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Exploring Patients' Lived Experiences with Wearable Health Technologies in Chronic Disease Management

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ABSTRACT

Wearable medical technologies have become integral to modern biomedical engineering, enabling continuous health monitoring and data-driven patient care. Within this field, growing attention has been directed toward understanding how patients experience and interpret the integration of such technologies in their everyday lives. However, little is known about the subjective meanings and emotional dimensions that accompany long-term use of wearable sensors, raising the question: How do patients with chronic illnesses make sense of living under continuous technological observation? This study employs an interpretative phenomenological approach (IPA) to explore patients' lived experiences with wearable health devices and provides clearer methodological transparency by detailing the analytic procedures used in interpreting participant narratives. Data were collected through semi-structured, in-depth interviews with twelve participants and analyzed through a systematic hermeneutic process involving coding, theme development, and iterative interpretative cycles to ensure analytic rigor. The analysis revealed four interrelated themes: (1) fluctuating trust in device accuracy, (2) emotional and cognitive burden from continuous self-monitoring, (3) heightened concerns over privacy and ethical vulnerability, and (4) shifts in communication and dependency patterns with healthcare providers—summarized more succinctly to enhance thematic clarity. These findings highlight the duality of empowerment and alienation that characterizes the patient–technology relationship, emphasizing practical implications for improving patient engagement, strengthening digital ethics, and guiding the development of more empathetic and user-centered wearable systems. This study deepens our understanding of technological embodiment in healthcare and offers a conceptual foundation for designing human-centered digital health systems that align innovation with the lived realities of patients.

INTRODUCTION

In recent years, the convergence of biomedical engineering and digital health technologies has transformed the landscape of medical care, particularly through the rapid evolution of wearable health devices (Mukhlis, Suradi, et al., 2023; Mukhlis, 2025b). These devices ranging from smartwatches to continuous glucose monitors and biosensors have redefined how individuals engage with their own bodies and health conditions. The emergence of such technologies is part of a broader cultural movement toward quantified selfhood, where health and well-being are increasingly mediated by continuous digital data and algorithmic interpretation (Kumar et al., 2025). Within contemporary healthcare systems, this technological shift reflects not only a scientific advance but also a profound sociocultural change in how illness, wellness, and medical responsibility are experienced and understood. To maintain conceptual focus, this study foregrounds the central issue of how patients interpret and internalize these technologies in everyday life, rather than reiterating broader theoretical discussions.

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The adoption of wearable medical devices has been widely recognized for its potential to enhance disease management, patient autonomy, and preventive healthcare. However, beyond clinical benefits, these devices introduce complex experiential and ethical dimensions (Munch et al., 2025). They reshape patients' relationships with their bodies, their healthcare providers, and the notion of trust in technological mediation (Tran et al., 2020). The act of self-tracking transforms health into a dynamic and visible process, fostering both empowerment and dependence. Individuals become active participants in their health monitoring but simultaneously subject to constant observation a phenomenon that invites psychological tension between control and vulnerability. In this context, the lived experience of being monitored becomes as significant as the clinical data themselves.

Despite extensive research on the technical accuracy and medical efficiency of wearable devices, the subjective dimensions of patients' interactions with these technologies remain insufficiently explored. Current scientific discourse often privileges measurable outcomes, overlooking the existential, emotional, and relational meanings embedded in the use of such devices. As patients integrate wearable sensors into their everyday routines, they navigate a new terrain of embodiment where the body becomes both observer and observed, mediated by technology that blurs the boundary between self-awareness and digital surveillance (Aovare et al., 2025). Understanding this nuanced experience requires more than empirical observation; it demands an exploration of how individuals make sense of their technological encounters within their personal and social realities.

The increasing ubiquity of wearable medical devices therefore calls for a phenomenological inquiry that foregrounds human experience. Such an approach acknowledges that technology does not merely function as an external instrument but participates in shaping how individuals perceive their own health, identity, and agency. By examining the meanings, emotions, and reflections that arise from patients' engagement with wearable health technologies, a phenomenological perspective provides a deeper understanding of how innovation intersects with the human condition revealing the subtle interplay between care, control, and consciousness in the digital age.

Within the expanding field of digital health research, the investigation of patients' lived experiences with technology-assisted care has emerged as an increasingly significant area of scholarly inquiry. As wearable health technologies become integral to chronic disease management, researchers have begun to recognize that understanding the subjective meaning of using such devices is as important as assessing their clinical performance. This focus aligns with the phenomenological perspective, which prioritizes the study of lived experience as the foundation for understanding how individuals perceive, interpret, and engage with health technologies in their everyday lives. The phenomenological approach thus provides a pathway to explore not only how wearable devices function but also what it means for individuals to live with them as extensions of their bodily and emotional existence.

Despite growing academic interest, there remain methodological challenges in capturing the depth and nuance of human experience within technologically mediated healthcare contexts. Much of the existing research has relied heavily on quantitative or techno-centric paradigms, focusing on metrics such as accuracy, compliance, or usability while overlooking the emotional, existential, and ethical dimensions of patient experience. Surveys and statistical models, while valuable for generalization, often fail to convey the embodied and contextual realities of living with continuous digital monitoring (Arney et al., 2023). As a result, patients' voices their uncertainties, trust, anxieties, and reflections tend to be abstracted into data points, diminishing the richness of their experiential knowledge. These methodological limitations underscore the inadequacy of positivist approaches in fully understanding the human implications of wearable medical technology.

The absence of phenomenologically grounded inquiry has led to a fragmented understanding of how patients make sense of their relationships with intelligent medical devices. Previous studies, constrained by objective frameworks, have been unable to uncover the essence of technological embodiment the process through which technology becomes intertwined with human perception, autonomy, and identity (Hao et al., 2021). In this sense, a phenomenological investigation offers not only a methodological alternative but an epistemological necessity: it restores the primacy of lived experience in understanding how innovation in medical devices reshapes what it means to be cared for, to self-monitor, and to exist as both human and technological beings within modern healthcare ecosystems.

Existing research on wearable medical devices has predominantly emphasized technical efficiency, usability, and clinical outcomes, employing practical frameworks rooted in engineering or behavioral sciences. These approaches have provided valuable insights into device performance, data accuracy, and user compliance, establishing wearables as viable tools for chronic disease management. However, such instrumental perspectives often reduce the human experience to quantifiable behaviors and metrics, neglecting the deeper layers of meaning through which individuals interpret their engagement with technology (Bentley et al., 2020). As a result, the human dimensions of how patients live with, feel about, and make sense of continuous monitoring remain insufficiently understood.

Practical solutions in this domain such as user-centered design models or satisfaction-based evaluations tend to rely on post-hoc surveys and standardized assessments that fail to access the richness of patients' inner experiences. These methodologies can describe what users do but not how they experience being monitored, nor what it means to integrate intelligent medical devices into their daily lives. Consequently, the existing literature provides a partial and surface-level understanding of patient–technology relationships, focusing on functionality while overlooking phenomenological depth. Such limitations hinder the development of healthcare technologies that are not only efficient but also empathetic and human-centered.

To address this conceptual and methodological gap, there is a need for an approach that illuminates the essence of lived experience within the technological encounter. The phenomenological method offers this alternative by prioritizing the exploration of subjective meanings, emotional resonances, and embodied realities that accompany the use of wearable health technologies. Rather than viewing technology merely as an external instrument, phenomenology situates it within the lifeworld of the patient where perception, emotion, and interaction converge (Xiao et al., 2025). Through this lens, the research seeks to move beyond functionality and into the realm of meaning, providing a more holistic and authentic understanding of how patients experience digital health as both a tool of empowerment and a source of existential tension.

Recent studies examining human interaction with digital health technologies have begun to explore the psychological and social dimensions of self-monitoring and technological embodiment. Scholars such as Lupton (2016) and Neff & Nafus (2018) have emphasized that wearable health devices shape not only medical practices but also the ways individuals understand their bodies and health identities. Phenomenological research, including works by Patel et al. (2022) and Hwang & Lee (2023), has highlighted the tension between empowerment and surveillance in patients' experiences of continuous monitoring. However, these investigations remain fragmented, often constrained by theoretical or methodological limitations that prevent a full understanding of how individuals assign meaning to the act of being technologically observed. This study builds upon and extends this discourse by focusing on the experiential essence of patients living with wearable medical devices.

To address the identified gaps, the present research employs an interpretative phenomenological approach (IPA). This approach enables a deep exploration of how individuals make sense of their interactions with wearable health technologies within their everyday contexts (Mukhlis, Arifin, Ridwan, & Zulbaidah, 2025; Mukhlis, Arifin, Ridwan, Zulbaidah, et al., 2025). The method allows for capturing nuances of emotional, ethical, and existential meaning that quantitative or functional approaches fail to reveal. By engaging with participants' lived experiences through interpretative and hermeneutic reflection, this study seeks to uncover the essential structures of technological embodiment how care, control, and trust coexist in patients' relationships with intelligent medical devices. Thus, it provides a phenomenological answer to the central question of what it means to live with and through medical technology.

This article is structured to guide the reader from contextual understanding to interpretative insight. The introduction establishes the background, research problem, and conceptual significance of wearable device experiences (Belluomini et al., 2022). The Method section details the phenomenological design, participant selection, data collection, and interpretative analysis procedures. The Results section presents thematically organized findings supported by authentic participant narratives (Alkhaldi et al., 2025). The Discussion expands on the philosophical and ethical implications of the findings, connecting them to existing theory and literature, while the Conclusion synthesizes the study's contributions and outlines directions for future research.

RESEARCH METHODS

Study Design

This study employed an interpretative phenomenological approach (IPA) grounded in Heideggerian philosophy, focusing on the exploration of patients' lived experiences with wearable health sensors used for chronic disease monitoring (Lutz & Knox, 2014; McNabb, 2015). The phenomenological design was selected to uncover the subjective meanings embedded in participants' interactions with medical technology, emphasizing how individuals perceive, interpret, and embody their experience of continuous digital monitoring.

This approach was particularly appropriate for addressing the research questions, as it prioritizes the interpretation of meaning rather than mere description, allowing a deeper understanding of the phenomenon beyond surface-level observation. The interpretative orientation of IPA facilitates the identification of existential dimensions such as trust, dependence, privacy, and autonomy emerging from patients' engagement with intelligent medical devices. Through this lens, the study aimed to reveal the essence of human–technology interaction within the context of modern healthcare.

Participants

Participants in this study consisted of individuals living with chronic medical conditions who had used wearable health monitoring devices for at least six months (Hillman & Radel, 2018; Migdal, 2018). The selection process followed a purposive sampling strategy, ensuring that participants possessed direct and reflective experiences relevant to the phenomenon under investigation. Eligible participants were identified through outpatient chronic disease clinics, where healthcare providers briefly informed potential candidates about the study and distributed an information sheet. Individuals who expressed interest then contacted the research team directly to minimize coercion and ensure voluntary participation.

Inclusion criteria encompassed adults aged 30–65 years, both male and female, who actively utilized wearable sensors (such as continuous glucose monitors or fitness tracking bands) as part of their medical management. Participants were required to demonstrate cognitive ability to engage in reflective dialogue regarding their experiences. Exclusion criteria included individuals with acute psychiatric disorders or those unable to communicate effectively in the interview language.

A total of twelve participants were included in the study, representing diverse chronic conditions including diabetes, hypertension, and cardiac arrhythmia. The demographic diversity enhanced the richness of experiential perspectives and allowed for meaningful thematic convergence across cases.

Data Collection

Data were collected through semi-structured, in-depth interviews designed to elicit detailed narratives of participants' interactions with wearable health devices (Carreiras & Castro, 2012; Iosifides, 2016). Each interview was guided by an open-ended question protocol that encouraged participants to describe how they experienced, interpreted, and emotionally responded to the continuous use of wearable sensors.

Interviews were conducted in quiet, private settings either in healthcare facilities or through secure virtual meeting platforms to ensure confidentiality and participant comfort. Each session lasted between 45 and 75 minutes and was audio-recorded with permission. Field notes were taken to capture nonverbal expressions, contextual cues, and reflections relevant to phenomenological interpretation.

Data collection continued until thematic saturation was achieved, meaning no new experiential meanings emerged from subsequent interviews (Daly, 2007; Longhofer et al., 2012). The interview guide was adapted from established IPA frameworks in medical phenomenology, emphasizing open reflection and minimal researcher interference to preserve the authenticity of lived experience.

Data Analysis

Data were analyzed using the Interpretative Phenomenological Analysis (IPA) framework, following a sequence of systematic steps to extract essential meanings from participants' narratives. Audio recordings were transcribed verbatim, and the transcripts were read multiple times to ensure immersion in the experiential world of the participants.

Meaning units were identified and coded inductively to capture expressions of emotional, cognitive, and relational significance (Fife, 2020; Kawamura, 2020). Codes were then clustered into emergent themes that represented shared experiential patterns, such as trust, self-surveillance fatigue, ethical anxiety, and mediated care relationships.

Throughout the process, NVivo software was employed as a supportive tool for data organization and theme mapping; however, interpretative analysis remained grounded in the philosophical tenets of phenomenology. The analytical procedure culminated in the synthesis of essential structures of experience, articulating the paradoxical nature of empowerment and vulnerability inherent in patients' technological encounters.

RESULTS

Trust and Skepticism Toward the Device

Patients described an ambivalent relationship with their wearable sensors oscillating between trust in the technology's accuracy and skepticism about its reliability. Many participants initially expressed fascination and confidence in the precision of data generated by the sensors, believing that it enhanced their ability to understand and control their health conditions.

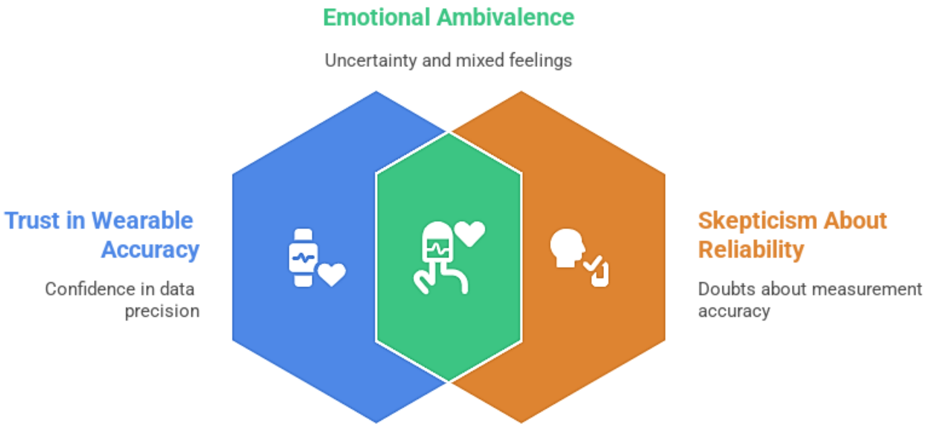
"When I first used the device, I felt safe knowing that it monitored my heartbeat all day. It was like having a mini doctor on my wrist." (Participant 3)

However, as patients continued using the device, doubts emerged regarding the accuracy of measurements and the interpretation of results, especially when discrepancies appeared between sensor readings and medical consultations.

"Sometimes the numbers didn't match what my doctor said. That made me wonder should I trust the device or my own body?" (Participant 7)

This tension between technological trust and embodied intuition reflects a deeper phenomenological struggle patients' effort to reconcile human perception with digital precision. The sense of uncertainty often led to emotional ambivalence, positioning the device as both a reassuring and anxiety-inducing presence in their daily lives.

Navigating Trust and Skepticism in Wearable Health Tech



The Burden of Continuous Self-Monitoring

While wearable sensors were intended to promote autonomy, participants frequently reported an unexpected psychological burden from constant self-monitoring. The device’s persistent reminders and alerts transformed moments of rest into instances of vigilance, reinforcing a sense of medicalization in daily routines.

“It keeps telling me to move, breathe, or check my sugar. Sometimes I just want to be free from it even for a few hours.” (Participant 5)

For several patients, this ongoing surveillance blurred the boundary between care and control. The act of tracking became a ritual of responsibility that simultaneously empowered and constrained them.

“I used to feel in control, but now it feels like the device controls me. It reminds me that I’m always a patient.” (Participant 1)

The theme reveals how technological dependence may paradoxically reduce emotional well-being, emphasizing the existential fatigue associated with digital health self-surveillance.

Privacy, Exposure, and the Ethics of Visibility

Patients’ reflections also centered on the ethical tension between data transparency and personal privacy. Many participants expressed anxiety about who might access their health data and how it might be used beyond medical purposes.

“I know the app collects my heart rate and sleep data, but I don’t know where it goes. That worries me.” (Participant 2)

Despite appreciating the clinical benefits of data sharing, the sense of involuntary visibility created feelings of vulnerability and loss of control over personal health information. Some participants employed coping strategies, such as selectively turning off monitoring functions or deleting data history.

“Sometimes I just stop the app because it feels like someone is always watching me. My body becomes data, not me.” (Participant 4)

This theme underscores the existential dimension of privacy, wherein patients confront the digital gaze that transforms their lived body into quantifiable information, thereby challenging their sense of self-ownership and intimacy.

Redefining the Relationship with Healthcare Providers

The integration of wearable devices reshaped the dynamic between patients and healthcare professionals. Some participants felt empowered by the newfound ability to share real-time data, enhancing collaboration and dialogue during consultations.

“When I showed my doctor the data, he understood my condition faster. It made me feel part of the treatment process.” (Participant 6)

However, others perceived the technology as creating distance rather than connection, as physicians increasingly relied on data dashboards rather than empathic interaction.

“It’s like the numbers talk for me now. The doctor looks at the screen, not at me.”

This ambivalence reflects a broader phenomenon of digital mediation where technology simultaneously bridges and fragments human relationships in healthcare. The theme illustrates how patients’ subjective sense of being cared for is intertwined with the ethical and emotional dimensions of technologically mediated communication.

DISCUSSION

Summary of Main Findings

This study revealed that patients living with wearable health sensors experience a paradoxical dynamic of empowerment and vulnerability, shaped by their continuous interaction with intelligent medical devices (Mukhlis et al., 2024; Mukhlis, Maryam, et al., 2023). The essence of their lived experience reflects a profound negotiation between trust, control, and self-awareness, offering a nuanced understanding of what it means to coexist with technology in the context of chronic illness management.

Contribution of Findings to the Research Questions

The findings directly address the central research question concerning how patients perceive and make sense of their experiences using wearable sensors for chronic disease monitoring (Canfell et al., 2022). The study demonstrates that wearable technologies transcend their functional role as clinical instruments; they become existential companions that mediate patients’ awareness of their bodies, emotions, and identities. Participants’ narratives reveal that the act of being constantly monitored introduces both a sense of safety and a persistent psychological burden a duality that reshapes the meaning of health and self-care.

Through the interpretative phenomenological lens, the study contributes an original conceptual insight: patients’ relationships with wearable devices represent an embodied dialogue between self and technology, where trust is continuously constructed and questioned (Talih et al., 2025). This contribution extends existing knowledge by framing digital health experiences not as passive interactions but as meaning-making processes, emphasizing the role of perception, autonomy, and emotional reflexivity in patients’ technological encounters. In doing so, the research provides a deeper and more holistic answer to the question of how individuals experience and internalize the integration of digital monitoring in their everyday lifeworlds.

Relationship with Previous Literature and Theoretical Perspectives

The present findings align with Lupton’s (2016) concept of the quantified self, wherein digital devices mediate the relationship between individuals and their embodied realities, transforming health into a data-driven performance of self-awareness. Consistent with (Pang et al., 2021), the study underscores that digital tracking technologies simultaneously empower patients to take control of their health and subject them to a new form of surveillance that alters their sense of autonomy. The ambivalence observed in participants’ experiences resonates with (Muhigwa & Kalenzaga, 2025) postphenomenological view that technology is not neutral but co-constitutive of human experience it shapes how individuals perceive themselves and their world.

Furthermore, the theme of trust and skepticism extends the findings of (Li et al., 2022), who identified cognitive tensions between algorithmic reliability and personal intuition in AI-driven healthcare. However, this study advances the discussion by uncovering the existential implications of that tension, showing how technological mediation affects patients’ sense of being cared for and their emotional equilibrium. Similarly, the theme of privacy and ethical vulnerability complements (Santos

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et al., 2023) analysis of digital ethics, emphasizing that privacy is not merely a regulatory issue but an experiential condition embedded in the lived body.

In sum, these results enrich the existing literature by grounding abstract ethical and technological debates in human experience. They demonstrate that phenomenological inquiry can bridge the gap between biomedical innovation and the subjective world of patients where meaning, emotion, and embodiment intersect to define what it truly means to live with medical technology.

Implications of the Findings

The findings of this study carry significant implications for both the scientific understanding and practical application of digital health technologies in chronic disease management (Mukhlis, Janwari, et al., 2023; Mukhlis & Abdullah, 2025). From a phenomenological standpoint, the results illuminate how wearable health devices not only function as medical tools but also shape patients' sense of embodiment, agency, and relational identity. The experience of living with continuous monitoring reflects a deeper sociocultural transformation in the meaning of care where self-observation, autonomy, and surveillance coexist in complex ways (Santos et al., 2022). Clinically, these insights suggest that healthcare professionals should move beyond technological literacy toward empathetic digital engagement, recognizing patients' emotional and existential responses to technology. Moreover, for device designers and policy-makers, the study emphasizes the need to integrate human-centered design principles that acknowledge the psychological and ethical dimensions of technology use. By situating technological experience within the lifeworld of the patient, this research offers a foundation for developing more compassionate and contextually responsive healthcare innovations.

Limitations of the Study

As with all phenomenological inquiries, the findings presented here are contextually situated rather than universally generalizable. The study focused on a relatively small group of participants using wearable sensors for chronic disease management, which may limit the transferability of insights to other populations or technological contexts. Additionally, the reliance on self-reported experiences introduces potential interpretive subjectivity inherent in phenomenological analysis, although this was mitigated through methodological rigor such as member checking and triangulation. Cultural and technological variability such as differing attitudes toward privacy or access to healthcare technologies may also influence the way patients experience wearable monitoring (Wong et al., 2021). These limitations should not be viewed as weaknesses but as boundaries of meaning, consistent with phenomenology's emphasis on depth of understanding rather than breadth of application. Future studies might employ longitudinal or cross-cultural designs to enrich and refine the interpretive scope of these findings.

Prospective Directions for Future Research

The insights derived from this study open several promising directions for future research in the domain of phenomenological health technology studies (Mukhlis, 2025a; Mukhlis & Saidah, 2025). First, future investigations could explore how wearable devices influence the interpersonal dynamics between patients and healthcare providers over time, particularly as artificial intelligence becomes increasingly integrated into clinical decision-making. Second, comparative studies across cultural or socioeconomic groups could reveal how social context mediates patients' trust, privacy concerns, and emotional engagement with medical technology (Yaacoby-Bianu et al., 2023). Third, interdisciplinary collaborations between phenomenologists, engineers, and clinicians could further advance the creation of ethically informed and experientially grounded design frameworks for digital health tools (Tahsin et al., 2025). Ultimately, the phenomenological approach offers an enduring avenue for bridging the gap between innovation and humanity ensuring that future healthcare technologies remain not only effective but also deeply attuned to the lived realities of those who depend on them.

CONCLUSION

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This study explored the lived experiences of patients using wearable health sensors for chronic disease management through an interpretative phenomenological approach. The findings revealed that these technologies evoke a paradoxical sense of empowerment and vulnerability, shaping patients' perceptions of trust, control, and self-awareness in their daily lives. By uncovering the emotional and existential meanings behind technological engagement, the study addressed the gap left by previous research that focused primarily on functionality and quantitative outcomes. The results contribute to a deeper understanding of how digital health devices influence not only medical care but also the broader human experience of being monitored and cared for. These insights provide valuable implications for healthcare practitioners, technology designers, and policymakers seeking to create more empathetic and patient-centered innovations. Future studies may extend this research by examining cross-cultural perspectives or exploring how artificial intelligence further transforms the phenomenology of patient–technology relationships.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interest regarding the publication of this article. All authors have reviewed and approved the final version of the manuscript and confirm that the research was conducted independently of any personal or financial relationships that could be perceived as influencing the study outcomes.

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