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THE IMPACT OF CONTINUOUS MONITORING ON THE MENTAL WELL-BEING OF ELDERLY PATIENTS: A COMPREHENSIVE REVIEW OF PORTABLE DEVICES AND THEIR ROLE IN ENHANCING GERIATRIC CARE

Maria Laura de Biasi Alves[1]
Francesco Maronese[2]
Daniella Gomes Rodrigues de Moraes[3]
Afrânio Côgo Destefani[4]
Vinícius Côgo Destefani[5]

ABSTRACT: This narrative review explores the impact of continuous monitoring devices on the mental well-being of elderly patients. As the global population ages, there is an increasing need for innovative solutions to support the health and independence of older adults. Portable and continuous monitoring devices have emerged as promising tools for enhancing geriatric care, offering benefits such as early detection of health issues, improved management of chronic conditions, and support for independent living. However, the effects of these devices on the mental well-being of elderly patients remain understudied. This review synthesizes the current literature on the topic, discussing the potential benefits and challenges associated with continuous monitoring in the context of mental health. By examining the evidence through the lenses of clinical outcomes, patient experiences, and ethical considerations, this review provides a comprehensive understanding of the role of continuous monitoring in promoting the mental well-being of elderly patients. The findings highlight the need for further research and the development of guidelines to ensure these devices' effective and ethical implementation in geriatric care.

Keywords: Aged. Mental Health. Health Monitoring Devices. Chronic Disease. Patient-Centered Care.

INTRODUCTION

The global population is rapidly aging, with the number of people aged 60 years and older projected to reach 2.1 billion by 2050 (1). This demographic shift presents significant challenges for healthcare systems, as older adults often require more complex and continuous care (2). In recent years, portable and constant monitoring devices have emerged as promising tools for enhancing geriatric care, potentially significantly improving health outcomes and supporting independent living. These devices, which include wearables, sensors, and in-home

[1]Centro Universitário de Votuporanga (UNIFEV).
[2]Universidade de Ribeirão Preto (UNAERP - Campus Ribeirão Preto).
[3]Instituto Master de Ensino Presidente Antônio Carlos. e-mail:
[4]Santa Casa de Misericórdia de Vitoria Higher School of Sciences – EMESCAM.
[5] Molecular Dynamics and Modeling Laboratory (DynMolLab).

monitoring systems, enable the real-time tracking of vital signs, activity levels, and other health-related data, thereby promising a brighter future for elderly patients (3). These devices, which include wearables, sensors, and in-home monitoring systems, enable the real-time tracking of vital signs, activity levels, and other health-related data. However, it's important to note that these devices also come with potential risks and limitations, such as privacy concerns, data security issues, and over-reliance on technology, which could lead to decreased human interaction and social support (4).

While the clinical benefits of continuous monitoring in elderly patients have been well-documented (5,6), the impact of these devices on mental well-being remains understudied. Mental health is critical to overall well-being, particularly in older adults who may face cognitive decline, social isolation, and loss of independence (7). As continuous monitoring becomes more prevalent in geriatric care, it is essential to understand how these devices affect the mental well-being of elderly patients. This underscores the importance of further research in this area, inviting the audience to participate in the ongoing exploration of this crucial topic.

This narrative review aims to synthesize the current literature on the impact of continuous monitoring on the mental well-being of elderly patients. By examining the evidence through the lenses of clinical outcomes, patient experiences, and ethical considerations, this review provides a comprehensive understanding of the role of continuous monitoring in promoting mental well-being in geriatric care. The thoroughness of this approach ensures the validity and reliability of the findings, providing a solid foundation for future research and the development of guidelines for the effective and ethical implementation of continuous monitoring devices in the care of older adults.

METHODOLOGY

This narrative review follows a structured approach to synthesize the current literature on the impact of continuous monitoring on the mental well-being of elderly patients. The review process involves four main steps: (1) literature search, (2) study selection, (3) data extraction, and (4) data synthesis and analysis.

Literature Search

A comprehensive literature search was conducted using the following databases: Scopus, Web of Science, PubMed, ERIC, IEEE Xplore, ScienceDirect, Directory of Open Access

Journals (DOAJ), and JSTOR. The search strategy included a combination of keywords and Medical Subject Headings (MeSH) terms related to continuous monitoring, geriatric care, and mental well-being. The search string was adapted for each database to ensure optimal coverage. Additionally, the reference lists of included studies were manually searched to identify any relevant articles that may have needed to be included in the initial search.

Study Selection

The study selection process involved two stages: (1) title and abstract screening and (2) full-text review. In the first stage, two independent reviewers screened the titles and abstracts of the retrieved articles based on predefined inclusion and exclusion criteria. Studies were included to determine whether they focused on continuous monitoring devices in elderly patients and reported outcomes related to mental well-being. Studies were excluded if they did not involve elderly patients, did not use continuous monitoring devices, or did not report mental health-related outcomes. Any disagreements with the reviewer were resolved through discussion or consulting a third reviewer.

In the second stage, the full texts of the articles that met the inclusion criteria were reviewed to ensure their eligibility for inclusion in the review. The same inclusion and exclusion criteria were applied, and any discrepancies were resolved through consensus.

Data Extraction

Data were extracted from the included studies using a standardized data extraction form. The extracted information included study characteristics (e.g., authors, year of publication, study design, sample size), participant characteristics (e.g., age, gender, health conditions), details of the continuous monitoring devices used (e.g., type of device, duration of monitoring), and outcomes related to mental well-being (e.g., depression, anxiety, quality of life, social connectedness). Two independent reviewers performed the data extraction, and any discrepancies were resolved through discussion.

Data Synthesis and Analysis

The extracted data were synthesized using a narrative approach. The findings were organized into thematic categories based on the outcomes related to mental well-being, such as the impact of continuous monitoring on depression, anxiety, quality of life, and social

connectedness. The evidence was summarized and critically analyzed within each thematic category, considering the quality of the included studies and the consistency of the findings across studies. The synthesis also considered the potential mechanisms through which continuous monitoring may influence mental well-being and any identified challenges or limitations associated with using these devices in geriatric care.

RESULTS

Impact on Depression and Anxiety

Continuous monitoring devices have shown promising results in detecting and managing depression and anxiety in elderly patients. A study found that using wearable devices to monitor physical activity and sleep patterns in older adults with depressive symptoms led to significant improvements in mood and a reduction in depressive symptoms over 12 weeks (8). The authors suggest that the real-time feedback the devices provided helped patients become more aware of their activity levels and encouraged them to engage in behaviors that promote mental well-being, such as regular exercise and consistent sleep schedules.

Similarly, a randomized controlled trial investigated the effects of a home-based continuous monitoring system on anxiety levels in elderly patients with chronic conditions (9). The system included sensors to track vital signs, physical activity, and medication adherence and a mobile app that provided personalized feedback and reminders. The intervention group showed significant reductions in anxiety scores compared to the control group, which received usual care. The authors propose that the continuous monitoring system helped alleviate anxiety by giving patients a sense of security and control over their health and facilitating timely communication with healthcare providers.

However, not all studies have found positive effects of continuous monitoring on depression and anxiety. A systematic review examined the impact of various monitoring technologies on mental health outcomes in older adults (10). While some studies reported improvements in mood and emotional well-being, others found no significant effects or potential negative consequences, such as increased anxiety, due to constant monitoring. The effectiveness of continuous monitoring for managing depression and anxiety in elderly patients may depend on factors such as the specific type of device used, the duration of monitoring, and the level of support provided by healthcare professionals.

Impact on Quality of Life

Several studies have investigated the impact of continuous monitoring devices on the quality of life of elderly patients. A qualitative study explored the experiences of older adults using wearable devices to monitor their physical activity and sleep (11). Participants reported that the devices helped them to set and achieve personal goals, leading to a sense of accomplishment and improved self-esteem. They also described feeling more connected to their healthcare providers and engaged in their care, contributing to greater empowerment and control over their health.

A study examined the effects of a comprehensive home monitoring system on the quality of life of elderly patients with multiple chronic conditions (12). The system included sensors to track vital signs, physical activity, and environmental factors and a telehealth platform for remote consultations with healthcare professionals. Over six months, participants in the intervention group showed significant improvements in physical, psychological, and social quality of life compared to the control group. The authors suggest that the continuous monitoring system helped to optimize disease management, prevent complications, and reduce healthcare utilization, leading to better overall well-being.

Conversely, the impact of continuous monitoring on quality of life may vary depending on the individual needs and preferences of elderly patients. A cross-sectional study found that while some older adults perceived monitoring devices as valuable tools for maintaining their health and independence, others expressed concerns about privacy, stigma, and the potential for increased dependence on technology (13). The authors emphasize the importance of involving elderly patients in designing and implementing continuous monitoring systems to ensure they align with their values and goals for care, social connectedness, and support.

Continuous monitoring devices have the potential to enhance social connectedness and support for elderly patients, particularly those who live alone or have limited access to care. A pilot study evaluated the feasibility and acceptability of a smart home monitoring system for older adults with mild cognitive impairment (14). The system included sensors to track daily activities and a social networking platform allowing participants to connect with family members and caregivers. Participants reported feeling less isolated and more supported as the system facilitated regular check-ins and communication with loved ones. Caregivers also expressed greater peace of mind and satisfaction with their ability to monitor and assist their elderly relatives remotely.

A qualitative study explored the experiences of older adults using wearable devices to monitor their physical activity and share their progress with peers in a virtual community (15). Participants described feeling motivated and accountable to their peers, encouraging them to maintain their exercise routines and engage in friendly competition. They also reported forming new social connections and a sense of belonging through the shared experience of using the monitoring devices. The authors suggest that peer support and social interaction facilitated by continuous monitoring devices may help combat loneliness and promote mental well-being in elderly patients.

Conversely, the impact of continuous monitoring on social connectedness may depend on the level of digital literacy and technology acceptance among elderly patients. A survey study found that older adults with lower education and income levels were less likely to adopt and benefit from monitoring devices, citing concerns about cost, complexity, and the need for more personal interaction (16). The authors recommend that efforts to promote continuous monitoring devices in geriatric care be accompanied by education and support to ensure that all patients can access and benefit from these technologies.

Cognitive Function and Dementia Care

Continuous monitoring devices have shown promise in assessing and supporting cognitive function in elderly patients, particularly those with or at risk of dementia. A longitudinal study investigated using a home-based monitoring system to detect early signs of cognitive decline in older adults (17). The system included sensors to track physical activity, sleep patterns, medication adherence, and cognitive assessments delivered via a mobile app. Over two years, the system identified subtle changes in behavior and cognitive performance that preceded clinical diagnoses of mild cognitive impairment or dementia. The authors suggest that continuous monitoring may enable earlier detection and intervention for cognitive decline, potentially slowing the progression of dementia.

A randomized controlled trial evaluated the effects of a personalized monitoring and support system on the quality of life of elderly patients with Alzheimer's disease and their caregivers (18). The system included wearable devices to track physical activity and sleep and a mobile app that provided tailored daily activities and care management recommendations. Patients in the intervention group showed significantly improved cognitive function, behavior,

and overall quality of life compared to the control group. Caregivers also reported reduced burden and stress, as the system helped them to monitor and manage their loved ones' care more effectively.

Nonetheless, the use of continuous monitoring devices in dementia care raises critical ethical considerations, such as the balance between autonomy and safety, the protection of patient privacy, and the potential for stigma and discrimination. A qualitative study explored the perspectives of elderly patients with dementia and their caregivers on monitoring technologies (19). While many participants recognized the potential benefits of these devices, they also expressed concerns about the loss of privacy, the risk of overdependence on technology, and the need for human interaction and compassion in care. The authors emphasize the importance of involving patients and caregivers in designing and implementing monitoring systems and ensuring that these technologies are used to respect the dignity and autonomy of people with dementia.

DISCUSSION

The findings of this review suggest that continuous monitoring devices have the potential to positively impact the mental well-being of elderly patients, particularly in the areas of depression, anxiety, quality of life, social connectedness, and cognitive function. The real-time feedback and personalized support these devices provide can help patients better understand and manage their health, set and achieve goals, and feel more connected to their care team and loved ones.

Nonetheless, the effectiveness of continuous monitoring for promoting mental well-being may depend on various factors, such as the specific type of device used, the duration of monitoring, and the level of support provided by healthcare professionals. It is essential to recognize that monitoring devices are not a substitute for human interaction and care but rather a tool to complement and enhance traditional care models.

Continuous monitoring devices in geriatric care bring forth critical ethical considerations, including safeguarding patient privacy, balancing autonomy and safety, and the possibility of heightened reliance on technology. It is crucial to actively engage elderly patients and their caregivers in developing and utilizing monitoring systems to guarantee they are by their values, preferences, and care objectives.

Additionally, initiatives aimed at encouraging continuous monitoring devices in geriatric care should include provisions for education and support to ensure equal access and benefits for all patients, irrespective of their economic circumstances or familiarity with digital technology. This may necessitate investments in infrastructure, training, and resources to narrow the digital gap and tackle disparities in healthcare access.

Future research should concentrate on creating and assessing monitoring systems designed to meet the unique needs and preferences of elderly patients. Additionally, it is necessary to investigate the enduring impacts of these devices on mental well-being and overall health outcomes. Studies should also combine continuous monitoring with other interventions, such as telehealth, social support, and behavioral health services, to offer a more thorough and synchronized approach to geriatric care.

CONCLUSION

In summary, continuous monitoring devices hold the potential to transform senior care by offering real-time data and personalized support to enhance the mental well-being of elderly patients. However, the success of these technologies hinges on our ability to address the ethical, social, and practical challenges associated with their implementation. By collaborating to develop and implement patient-centered, evidence-based, and equitable monitoring systems, we can harness technology's potential to enhance the lives of older adults and their caregivers.

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