0.924, while technology acceptance domains had stronger reliability (α = 0.913-0.961). Total usability and total technology acceptance scales reported an α-value of 0.967 and 0.980, respectively, confirming very high internal consistency and stability of the instruments in this population (Table 2).

A total of 106 respondents participated in the quantitative phase, with a median age of 46.5 years (range 14-76), predominantly consisting of females (58.5%). The majority were family caregivers (60.4%), followed by patients (38.7%), and one nurse (0.9%). Educational backgrounds varied from no formal schooling to university-level education, showing wide heterogeneity in participant literacy levels (Table 3).

Respondents showed positive evaluations of M-PEACE. Satisfaction was high, with strong intentions to continue using and provide recommendations. Technological acceptance was similarly strong, as participants agreed that the application improved monitoring, communication, and caregiving efficiency. Table 4 shows the median scores as well as ranges for usability and

technological acceptance among respondents. Based on the results, M-PEACE showed high usability, with median scores reaching the upper range across key domains, including usability, functionality, transportability, validity, reliability, and user views. Usability and functionality each achieved median scores of 20, showing positive user evaluations of system performance and ease of interaction. Regarding technological acceptance, PEOU showed the highest median score (20), suggesting that respondents found the application intuitive and easy to navigate. Perceived Usefulness (PU) also had a high median score (16), suggesting users' perceptions that M-PEACE was beneficial in supporting palliative care activities. Positive attitudes toward using the application (ATU) and strong BI to use had median scores of 12, which showed favorable acceptance and willingness to continue using M-PEACE. These results suggest that the application is both highly usable and well accepted, supporting the potential for sustained adoption in palliative care setting.

Theme 1: Positive Experience with M-PEACE. Respondents expressed positive impressions of M-PEACE interface and accessibility. The majority appreciated the user-friendly design, describing the layout as simple, clear, and easy to navigate.

Subtheme 1: User-Friendly. Respondents showed M-PEACE's user-friendly design as a key factor shaping their positive experience. The interface was consistently described as simple, intuitive, and easy to navigate, reducing cognitive effort and supporting quick access to information.

"The display is user-friendly." (Female family of 32 years)

> *"What I like about the M-PEACE application is that the interface is simple. Therefore, it is not complicated when trying to find certain features or information." (Female family of 20 years)*

Subtheme 2: Easy Access. Respondents showed appreciation for the convenience, availability, and interactive features of M-PEACE. Interactive answer-selection features further enhanced engagement, making the experience more dynamic and promoting active participation, better understanding, and improved adherence to care routines.

> *"Easy to access and easy to understand." (Female family of 14 years)*

> *"Can be accessed anytime without needing to open many other applications." (Male family of 50 years)*

> *"The way of selecting answers is interactive and not monotonous." (Male family of 21 years)*

Theme 2: Perceived Benefit. Respondents identified several benefits of using M-PEACE. The application served as a motivation booster, providing encouragement and accessible health information. Caregivers also experienced enhanced self-care ability and greater confidence in managing patient needs at home through the practical guidance.

Subtheme 1: Motivation Booster. M-PEACE enhanced users' emotional readiness and willingness to engage in palliative care. Based on the reports, respondents perceived that the application increased motivation by pro-viding accesssible, reliable health information and offering encouragement during difficult care situations.

> *"Increases motivation and helps in finding health information." (Female patient of 43 years)*

> *"The main benefit of this application is understanding palliative care and receiving support in palliative care recovery." (Female family of 20 years)*

Subtheme 2: Ease of Monitoring Patient Condition. M-PEACE supported caregivers and pa-

tients in understanding as well as tracking their health status. By providing clear health information, the application also improved shared understanding between patients and families, improving communication and supporting continuity of palliative care.

> *"Makes it easier to monitor the patient's condition." (Female family of 32 years)*

> *"Helps me understand my disease and my health information." (Female patient of 37 years)*

Subtheme 3: Monitor and Improve Quality of Life. M-PEACE helped users to assess and understand overall well-being. The results showed that the application allowed respondents to recognize physical, emotional, social, and functional changes, requiring attention and supporting more proactive caregiving.

> *"Knowing the patient's quality of life." (Male family of 31 years)*

> *"Can identify quality of life to make significant improvement." (Female patient of 55 years)*

Subtheme 4: Enhancing Dignified Death. Respondents perceived M-PEACE as supporting emotional, spiritual, and practical needs at the end of life. The application also promoted a dignified death by providing clear information, structured assessments, and guidance, reducing fear and uncertainty.

> *"Helps promote a dignified death." (Male patient of 55 years)*

Subtheme 5: Increase Self-Care. M-PEACE strengthened caregivers' as well as patients' skills and confidence in managing care at home. By improving skills and confidence, the application enhanced patient comfort, reduced caregiver burden, and promoted continuity of care.

> *"Can learn how to take care of patients at home." (Female family of 50 years; Female patient of 54 years; Female patient of 55 years)*

Theme 3: Improvement Needed. Respondents recommended improvements, including reminder features, simpler language, multi-device compatibility, and offline access. Others included the provision of educational materials, clearer user guides, disease explanations, and communication tools for contacting health professionals to enhance usability and support diverse users' needs.

Subtheme 1: Reminder. The subtheme shows the desire of respondents for proactive support. Users recommend adding flexible reminders or notifications to maintain consistency with monitoring, caregiving tasks, and app engagement.

> *"It would be very good if the application could later be equipped with a reminder or notification feature that can be used in various situations." (Female family of 20 years)*

Subtheme 2: Language Improvement. The improvement of language showed the need for clearer, more accessible wording within M-PEACE. Respondents recommended simpler and more user-friendly terminology to ensure confidence, equitable access, and effective use of the application.

> *"The language used should be easier to understand." (Male family of 50 years)*

> *"There are some sentences and words that need improvement." (Female patient of 55 years)*

Subtheme 3: Not Only for Android. Respondents raised concerns about limited access to the application. Users emphasized the need for M-PEACE to be available on all devices, suggesting that Android-only compatibility created digital inequality, as timely and inclusive access remained essential in palliative care.

> *"To make it easier to access on all devices."*

(Female patients of 55 years)

"Maybe it can be accessed on all types of phones." (Male family of 44 years)

Subtheme 4: Additional Features. Respondents requested educational modules, clearer user guides, disease explanations, and communication features with health professionals. Users considered these additions essential for improving confidence, decision-making, and continuity of home-based care.

"Add educational features." (Female family of 50 years)

"Add a user guide menu for new users." (Female patient of 45 years)

"Hopefully, a feature can be added to communicate with doctors/nurses at the hospital." (Male nurse of 45 years)

"There should be explanations about diseases." (Male family of 54 years)

Subtheme 5: Accessible Without Internet. The access without internet subtheme showed users' need for M-PEACE to function even without an internet connection. Users emphasized that the application must remain dependable, without considering internet access.

"Can be used when there is no internet connection." (Female patients of 54 years)

"Can be accessed without internet." (Female family of 23 years)

Discussion

This study examined the usability, acceptance, and user experience of M-PEACE as a digital innovation in PEoLC. The results from both quantitative and qualitative phases showed strong acceptance, highly perceived usefulness, and positive emotional responses, showing that the application served as a feasible and meaningful tool to support patients, caregivers, and nurses within home-based and community palliative settings.

Users reported minimal cognitive burden, emphasizing clarity, readability, and straightforward functions and features, consistent with principles that reduced mental effort and strengthened engagement in palliative care (Finucane et al., 2021). The interface's simplicity fostered confidence, particularly among users with limited digital literacy. This is in line with the evidence that visual clarity, consistent navigation, and simplified task flows enhance acceptance among older adults and caregivers managing complex diseases (Tan et al., 2024; Wicki et al., 2024). Previous studies showed that culturally adapted digital platforms with minimal technical demands could support equitable adoption across age, education, and socioeconomic groups (Kruse et al., 2019; Taylor et al., 2022). Respondents further appreciated the smoothness of information-seeking during emotionally stressful moments, showing that intuitive interfaces reduced cognitive overload. The interactive answer-selection format, reported to reduce monotony and increase focus, replicated the results that interactive mechanisms enhanced engagement and sustained attention, particularly for users experiencing fatigue or emotional strain (Cucciniello et al., 2021; Wei et al., 2020).

The PU results showed a strong correlation that M-PEACE enhanced caregiving by improving monitoring, communication, and decision-making. Users valued the ability to support efficient symptom checks, provide structured guidance, and deliver reliable information. This is consistent with TAM principles that usefulness drives technology adoption. Qualitative insights reinforced these results, suggesting high preparedness, reduced uncertainty, and better understanding of patient needs. The results are in accordance with digital tools offering real-time information and structured assessments, which strengthen caregiver self-efficacy and timely decision-making in home-based palliative care

(Wicki et al., 2024). Studies in digital palliative care similarly reported that a mobile application capable of integrating symptom alerts, educational content, and care coordination functions significantly improved care efficiency and reduced caregiver burden (Agarwal et al., 2021; Nezamdoust et al., 2022). Reports also showed that digital tools with real-time tracking features positively influenced families' ability to detect early symptom deterioration, promote rapid response, and enhance communication with health professionals (Zhai et al., 2023). The capacity of M-PEACE to consolidate essential information in a culturally sensitive format shows correlation with digital interventions to strengthen users' trust, meaning-making processes, and caregiving confidence. Several users described M-PEACE as helpful in supporting quality of life and dignified death, suggesting broader psychosocial-spiritual value beyond routine monitoring. This dimension resonates strongly with culturally grounded palliative care frameworks. Another study reported that digital tools integrating psychosocial-spiritual elements could foster emotional preparedness, enhance family communication, and support values-based decision-mak ing at the end-of-life (Nysaeter et al., 2024; Skomakerstuen Ødbehr et al., 2025). Furthermore, applications that enhance prognostic awareness, symptom comprehension, and emotional guidance have been shown to improve the perceived quality of dying and reduce existential distress among caregivers (Laranjeira et al., 2022). These results show that the application functions as a technical support system and an instrument influencing broader dimensions of holistic palliative care.

Positive attitudes toward M-PEACE were shown in both quantitative scores and qualitative narratives, with respondents reporting satisfaction, emotional comfort, and reassurance while using the platform. In line with TAM, these attitudes were influenced by high perceptions of usefulness and ease of use. Previous studies showed that empathetic, culturally sensitive, and intuitive digital interfaces strengthened emotional acceptance in palliative care (Arendse et al., 2025; Finucane et al., 2021). The emotionally supportive design, particularly the structured communication pathways and personalized guidance, appeared to help users manage distress and uncertainty. This is similar to the results that symptom-monitoring tools enhance motivation and perceived control (Seibel et al., 2024). Simple navigation, predictable layouts, and supportive language helped reduce user anxiety, correlating with evidence that compassionate digital design fosters psychological safety and trust. The description of the application as studies showing digital tools enhance emotional preparedness and communication, thereby supporting both functional and emotional needs in palliative care.

BI results showed strong user commitment to continue usability, explore more features, and recommend to others. This is consistent with TAM, where BI is influenced by usefulness, ease of use, and positive attitudes. Users considered M-PEACE a reliable caregiving companion that reduced burden and supported timely decisions. Similar patterns have been documented in digital interventions, where perceived benefits directly enhance caregivers' willingness to adopt and integrate digital tools into long-term care routines (Osei & Mashamba-Thompson, 2021; Taylor et al., 2022). These results suggest strong potential for M-PEACE to be incorporated into routine palliative work-flows. Trust is one of the strongest domains, with participants expressing high confidence in content accuracy and reliability. Specifically, trustworthiness is critical in palliative care, where caregivers often depend on digital guidance to make emotionally significant decisions. Users appreciated the accuracy of educational materials and the consistency of system performance, supporting the value of credible and dependable digital health tools (Tan et al., 2024; Wicki et al., 2024). High acceptance scores further show that respondents considered the application as a supplemental technology and an integrated component of their caregiving practice. This degree of acceptance suggests an opportunity for the application to enhance nursing workflows, strengthen communication between care partners, and sup-

port continuity of care across settings.

This study provides important implications for the design and implementation of digital decision-support tools in palliative care. These results support the application of the TAM in palliative care settings, emphasizing usability as a critical determinant of engagement. Practically, the application shows the potential of culturally adapted, user-centered digital platforms to enhance equitable access to palliative care information, support shared decision-making, and reduce cognitive overload for patients and caregivers. For educators and developers, the results show the value of integrating interactive features and clear visual design to sustain attention and usability in emotionally sensitive healthcare contexts. However, several limitations should be considered when interpreting the results. These included the sample size, which was relatively small for full-scale validation and could limit the generalizability of the results, despite adequate preliminary psychometric and usability evaluation. This study depended on self-reported measures, which were subject to response and social desirability biases. The cross-sectional design did not allow for assessment of long-term use, sustained engagement, or behavioral outcomes. Furthermore, the analysis focused primarily on PEOU, with limited emphasis on other TAM constructs such as perceived usefulness, BI, and actual system. To address these limitations, future studies should include larger, more diverse samples and longitudinal designs to confirm the results and evaluate the broader impact of M-PEACE on palliative care out-comes.

Conclusion

This study shows that the M-PEACE is a feasible and acceptable digital tool to support PEoLC. The application enhances motivation, self-care ability, and emotional comfort among users. The results show the potential role of digital health technologies in supporting palliative care within the local cultural context, where family inclusion, emotional support, and spiritual considerations are integral components of end-of-life care. In this context, tools like M-PEACE can facilitate communication, shared decision-making, and culturally sensitive care planning among patients, families, and healthcare providers. From a practical perspective, the application also serves as a supportive tool for nurses and palliative care teams to enhance symptom monitoring, patient education, and communication with families, particularly in home-based and community palliative care settings. The integration of simple and culturally sen-sitive digital platforms into palliative services may help extend care beyond clinical encounters and support continuity of care. In line with the analysis, M-PEACE shows significant potential to support compassionate, person-centered palliative care. Moreover, further studies are recommended to examine the longterm impact of M-PEACE and explore the broader applicability across different healthcare settings and cultural contexts.

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Data Availability Statement

The data sets generated and analyzed during the study are not publicly available due to confidentiality and ethical restrictions related to sensitive palliative care data but are available from the corresponding author on reasonable request.

Author Contributions

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tualization, Methodology, Investigation, Data Curation, Formal Analysis, Writing-Original Draft, Project Administration. **I Gede Putu Darma Suyasa:** Methodology, Supervision, Validation, Writing Review & Editing. **Israfil Israfil:** Supervision, Validation, Writing Review & Editing.

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