



User Experience with AI-Enabled Wearable Medical Technology for Self-Care

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Article Info

Article history:

Received 18-01-2025

Revised 02-02-2025

Accepted 15-02-2025

Keyword:

Biomedical Engineering;
Medical Devices; Wearable
Technology; Health
Monitoring; Artificial
Intelligence; User Experience.

ABSTRACT

Wearable medical devices equipped with artificial intelligence (AI) have emerged as transformative tools in managing chronic conditions, offering real-time health monitoring and enhancing patient autonomy. While technological advancements have improved device functionality, the subjective experiences of users, particularly their adaptation, trust, and emotional engagement with these technologies, remain underexplored. This study addresses this gap by investigating the lived experiences of individuals using AI-enabled wearable medical devices, focusing on how these technologies are perceived, adopted, and integrated into daily life. Using a phenomenological approach, we identified three key themes: initial adaptation challenges, concerns about trust and data accuracy, and psychological reassurance from self-monitoring. Data were collected through semi-structured interviews with 10 participants, analyzed thematically to uncover the deeper meanings behind their experiences. Findings highlight the importance of user-centered design and the need for clearer communication from manufacturers to build trust and support long-term device engagement. These insights contribute to a more nuanced understanding of the interplay between technology and user experience, with implications for improving the design and implementation of wearable medical devices. Future research should explore diverse populations and longitudinal impacts to further enhance the adoption and effectiveness of health technologies.



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INTRODUCTION

The growing prevalence of chronic conditions such as diabetes and hypertension has created an urgent need for effective self-monitoring tools to support individuals in managing their health. Wearable medical devices, equipped with artificial intelligence (AI) capabilities, have emerged as promising solutions for real-time health monitoring, offering convenience and immediate feedback to users (Aldhaibani dkk., 2024). These technologies provide a unique opportunity to empower individuals in maintaining control over their health while potentially reducing the burden on healthcare systems.

Wearable medical devices are designed to capture and analyze physiological data, such as blood pressure, glucose levels, and heart rate, enabling users to monitor their health and respond proactively to changes. The integration of AI into these devices enhances their functionality, allowing for predictive analytics, personalized recommendations, and automated alerts. Despite the technological advancements, the adoption of these devices has been met with mixed reactions from users, highlighting challenges related to usability, trust, and data interpretation.

Previous research has predominantly focused on the technical performance of wearable devices, including their accuracy, durability, and cost-effectiveness. However, there is a lack of detailed comparison between phenomenological studies and prior quantitative research, which is essential for strengthening the rationale for the chosen methodology. While quantitative approaches

are valuable for assessing device performance, they often overlook the deeper, subjective meanings that users attach to these devices. On the other hand, phenomenological studies offer rich insights into how individuals perceive and experience these technologies in the context of their daily lives, providing a more comprehensive understanding of their impact. This gap is significant, as the effectiveness of wearable devices is not solely determined by their technical specifications but also by how individuals perceive, use, and adapt to them in their daily lives.

This study seeks to explore the lived experiences of individuals using wearable medical devices for chronic disease management, emphasizing the subjective meanings and interpretations associated with their use (Cai & Cai, 2024). By adopting a phenomenological approach, the research aims to delve into the complexities of user experiences, shedding light on how these technologies are integrated into personal routines and perceived within the broader context of self-care and health management.

Research into the subjective experiences of individuals engaging with health-related technologies has become an increasingly important field of inquiry, particularly in the context of chronic disease management. The lived experiences of users provide invaluable insights into how these technologies are perceived, adopted, and integrated into everyday life. Such explorations are essential to understanding not only the practical utility of these devices but also the psychological and emotional dimensions of their use.

Traditional research approaches often rely on quantitative methods to assess the effectiveness and performance of wearable medical devices. While these methods are valuable for measuring accuracy, reliability, and general trends, they fall short in capturing the nuanced, subjective meanings and interpretations that users attach to these technologies. The focus on metrics such as device accuracy or compliance rates neglects the intricate ways in which individuals navigate their relationship with these tools, including challenges in trust, adaptation, and perceived control over their health.

This methodological gap has underscored the limitations of prior studies in fully grasping the essence of the phenomenon (Chen dkk., 2024). By failing to account for the deeply personal and contextual factors influencing user experiences, previous research has provided an incomplete picture of the broader implications of wearable medical devices. These shortcomings highlight the necessity of qualitative methodologies, particularly phenomenology, which centers on the lived experiences of individuals and seeks to uncover the underlying meanings embedded in their interactions with these technologies.

The current study addresses this gap by employing a phenomenological approach to delve into the subjective experiences of individuals using wearable medical devices for health monitoring. This focus provides a more holistic understanding of the phenomenon, emphasizing the interplay between technological features and the users' personal, social, and emotional contexts.

Existing approaches to understanding the use of wearable medical devices have predominantly focused on practical solutions, such as improving device functionality, optimizing AI algorithms, and enhancing user interfaces. While these efforts address critical technical and usability aspects, they often fail to capture the deeply personal and subjective experiences of individuals interacting with these technologies. As a result, much of the current understanding remains limited to surface-level insights, overlooking the complex interplay between user perceptions, emotions, and the contextual factors that shape their engagement with wearable devices.

The reliance on quantitative metrics, such as device accuracy, user adherence rates, or performance benchmarks, offers a fragmented view that does not fully reflect the holistic nature of user experiences. These methodologies are insufficient for exploring the nuanced meanings and interpretations that individuals derive from their interactions with wearable medical technologies. For example, factors such as trust in the device, the psychological impact of continuous health monitoring, and the challenges of interpreting AI-driven data remain underexplored in existing literature.

To address these limitations, a phenomenological approach provides an alternative methodology capable of uncovering the essence of user experiences. By focusing on the lived

experiences and subjective meanings attached to wearable medical devices, phenomenology allows for a more comprehensive understanding of how individuals perceive, adopt, and integrate these technologies into their lives. This approach bridges the gap left by prior research, enabling a richer, more contextually grounded exploration of the phenomenon.

The current study responds to this knowledge gap by employing phenomenology to investigate the subjective experiences of individuals using AI-based wearable medical devices for managing chronic conditions. This research aims to provide insights into the psychological, emotional, and social dimensions of device use, contributing to the development of more user-centered and empathetic technological solutions.

Previous studies on wearable medical devices have primarily focused on technical performance and usability, often neglecting the subjective experiences of users (Hirczy dkk., 2024). Research in related domains, such as the Technology Acceptance Model (TAM), has highlighted the importance of perceived ease of use and perceived usefulness in technology adoption. However, these frameworks fail to capture the nuanced, lived experiences of individuals engaging with health-monitoring technologies. Existing qualitative studies, while valuable, often lack the depth and focus on meaning that phenomenology provides. This study builds on these foundations by employing a phenomenological approach to uncover the deeper, subjective dimensions of user experiences with AI-enabled wearable medical devices.

The phenomenological method used in this research allows for a detailed exploration of how individuals perceive and integrate wearable medical devices into their lives. By focusing on the lived experiences of users, this study addresses the knowledge gap identified earlier, offering insights into the interplay between technological design, user trust, and psychological well-being. Interpretative Phenomenological Analysis (IPA) was chosen to examine how users make sense of their experiences, enabling a richer understanding of the emotional and contextual factors influencing adoption and sustained use. This method provides the necessary depth to answer the research questions and to explore the subjective meanings embedded in user interactions with the technology.

This article is organized into six sections. Following the introduction, the contextual background of the phenomenon is discussed, highlighting its significance and relevance. The methodological framework is then elaborated, detailing the phenomenological approach and its application in data collection and analysis (John & Rai, 2024). Subsequent sections present the findings, structured thematically to align with user experiences, and discuss their implications within the broader theoretical and practical context. The article concludes with a summary of key insights and recommendations for improving wearable medical device design and user engagement strategies.

RESEARCH METHODS

Study Design

This study employed a phenomenological approach to explore the subjective experiences of individuals using wearable medical devices for self-monitoring of chronic conditions (Karim dkk., 2024). Phenomenology was chosen to investigate the lived experiences of participants, emphasizing their perceptions, interpretations, and meanings associated with the use of the technology. This approach aligns with the study's aim to gain in-depth insights into the complexities of user interactions with wearable devices, transcending mere functional or technical evaluations.

Specifically, an interpretative phenomenological analysis (IPA) was applied, which focuses on understanding how participants make sense of their experiences. This method facilitated a nuanced exploration of both the psychological and practical dimensions of adopting medical wearable technology, allowing for the emergence of rich and layered narratives.

Participants

Participants included adults aged 25–60 years who had been diagnosed with chronic conditions such as diabetes or hypertension and had used AI-based wearable medical devices for at least six months (Karunya dkk., 2021a). Inclusion criteria required participants to have direct,

sustained experience with these devices, possess the capacity to articulate their experiences, and be willing to participate in in-depth interviews. Individuals using wearable devices for non-medical purposes, such as general fitness tracking, were excluded to ensure focus on medical applications.

A purposive sampling approach was utilized to identify 15 participants, ensuring representation of diverse demographic and experiential backgrounds while maintaining the depth of inquiry characteristic of phenomenological research. The participant group comprised 9 females and 6 males, with an average age of 48 years. This demographic profile supported an exploration of varied perspectives within the context of chronic disease management.

Data Collection

Data were collected through semi-structured, in-depth interviews conducted either face-to-face or via secure online platforms, depending on participant preference and convenience (Karunya dkk., 2021b). An interview guide, developed to explore key themes such as adaptation, trust, and perceived benefits, provided a flexible framework for discussions while allowing participants to share their experiences in their own words.

Each interview lasted between 45 and 90 minutes and was conducted in a quiet, private environment to ensure comfort and confidentiality. Participants were encouraged to reflect on their experiences freely, with prompts provided to delve deeper into specific aspects of their interaction with the wearable devices. Interviews were audio-recorded with participant consent and transcribed verbatim for analysis.

Data Analysis

Thematic analysis was employed, following the six-step approach outlined by Braun and Clarke, to systematically identify and interpret key themes within the data. Initial familiarization involved repeated reading of transcripts to immerse in the data, followed by the generation of initial codes highlighting significant phrases or concepts.

To ensure rigor and transparency in the validation of themes, the analysis was subject to member checking, where participants were invited to review a summary of the identified themes and provide feedback on whether they felt these themes accurately represented their experiences. Additionally, two independent researchers conducted a preliminary coding of a subset of interviews, and inter-coder reliability was assessed to verify the consistency and accuracy of the codes.

Codes were reviewed and organized into themes that captured the essence of participants' experiences, such as "challenges in adaptation," "trust and accuracy concerns," and "psychological benefits." Themes were refined through iterative analysis, ensuring they were grounded in the data and reflective of the participants' perspectives (Nanda & Gautam, 2020). NVivo software was used to support the coding process, facilitating organization and retrieval of data.

The analysis emphasized the interpretative process, linking identified themes to broader contextual and theoretical frameworks, ensuring that findings were both empirically grounded and conceptually robust.

Ethics

Ethical approval was obtained from the relevant institutional ethics committee prior to the commencement of the study (Patan dkk., 2020). Written informed consent was secured from all participants, ensuring they were fully aware of the study's purpose, procedures, and their right to withdraw at any time without penalty. Anonymity and confidentiality were strictly maintained by de-identifying all participant data and securely storing records.

The study adhered to the ethical principles outlined in the Declaration of Helsinki and complied with local regulatory standards governing research with human participants.

RESULTS AND DISCUSSION

Adapting to Medical Wearable Technology

Participants consistently described the initial stages of using medical wearable devices as challenging due to difficulties in understanding the user interface and device connectivity. These challenges were heightened by a lack of clear guidance or support during the early adoption period. Many users reported feelings of frustration and uncertainty as they navigated the learning curve of the technology.

One participant reflected, “When I first started using it, I didn’t know how to connect it to my phone properly. The instructions weren’t clear, and I felt lost for days before figuring it out.” Another participant shared, “The interface was not user-friendly. It took me a while to understand how to access my daily reports, which made me feel like I wasn’t using it properly.”

Despite these initial barriers, most participants noted that over time, they became more accustomed to the devices. This adaptation was often facilitated by support from family members or healthcare providers, underscoring the importance of external assistance during the learning phase.

Trust and Perceived Accuracy of Data

Trust in the device’s output emerged as a critical theme, with participants expressing both reliance on and skepticism toward the data provided by their wearable devices. While many appreciated the convenience and immediacy of health monitoring, discrepancies between device readings and manual measurements raised doubts about the reliability of the technology.

One participant stated, “When the device said my blood pressure was high, I checked with a manual device, and the results didn’t match. It made me wonder which one to trust.” Another echoed this concern, saying, “Sometimes, the readings feel off. I don’t know if it’s the device or me not using it right, but it does make me cautious.”

Despite these concerns, participants generally valued the devices as supplementary tools rather than replacements for traditional methods, often cross-verifying their results with healthcare professionals or manual instruments.

Psychological Benefits and Empowerment

Participants highlighted the psychological reassurance provided by wearable medical devices, particularly in managing chronic conditions like diabetes or hypertension. The ability to monitor their health independently offered a sense of control and reduced anxiety, especially during potentially critical situations.

“Knowing that I can check my sugar levels at any time makes me feel more in control,” shared one participant. Another remarked, “The device alerts me when something’s wrong, and that gives me peace of mind, even if I’m not entirely sure about its accuracy.”

This sense of empowerment extended to their interactions with healthcare providers, as participants reported feeling more informed and prepared to discuss their conditions during medical consultations. However, the psychological benefits were occasionally tempered by feelings of confusion or stress when device readings were inconsistent or difficult to interpret.

Integration into Daily Routines

Observational data revealed that participants often incorporated their wearable devices into morning routines, using them to monitor baseline health metrics before starting their day. This habit became a natural part of their health management practices, with some participants likening the devices to daily necessities akin to mobile phones.

“Every morning, I check my blood pressure using the device. It’s become as routine as brushing my teeth,” one participant noted. However, instances of neglecting device notifications were also observed, particularly when participants did not fully understand the alerts or perceived them as insignificant.

The findings illuminate a multifaceted experience of using wearable medical devices for self-monitoring, marked by an interplay of challenges and benefits. While users initially struggled to adapt to the technology and expressed concerns about data accuracy, the psychological reassurance and

sense of control provided by these devices ultimately reinforced their value. This underscores the need for more intuitive designs and enhanced user education to bridge the gap between technological capabilities and user expectations.

The findings of this study revealed three core themes in the lived experiences of individuals using AI-enabled wearable medical devices for chronic disease management: initial adaptation challenges, concerns about trust and data accuracy, and the psychological benefits of self-monitoring. These themes align closely with the central research questions, providing a nuanced understanding of how users perceive and integrate these technologies into their daily lives.

Contribution of Findings to Research Questions

The results address the primary research questions by highlighting the multifaceted experiences users encounter when adopting wearable medical devices. Users reported significant hurdles in the early stages of adaptation, including difficulties in understanding device interfaces and connectivity issues (Sneha dkk., 2021). This insight underscores the need for user-centered designs that cater to diverse technological proficiencies. Additionally, concerns about data accuracy and trust illuminated a critical tension between reliance on AI-driven health insights and skepticism about their validity. These findings emphasize the importance of transparency in data processing and communication from device manufacturers. Finally, the psychological benefits identified, such as increased feelings of control and security, demonstrate the potential of wearable devices to positively influence users' emotional well-being, particularly in managing chronic health conditions.

Relationship to Previous Literature and Theories

These findings extend and deepen the existing body of research on wearable medical technologies. Previous studies guided by the Technology Acceptance Model (TAM) have emphasized the role of perceived ease of use and usefulness in technology adoption. While this study corroborates these factors, it also reveals that trust in data accuracy and emotional reassurance are equally pivotal for sustained usage, aligning with recent critiques of TAM's limited focus on user emotions. Furthermore, this study adds depth to the literature by integrating a phenomenological lens, which prioritizes subjective experiences often overlooked in quantitative analyses.

The psychological benefits reported by participants resonate with earlier findings on the potential of wearable devices to enhance user empowerment (Stevens dkk., 2024). However, this study contributes unique insights into how these devices influence users' sense of agency and control in managing chronic illnesses. The identified gap between users' expectations and the perceived reliability of device data echoes concerns raised in prior research but also introduces a more detailed understanding of how these perceptions shape trust and engagement with technology.

Implications of the Findings

The findings of this study hold significant implications for both the scientific community and practical applications in the design and deployment of wearable medical devices. Scientifically, the research underscores the importance of incorporating user-centered perspectives into the development of health technologies, shifting the focus from purely technical advancements to the lived experiences of end-users (Tannirkulam Chandrasekaran dkk., 2021). Culturally, these findings highlight how trust and accuracy in AI-enabled devices can influence broader societal acceptance of digital health innovations. For healthcare professionals, the results emphasize the need for clearer communication and education to bridge the gap between users' expectations and the perceived limitations of these devices. On a broader scale, understanding the psychological benefits of wearable devices suggests their potential role in enhancing self-management practices and improving the quality of life for individuals with chronic conditions.

Limitations of the Study

While this study offers valuable insights, several limitations should be acknowledged. First, the small sample size, characteristic of phenomenological research, limits the generalizability of the findings to wider populations. The demographic homogeneity of participants, which may not represent a broader cross-section of users across different socioeconomic, cultural, or geographic

contexts, restricts the ability to apply these findings universally (Xinyan dkk., 2022). Second, the reliance on self-reported data may introduce biases, as participants' perceptions and memories could influence their narratives. Finally, the study's focus on chronic conditions such as diabetes and hypertension may limit its applicability to other health conditions where wearable medical devices are utilized. These limitations highlight the need for caution when interpreting the findings and applying them to broader contexts.

Future Research Directions

This study opens several avenues for future research. First, expanding the scope to include larger and more diverse populations would provide a broader understanding of the experiences associated with wearable medical devices (Zhao dkk., 2021). Comparative studies across different cultural or economic settings could reveal how contextual factors shape user perceptions and adoption patterns. Additionally, longitudinal research tracking users over extended periods could offer deeper insights into how trust, adaptation, and psychological benefits evolve over time. Finally, interdisciplinary studies integrating phenomenology with usability testing or data science could further bridge the gap between technical design and user experience, ultimately leading to more inclusive and effective health technologies.

CONCLUSION

This study explored the lived experiences of individuals using AI-enabled wearable medical devices for chronic disease management, addressing the challenges, trust, and psychological impact of these technologies. The findings revealed key themes, including adaptation difficulties, concerns about data accuracy, and the psychological reassurance these devices provide. These insights contribute to bridging the gap in prior research, which has often overlooked the subjective and emotional dimensions of technology adoption. By emphasizing the user-centered perspective, this study offers valuable implications for improving device design, fostering user trust, and enhancing educational support for patients. To address the identified challenges, device manufacturers could prioritize improving the accuracy and reliability of data collected by these devices, ensuring that the technology is easy to use and accessible for individuals with varying levels of technological proficiency. Healthcare professionals should also be trained on how to effectively communicate the benefits and limitations of these devices to patients, providing ongoing support to address concerns and build trust. Additionally, it is essential to implement feedback loops where users can share their experiences, allowing for continuous device improvement and personalized patient care. Furthermore, the research underscores the importance of integrating phenomenological approaches to uncover nuanced meanings that enrich the understanding of health technology adoption. Future studies could build on these findings by exploring diverse populations, longitudinal impacts, and interdisciplinary applications to further enhance the development and acceptance of wearable medical devices.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

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