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Hospital Patients' Expectations on the Use of Modern Technologies by Medical Personnel

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Abstract

The integration of innovative technologies in nursing care, such as emotional robots, incident detection systems, and digital communication tools, has gained momentum. These advancements aim to enhance patient care and alleviate workforce shortages. However, their potential to address patient needs effectively, while ensuring meaningful human interaction, remains uncertain. Patients' perspectives are crucial in understanding the benefits and challenges of these technologies.This study was conducted using semi-structured, in-depth interviews with hospitalized patients to explore their perceptions of emerging nursing technologies. Participants were presented with eight innovative devices through videos and text descriptions. The interviews, guided by open-ended questions, aimed to capture attitudes toward the impact of these technologies on patient care and nursing practices. Data were analyzed using a content analysis framework, combining deductive and inductive approaches.Seventeen patients participated, sharing mixed perceptions of the technologies. Positive outcomes included improved autonomy, enhanced well-being, and better safety. However, concerns were raised about diminished human interaction, privacy risks, and the potential over-reliance on devices. Patients emphasized the importance of training, reliability, and alignment with core caregiving principles to ensure successful integration. Perceptions varied based on age, education level, and familiarity with technology.Patients perceive both opportunities and risks associated with new nursing technologies. While these tools can enhance care delivery, their success depends on thoughtful implementation that prioritizes human-centered care. Further research is needed to refine these technologies and address patient concerns to maximize their benefits and mitigate unintended consequences.

Keywords: *Hospital Patients, Modern Technologies, Medical Personnel.*

Introduction

The availability of innovative assistive technologies, including emotional, service, and care robots, incident detection systems, mobility aids, and digital communication tools, has grown significantly in nursing care settings. These advancements are anticipated to play a pivotal role in addressing the needs of patients and supporting caregivers, particularly in mitigating workforce shortages (World Health Organisation, 2015). Technology is frequently viewed as an essential and progressive development, offering opportunities to enhance nursing processes (Locsin, 2017). The World Health Organisation highlights the potential of digital technologies to address inefficiencies in healthcare systems, emphasizing the importance of expanding digital infrastructure and developing digital competencies to strengthen the healthcare workforce (World Health Organisation, 2022).

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Despite the optimism surrounding these technologies, their actual ability to deliver on these expectations across various nursing sectors, including acute inpatient care, long-term care, and outpatient care, remains uncertain (Hülsken-Giesler et al., 2022). The rapid adoption of these technologies has also raised concerns about potential unintended consequences. For example, as caregiving is inherently a social and physical interaction between caregivers and patients, there is a risk that care could shift toward servicing devices instead of focusing on individuals. This concern is particularly relevant in the ongoing debate about high-tech versus high-touch approaches to care (Waidley, 2019). Similarly, technologies designed to simulate social interactions, such as emotional robots, raise ethical and practical questions about whether such devices can genuinely replicate human caregiving (Coghlan, 2021). Consequently, the integration of technology into nursing care must prioritize its supportive role rather than risk replacing essential human interactions.

While various challenges are evident, several strategies can facilitate the successful implementation of technology in nursing care. These include training healthcare workers in digital skills (Kaihlanen et al., 2021), fostering positive attitudes toward technology (Nadav et al., 2021), and ensuring comprehensive training on operating such technologies (Albrecht et al., 2013). Surveys in certain healthcare systems indicate a generally positive and curious attitude among professional medical personnel toward assistive technologies, with many considering them beneficial and user-friendly. However, perceptions regarding robotics are more ambivalent, with some expressing significant reservations (Merda et al., 2017). Similarly, a study examining medical personnel ' expectations for various assistive technologies found positive views about their potential for physical relief, documentation tasks, and patient monitoring. However, there were uncertainties about whether these technologies could positively impact social and emotional care for patients (Zentrum für Qualität in der Pflege, 2019).

Although much research focuses on healthcare professionals' perspectives and strategies for integrating technology, it is equally important to consider the viewpoints of patients, who are directly affected by these innovations (Archibald and Barnard, 2018).

Patients occupy a unique and vulnerable position when it comes to new technologies in nursing care. They rely on healthcare professionals to address their health concerns while navigating challenges such as pain and psychological distress (Fassin, 2008). At the same time, they are expected to adapt to being users of these technologies, which often requires new skills, such as operating devices or managing personal data—raising concerns about data security and privacy (Illiger et al., 2014).

Moreover, as patients are increasingly involved in making informed decisions about their treatment, their role as competent users of technology capable of understanding its benefits and limitations becomes more critical. The integration of technology into caregiving represents more than simply using a tool; it transforms healthcare practices and involves multiple stakeholders, including medical personnel and patients (Mol, 2008).

For individuals with chronic conditions, addressing emotional and social factors is just as important as physical health, as these can significantly influence pain perception, social integration, and overall quality of life (Male et al., 2016). Technologies have the potential to provide personalized health interventions that promote coping, emotional well-being, and disease acceptance (Durosini et al., 2022). For instance, devices such as autonomous robots can enhance patient independence or offer companionship (Wright, 2023). AI-driven systems can also provide healthcare professionals with insights into patient behavior and physical parameters, enabling more tailored interventions.

However, the risk of standardization through technology remains a concern (Bächle, 2019). Questions persist about whether these innovations will support individualized care or merely impose rigid, standardized interventions. Similarly, there is uncertainty about whether technology can effectively address the emotional needs of patients or if such requirements necessitate human interaction. To better understand patients' expectations for these technologies, as well as the barriers and risks they perceive, further research is essential. Exploring how patients view these innovations is critical for designing technologies that genuinely enhance individualized care, autonomy, and overall health.

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To address these issues, a study was conducted to investigate how patients perceive the introduction of novel technologies in nursing care and their anticipated impact on care delivery and implementation processes.

Methods

This study employing semi-structured, in-depth interviews was adopted to gain insights into patients' attitudes and perceptions (Green & Thorogood, 2004b). To stimulate discussion and encourage participants to reflect on technological advancements in care, tangible examples of innovative devices were presented. Participants were further prompted using text and video materials to share their perspectives on how these technologies could influence healthcare delivery, nursing practices, and the integration of cultural values into care (Törrönen, 2002).

Eight technological solutions were chosen as examples based on specific criteria: (1) they needed to be innovative and relatively unfamiliar to participants, (2) they should represent a wide array of product types and functionalities currently emerging in healthcare, and (3) the devices should be either undergoing implementation or considered for future use in the clinical setting. Table 1 provides an overview of these technologies. Each participant was randomly assigned three technologies to ensure variability in responses and to minimize bias related to participants' demographic characteristics. This approach also allowed each respondent to engage with unfamiliar technologies without requiring prior knowledge or experience.

Interviews were guided by the following key questions, with follow-ups as needed for clarification or deeper exploration:

- What is your general opinion about the technology?
- What benefits or challenges do you foresee in implementing the technology in this setting?
- How do you imagine patients would react to this technology?
- Would you personally use the device? Why or why not?
- How do you think the use of this technology might affect patient care?
- Do you anticipate any impacts on medical personnel or their work routines due to this technology?

A target of 20 interviews was set to ensure sufficient data for meaningful theoretical generalization (Polit & Beck, 2010). Interim analyses were conducted to assess whether saturation had been reached, enabling discontinuation if no new themes emerged. The first interview served as a pilot to refine the question structure and format.

The study employed a purposeful sampling approach to recruit participants who could share diverse experiences with healthcare services and provide informed opinions on the technologies presented (Patton, 2009). Patients from a selected ward were chosen to reflect the demographic diversity and clinical conditions likely to be encountered during future implementation of these devices. Potential participants were identified using criteria such as (1) current admission to the ward, (2) gender, (3) age, and (4) reason for hospital admission (elective or emergency).

Gender and age were emphasized to capture variations in technology perception, aligning with prior research highlighting the influence of these factors on technology acceptance and use (UNESCO, 2007; Haraway, 1988; Nierling & Domínguez-Rué, 2016). Patients with dementia were excluded due to ethical and methodological challenges in obtaining consent and conducting interviews with this group.

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Ward medical personnel played a crucial role in identifying suitable participants. They received training on selection criteria and consulted the research team if uncertainties arose. Interested patients were approached by a researcher who explained the study objectives, procedures, and ethical safeguards, including confidentiality and the use of audio recordings. Written informed consent was obtained before participation. No incentives were provided, and participation was entirely voluntary.

Interviews began with an introductory presentation of each assigned technology, supported by text and video stimuli. Participants were then asked semi-structured questions. Afterward, they completed a brief demographic questionnaire. The interviewer documented observations, including the interview's atmosphere and any notable interactions. Each interview lasted approximately 30–45 minutes.

Data Analysis

Interview recordings were transcribed verbatim and analyzed using a qualitative content analysis framework (Kuckartz, 2018). This method combined deductive and inductive coding to develop a comprehensive categorization system. Deductive codes were derived from the research questions and existing literature, while inductive codes emerged from the interview data during analysis (Green & Thorogood, 2004a; Kuckartz, 2018).

Stage 1: A coding framework was created, categorizing responses as positive, negative, ambivalent, or neutral. Additional codes were added as needed to capture the full range of participant perspectives. This initial analysis focused on responses related to specific technologies.

Stage 2: The data were re-examined to identify overarching themes across all technologies. These themes were grouped into three domains: the anticipated impact of technology on patients, the effects on nursing staff, and changes to the care process. MaxQDA software was used for transcription and analysis (versions 2020 and 2022).

Results

A total of 17 individuals participated in the study. The initial interview served as a pilot test, but since no significant modifications to the interview guide were necessary, it was included in the final analysis. The study did not adopt a theoretical sampling method, and theoretical saturation was not formally evaluated. Although the plan initially included 20 interviews, data collection concluded early after observing diminishing new insights during the final three interviews. Preliminary analyses from research notes suggested that further interviews would add limited value.

No interviews were canceled, and none of the participants withdrew after consenting. As study participants were identified by trained medical personnel , information about the refusal rate of interview requests was unavailable. All interviews were conducted in the local language, and selected excerpts were translated by the authors for this publication (indicated with [square brackets]).

The average interview duration was approximately 39.6 minutes, ranging from 23 minutes to 62 minutes. Details regarding participant demographics and the contributions of the technologies to their experiences were compiled.

During the first stage of analysis, a coding framework was developed using a mixed inductive-deductive approach. This coding tree provided a structural overview of the data, as illustrated in Figure 1. Since the study did not aim to assess individual technologies independently, the findings reflect an aggregated evaluation of technological impacts under each primary code.

The second stage of analysis identified a spectrum of potential impacts of implementing nursing technologies, shown in Figure 2. This spectrum encompasses the effects on (1) patients, (2) medical personnel , and (3) the nursing care process, with both positive and negative outcomes explored.

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Additionally, the study documents patient-proposed strategies to enhance the benefits of these technologies and mitigate unintended consequences.

The introduction of nursing technologies was generally associated with beneficial outcomes for patients, such as improved health, greater well-being, and enhanced hospital experiences. Most technologies were expected to positively influence recovery, health maintenance, or emotional comfort.

Some technologies were also appreciated for improving autonomy and quality of life.

Such tools were seen as empowering, particularly for patients with limited mobility.

Despite the potential advantages, some participants expressed concerns about negative implications of certain technologies.

Others questioned the safety or reliability of devices.

Other worries included diminished autonomy (e.g., with repositioning systems) or privacy concerns (e.g., incontinence detection mats potentially causing embarrassment). Additionally, some participants felt older adults might struggle to use certain technologies.

Nevertheless, many participants believed proper guidance and support could help older adults adapt to these innovations (discussed further in the mitigation strategies section).

Participants' attitudes toward these technologies varied based on age and educational background. Younger participants (under 49 years old) were more optimistic, while those with higher educational levels were more cautious, often envisioning potential technical malfunctions. However, across all groups, participants generally agreed that these technologies could positively impact patient care.

Various technologies are expected to benefit professional medical personnel significantly. For six out of the eight technologies discussed, these tools are anticipated to alleviate physical strain (e.g., reducing the need for heavy patient lifting or minimizing walking distances), help prioritize tasks, and free medical personnel from repetitive or time-intensive duties like documentation. They may also offer critical support during staff shortages.

Similarly, the potential benefits of a transport robot were noted, particularly for reducing medical personnel ' walking distances:

Despite the advantages, some patients raised concerns about the adverse effects these technologies might have on medical personnel . Six out of the eight technologies (except the hand exoskeleton and the incontinence detection mat) sparked fears that they could replace human workers, leading to job losses.

This fear of job reduction was often tied to concerns about the potential decline in care quality. Interestingly, women and older participants (>60 years) were more critical of these technologies, particularly about how they might burden medical personnel or harm the medical personnel -patient relationship.

Some participants expressed apprehension about specific scenarios. For example, a robotic cat might create a situation where demand exceeds supply, leading to emotionally challenging situations for patients. There were also concerns about technologies like the bed-exit alert system, which could impose significant pressure on medical personnel :

From the perspective of care delivery, patients identified several ways these technologies could improve nursing processes.

On the downside, some patients feared that technology could depersonalize care.

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A few participants expressed anxiety about the potential for constant surveillance through technologies like the detection mat, although these concerns were less frequently mentioned.

The benefits and risks of nursing technologies are often interconnected. For instance, a device designed to improve well-being could pose risks if it malfunctions. Similarly, tools intended to save medical personnel time could become burdensome if they lead to over-reliance on machines.

Participants reflected on strategies to maximize benefits while addressing concerns.

Conversely, patients expressed concerns about technical malfunctions and their unintended consequences.

Discussion

The findings of this study reveal that patients perceive a wide range of potential effects of implementing healthcare technologies, weighing both the benefits and challenges critically. Interestingly, the same feature of a technology may result in both positive and negative outcomes. For instance, while some patients believe robotic pets could have a soothing effect on individuals with dementia, they also worry that such devices might reduce meaningful interactions with caregivers, thereby heightening social isolation. Similarly, technologies can simultaneously affect various aspects of care—patients, caregivers, and processes—since these elements are interdependent. For example, a fall-detection mat is anticipated to enhance patient safety but might also increase caregivers' workloads due to the immediate attention required when falls are detected and the necessity of operating additional devices like smartphones.

Thus, this study highlights not only the possible outcomes of technology use but also patients' optimistic and pessimistic expectations, reflecting their emotional responses to technology's role in healthcare. Positive implementation outcomes align with health-promotion objectives, while negative effects could potentially undermine health and well-being. These insights suggest that the use of new technologies can directly influence the emotional and physiological states of patients.

From the patients' perspective, the technologies examined cannot be classified definitively as purely beneficial or harmful. The conditions under which the technology is implemented and applied determine whether its effects are more likely to be positive or negative. Previous research, such as that by Zadvinskis et al. (2018), has shown that users' perceptions of technology can change over time due to learning and adaptation, further supporting the variability of its impact.

As with other studies (e.g., Kaihlanen et al., 2022), the present findings demonstrate that patients have a dynamic, relational understanding of healthcare technologies (Friesacher, 2010; Beedholm et al., 2015). The practical application of these technologies, their integration into care processes, and the broader implementation context are pivotal in shaping patients' perceptions. From these observations, three key implications for adopting and utilizing care technologies can be drawn.

Patients' relational understanding of technology underscores the importance of its application being guided by care principles to ensure beneficial outcomes. For instance, Crocker and Timmons (2009) demonstrated how a medical device for weaning could be adapted into a "nursing technology" when used within the framework of nursing care. This aligns with the concept of "fundamentals of care," which emphasizes holistic relationships between caregiver and patient, integrating physical, social, and emotional elements into care delivery (Kitson et al., 2014).

When technologies are used to support these foundational principles, they are perceived positively. Conversely, when technology undermines these principles—such as by replacing human-centered care with mechanized, impersonal approaches—it is viewed with skepticism or outright rejection (Stayt et al., 2015; Archibald and Barnard, 2018).

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The findings suggest that patients consider how new technologies might impact caregivers, demonstrating an implicit sense of mutual care. This consideration is particularly important in healthcare settings where patients depend heavily on caregivers for support and assistance. Previous research has described this dynamic as "mutual vulnerability," where patients and caregivers are interdependent in the care process (Angel and Vatne, 2017).

While patients may not fully understand caregivers' experiences, their concerns about issues such as increased workloads or diminished interpersonal relationships highlight their desire to preserve strong caregiver-patient connections. Patients' fears about the replacement of human caregivers by robots and potential job losses illustrate their belief in maintaining the human aspect of care, even as technology becomes more prevalent. This reinforces the idea that changes in caregivers' circumstances directly or indirectly affect patients, making patients' perspectives essential for shaping technology implementation strategies.

Patients navigate multiple roles in the healthcare setting, described by Fassin (2008) as the "patient as person" and "person as patient." These roles encompass actions related to treatment adherence, coping with physical discomfort, maintaining autonomy, and negotiating their experiences in healthcare settings. The introduction of new technologies does not create an entirely new role for patients; rather, it influences and interacts with their existing experiences.

For example, healthcare technologies offer opportunities to enhance patients' overall well-being when integrated thoughtfully into broader care interventions. As illustrated in studies on breast cancer survivors, targeted technological interventions can positively influence mental health and self-perception (Sebri et al., 2022). Similarly, systematic reviews have shown that robots in healthcare settings can yield benefits across physical, mental, and social domains, such as improving medication adherence, enhancing mood, and fostering social connections (Huang et al., 2023).

However, even the most effective technologies cannot, in isolation, define a positive healthcare experience. Instead, they can enhance the quality of interactions between patients and caregivers, supporting a meaningful and resonant care environment (Rosa, 2019). This reinforces the idea that while technology can complement existing care practices, it does not replace the fundamental human relationships that underpin positive healthcare experiences.

Conclusion

The study demonstrates that the perspectives shared by participants reflect not just a prediction of outcomes but an understanding of the complex social and psychological factors shaping future trends (Saritas, 2013). Interventions often have both intended and unintended effects, some of which may be unforeseen (de Zwart, 2015; van Manen, 2015). Incorporating the views of diverse stakeholders, such as hospital patients, into the development of new technologies can yield valuable insights rooted in varied experiences, knowledge, and social values (Weiss et al., 2018).

Patients neither fully embraced nor entirely rejected the proposed technologies. Instead, they critically evaluated the potential advantages and risks, offering suggestions to enhance positive impacts and mitigate negative ones. While most participants generally supported the technologies in specific scenarios, they also raised concerns about the potential risks of mechanistic care replacing human interaction.

The continuum of anticipated effects developed in this study provides a framework for predicting both positive and negative consequences of introducing new technologies. These findings suggest that successful implementation can lead to better patient outcomes, enhanced healthcare quality, and improved working conditions for nursing staff. However, the concerns raised highlight the risks of dehumanization if technologies are misused. Moving forward, the integration of technology should be designed to complement human-centered care processes, incorporating patient perspectives to avoid technology-centric

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approaches (Fassin, 2008). Further research should build upon this framework, incorporating feedback from medical personnel and other stakeholders to create a more robust anticipation tool.

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