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EMERGING TRENDS AND FUTURE PERSPECTIVES ON CONTINUOUS MONITORING (E.G. CGM, REMOTE ECG) FOR OPTIMIZING TREATMENT ADHERENCE AND QUALITY OF LIFE IN PATIENTS WITH CHRONIC CONDITIONS

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ABSTRACT

Background: The escalating prevalence of chronic non-communicable diseases (NCDs), including diabetes mellitus, cardiovascular diseases, and neurodegenerative disorders, presents a significant challenge to global healthcare systems. The traditional paradigm of episodic, reactive care is increasingly proving insufficient. Consequently, a digital transformation is underway, characterized by the adoption of Continuous Monitoring (CM) technologies such as Continuous Glucose Monitoring (CGM), remote Electrocardiography (ECG), and wearable biosensors.

Objectives: This narrative review aims to provide a comprehensive overview of emerging trends in continuous monitoring technologies from 2020 to 2025. Specifically, it evaluates the impact of these technologies on treatment adherence and Quality of Life (QoL), analyzes the integration of Artificial Intelligence (AI) and Digital Twins, and identifies sociotechnical barriers to widespread implementation.

Methodology: A rigorous narrative review was conducted based on a systematic search of high-impact literature. Thirty two key studies, including systematic reviews, meta-analyses, and technical frameworks, were synthesized to explore the intersection of technological innovation (IoMT, AI) and social science dimensions (behavioral change, patient empowerment, and equity).

Results: Current evidence indicates that CM technologies significantly improve clinical outcomes, including HbA1c reduction in diabetes and decreased hospital readmission rates for heart failure. However, the impact on QoL is bidirectional: while fostering empowerment and safety, continuous surveillance can also induce anxiety and symptom preoccupation. Novel frameworks like Digital Twins and AI-driven predictive analytics offer promising avenues for personalized medicine but raise ethical and privacy concerns.

Conclusion: Continuous monitoring serves as a critical enabler of proactive health management. Future advancements must prioritize user-centered design, interoperability, and equitable access to realize the full potential of these technologies in improving societal health and well-being.

KEYWORDS

Continuous Monitoring, CGM, Remote ECG, Treatment Adherence, Quality of Life, Artificial Intelligence, Digital Twins, Chronic Disease Management

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1. Introduction

1.1. The Global Burden of Chronic Disease: A Crisis of Scalability

The global healthcare landscape is currently facing an unprecedented challenge driven by the accelerating prevalence of chronic non-communicable diseases (NCDs). Conditions such as diabetes mellitus, cardiovascular diseases (CVD), chronic obstructive pulmonary disease (COPD), and neurodegenerative disorders have supplanted infectious diseases as the primary causes of morbidity and mortality worldwide. Adepoju et al. (2025) argue that this epidemiological transition has exposed the fundamental limitations of traditional healthcare delivery models. The historical paradigm, predicated on episodic, facility-based care—where patients interact with healthcare providers only during acute exacerbations or scheduled check-ups—is increasingly proving insufficient and economically unsustainable.

This reactive model fails to capture the dynamic nature of chronic conditions, which are characterized by continuous physiological fluctuations occurring within the patient's daily environment. For instance, a diabetic patient spending 99% of their time outside the clinic manages their condition based on fragmented data, often leading to "clinical inertia," delayed interventions, and preventable complications such as diabetic ketoacidosis or myocardial infarction. Pong et al. (2024) highlight that approximately one in three adults now lives with multiple chronic diseases (multimorbidity), creating a complexity of care that overwhelms the cognitive and logistical capacity of traditional, paper-based, or siloed electronic health systems. Consequently, there is an urgent imperative to transition from a "sick-care" system to a proactive, continuous health management ecosystem.

1.2. The Technological Paradigm Shift: From Episodic to Continuous Monitoring

In response to this crisis, the convergence of biomedical engineering and information technology has given rise to the era of Digital Health, fundamentally anchored by Continuous Monitoring (CM) technologies. This shift is characterized by the migration of diagnostic capabilities from the hospital to the home, facilitated by the Internet of Medical Things (IoMT). Jayousi et al. (2025) describe the IoMT as a connected infrastructure where medical devices and applications communicate seamlessly with healthcare IT systems, enabling the real-time transmission of patient data.

The evolution of sensor technology has been rapid and transformative. In the domain of metabolic health, the management of diabetes has been revolutionized by Continuous Glucose Monitoring (CGM). Klupa et al. (2023) note that modern CGM systems have moved beyond their initial application in Type 1 Diabetes to become essential tools for Type 2 Diabetes and gestational diabetes management. Unlike traditional capillary blood glucose monitoring (finger-prick testing), which provides a static snapshot, CGM offers a dynamic video-like stream of glucose trends, allowing for the detection of asymptomatic hypoglycemia and the analysis of glycemic variability.

Parallel advancements have occurred in cardiovascular medicine. Liu et al. (2024) and Cricco et al. (2025) document the transition from cumbersome Holter monitors to unobtrusive, wrist-worn wearable devices equipped with photoplethysmography (PPG) and single-lead electrocardiogram (ECG) sensors. Sadiq et al. (2025) emphasize that these consumer-grade and medical-grade wearables have democratized arrhythmia screening, allowing for the long-term, continuous surveillance of Atrial Fibrillation (AF) and Chronic Coronary Syndrome (CCS) in real-world settings. These technologies effectively extend the "clinical gaze" into the domestic sphere, promising to detect deterioration days or weeks before a catastrophic event occurs.

1.3. The Social and Behavioral Dimension: Adherence and Quality of Life

While the technological feasibility of continuous monitoring is well-established, its successful integration into society depends heavily on human factors. From a social science perspective, the introduction of surveillance technology into the private lives of patients represents a complex sociotechnical intervention. The efficacy of any medical advice or technology is contingent upon **treatment adherence**—defined as the extent to which a person's behavior corresponds with agreed recommendations from a health care provider.

Non-adherence remains a "silent epidemic," costing healthcare systems billions annually and leading to poor prognosis. Lu et al. (2025) suggest that digital technologies offer novel mechanisms to engineer behavioral change. Through strategies such as gamification, real-time feedback loops, and social connectivity, wearables can transform passive patients into engaged co-managers of their health. However, adherence is not merely a matter of motivation; it is also a function of capability. Guo et al. (2023) demonstrate that "Mobile eHealth Literacy" is a critical prerequisite, without which the digital divide threatens to exacerbate existing health disparities.

Furthermore, the ultimate goal of healthcare is not just the optimization of biomarkers (e.g., HbA1c or blood pressure) but the improvement of the patient's Quality of Life (QoL). The impact of continuous monitoring on QoL is nuanced and bidirectional. On one hand, Kłak et al. (2021) and S.Y. Tan et al. (2024) provide evidence supporting the "Peace of Mind" hypothesis, where patients feel safer and more empowered knowing their vital signs are under surveillance. On the other hand, Rosman et al. (2024) identify a concerning trend of device-induced anxiety and symptom preoccupation, often termed "digital hypochondria." This paradox—where technology can simultaneously empower and burden—is a critical area of inquiry for social scientists and healthcare providers alike.

1.4. Emerging Trends and Study Objectives

As we move through the middle of the decade (2020–2025), new trends are emerging that promise to further disrupt this landscape. The integration of Artificial Intelligence (AI) and Machine Learning (ML) is transforming raw sensor data into predictive analytics (Kumar et al., 2025). Moreover, the concept of "Digital Twins"—creating a virtual replica of a patient's physiology for simulation and personalized treatment—is moving from theoretical frameworks to practical application (Jameil & Al-Raweshidy, 2025).

Despite the proliferation of literature on specific devices or clinical outcomes, there is a paucity of comprehensive reviews that synthesize these technological advancements with their profound social and behavioral implications. Most existing reviews focus either strictly on clinical efficacy (e.g., HbA1c reduction) or technical sensor specifications, often neglecting the "human factor" of adherence, mental well-being, and implementation barriers.

Objectives:

This narrative review aims to bridge this gap by providing a holistic overview of the emerging trends in continuous monitoring technologies from 2020 to 2025. Specifically, this paper seeks to:

1. **Evaluate Clinical Efficacy:** Synthesize recent evidence regarding the impact of CGM, remote ECG, and wearable sensors on clinical outcomes in chronic disease management.
2. **Analyze Behavioral Mechanisms:** Explore how digital interventions leverage behavioral science (gamification, feedback) to optimize treatment adherence.
3. **Assess Psychosocial Impact:** Critically examine the dual impact of continuous monitoring on Quality of Life, balancing empowerment against anxiety and burden.
4. **Explore Future Horizons:** Discuss the implications of AI integration, Digital Twins, and the systemic barriers (interoperability, equity) that must be addressed to realize the full social potential of these technologies.

By integrating insights from medical, engineering, and social science disciplines, this review offers a multidimensional perspective on the future of patient-centered care in the digital age.

2. Methodology

To provide a comprehensive, rigorous, and interdisciplinary analysis of the impact of continuous monitoring technologies on chronic disease management, this study adopted a narrative review design underpinned by systematic search principles consistent with the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines. Given the hybrid nature of the research topic—which sits at the intersection of biomedical engineering, clinical medicine, and social science—a narrative synthesis was deemed the most appropriate methodological framework. This approach allows for the integration of diverse evidence types, ranging from quantitative randomized controlled trials (RCTs) and meta-analyses to qualitative observational studies and technical architectural frameworks (e.g., Digital Twins), facilitating a holistic exploration of sociotechnical trends.

2.1. Search Strategy and Data Sources

A systematic literature search was executed to identify high-impact publications relevant to the study's objectives. The search strategy was designed to cover the technological, clinical, and psychosocial dimensions of the topic. Five major electronic databases were queried:

1. **PubMed/MEDLINE:** Selected for its comprehensive coverage of biomedical and clinical literature.
2. **Scopus:** Utilized for its broad interdisciplinary indexing, covering both health sciences and social implications of technology.
3. **Web of Science (Core Collection):** Chosen to ensure the inclusion of high-impact, peer-reviewed citations.

4. **IEEE Xplore:** Specifically targeted to identify engineering and technical papers regarding sensor development, IoMT architectures, and Artificial Intelligence algorithms.

5. **CINAHL (Cumulative Index to Nursing and Allied Health Literature):** Included to capture the patient care, nursing, and caregiver perspectives.

The search encompassed articles published between **January 1, 2020, and August 2025**. This specific temporal window was critically selected to capture the most recent advancements in sensor miniaturization, the post-pandemic acceleration of telehealth adoption, and the emergence of Generative AI in healthcare. Literature predating 2020 was excluded to ensure the review reflects "emerging trends" rather than historical practices.

2.2. Keywords and Boolean Logic

To ensure a rigorous retrieval process, a complex search string was developed using Boolean operators (AND, OR) to combine keywords from three primary thematic clusters:

- Cluster 1: Technological Modalities
- ("Continuous Glucose Monitoring" OR "CGM" OR "Remote ECG" OR "Wearable Sensors" OR "Internet of Medical Things" OR "IoMT" OR "Digital Twins" OR "Artificial Intelligence" OR "Machine Learning" OR "Photoplethysmography")
- Cluster 2: Clinical Conditions
- ("Chronic Disease Management" OR "Type 2 Diabetes" OR "Heart Failure" OR "Atrial Fibrillation" OR "Parkinson's Disease" OR "Freezing of Gait" OR "Chronic Coronary Syndrome")
- Cluster 3: Psychosocial and Behavioral Outcomes
- ("Treatment Adherence" OR "Medication Adherence" OR "Quality of Life" OR "Patient Empowerment" OR "Anxiety" OR "Health Literacy" OR "User Experience" OR "Caregiver Burden" OR "Digital Divide")

Example Search String: ("Wearable Devices" OR "Remote Patient Monitoring") AND ("Adherence" OR "Quality of Life") AND ("Chronic Disease").

2.3. Inclusion and Exclusion Criteria

Strict eligibility criteria were applied to the screening process to ensure the relevance and quality of the included studies.

Inclusion Criteria:

- **Study Design:** Systematic reviews, meta-analyses, randomized controlled trials (RCTs), prospective and retrospective cohort studies, and high-quality technical perspective papers (specifically regarding AI frameworks and Digital Twins).
- **Population:** Adult patients (≥ 18 years) diagnosed with chronic non-communicable diseases, specifically metabolic (Diabetes), cardiovascular (Heart Failure, Arrhythmias), or neurological (Parkinson's Disease, Multiple Sclerosis) disorders.
- **Intervention:** Use of continuous monitoring technologies (wearables, sensors, apps connected to sensors) for disease management.
- **Outcomes:** Studies reporting at least one of the following: clinical efficacy (e.g., HbA1c, hospital readmission), behavioral outcomes (adherence, self-management), or psychosocial impact (QoL, anxiety, caregiver burden).
- **Language:** Full-text articles available in the English language.

Exclusion Criteria:

- Studies published before 2020.
- Articles focusing solely on general wellness or fitness tracking in healthy populations (e.g., step counting for fitness) without a specific chronic disease diagnosis.
- Studies involving invasive monitoring technologies requiring surgical implantation (excluding standard implantable loop recorders where remote transmission was the primary focus).
- Conference abstracts, editorials, and commentaries lacking empirical data or theoretical framework.

2.4. Data Selection and Extraction

The initial search yielded a broad range of potential articles. Titles and abstracts were screened for relevance, and duplicates were removed. Full-text articles were then assessed against the inclusion criteria. For the final synthesis, **32 key studies** were selected. Data extraction was performed to identify: (1) The specific technology used (Hardware/Software); (2) The target patient population; (3) Key clinical findings; (4) Social/Behavioral observations; and (5) Identified barriers to implementation.

2.5. Analytical Framework and Synthesis

Given the heterogeneity of the included studies—which utilize different methodologies and report on different disease states—a statistical meta-analysis was not feasible. Instead, a **thematic synthesis** was employed. Data were coded and grouped into four main analytical themes:

1. **Clinical Efficacy:** Quantifiable improvements in health outcomes.
2. **Technological Frontiers:** The role of AI, algorithms, and sensor evolution.
3. **Behavioral Mechanisms:** Drivers of adherence (gamification, literacy).
4. **Psychosocial Impact:** The dual nature of empowerment versus anxiety and the "digital divide."

3. Results

The review of the selected literature reveals a multifaceted landscape where continuous monitoring technologies are reshaping clinical outcomes, patient behaviors, and psychosocial well-being. The results are synthesized below into four key domains.

3.0. General Landscape of Wearable Interventions

Before analyzing specific clinical domains, it is essential to establish the breadth of current wearable technologies as identified in recent scoping reviews. Lodewyk et al. (2025), in a scoping review of patient outcomes, emphasize that the current landscape of wearables has diversified significantly, moving from simple activity trackers to complex diagnostic tools capable of multiparametric monitoring. This evolution is corroborated by Kajzar (2024), who notes that modern devices now seamlessly integrate training load monitoring with vital sign acquisition, making them indispensable for both rehabilitation and chronic disease management.

Furthermore, Okeme et al. (2025) highlight that the integration of these devices into routine care is gaining momentum globally, driven by the need to reduce the economic burden of chronic diseases. Khan (2024) supports this view specifically within cardiac care, arguing that the future of cardiology is intrinsically linked to remote patient monitoring (RPM) and telehealth. Similarly, Jakubczyk et al. (2025) provide evidence that tracking well-being through wearables fosters a holistic approach to health, although Lu et al. (2020) previously warned that early generations of these devices struggled with accuracy—a challenge that newer sensors are progressively overcoming. Collectively, these foundational reviews set the stage for the specific clinical efficacies detailed below.

3.1. Metabolic Control: The Efficacy of CGM in Diverse Populations

The management of diabetes mellitus has undergone the most significant transformation due to sensor technology. While Continuous Glucose Monitoring (CGM) was historically reserved for Type 1 Diabetes, recent evidence confirms its critical role in Type 2 Diabetes (T2DM) management.

Evidence from Umbrella Reviews:

Y.Y. Tan et al. (2024) provided the highest level of evidence through an umbrella review encompassing 31 systematic reviews published between 2011 and 2024. This comprehensive synthesis aimed to resolve discrepancies regarding the clinical utility of CGM in T2DM populations, both insulin-treated and non-insulin-treated. The results indicated a consistent clinical benefit favoring CGM over Self-Monitoring of Blood Glucose (SMBG). Specifically, the meta-analyses included in the review reported reductions in glycated hemoglobin (HbA1c) ranging from 0.2% to 0.5% in patients using real-time CGM (rt-CGM) or intermittently scanned CGM (is-CGM) compared to usual care.

Furthermore, Y.Y. Tan et al. highlighted the superiority of "Time in Range" (TIR) as a dynamic metric. Studies demonstrated that CGM use significantly increased the percentage of time patients spent within the target glucose range (70–180 mg/dL), which is strongly correlated with a reduction in microvascular complications. The review also noted a reduction in the frequency and duration of hypoglycemic events, addressing a major safety concern in intensive insulin therapy.

The Role of Integrative Nursing Interventions:

Technological efficacy, however, is not autonomous. Alhaiti (2025) conducted a systematic review of 13 randomized controlled trials (RCTs) spanning from 2013 to 2024 to evaluate nursing-led interventions incorporating digital technologies. The synthesis revealed that the most significant clinical improvements occurred when sensor data was mediated by healthcare professionals. In trials where nurses utilized CGM data to provide personalized education and medication adjustments, patients demonstrated not only improved glycemic control but also higher self-efficacy scores. For instance, one RCT highlighted in the review showed that real-time feedback from nurses based on sensor trends led to a sustained reduction in HbA1c over a 12-month period, emphasizing that human support potentiates technological capability.

Barriers in Type 2 Diabetes:

Despite these benefits, Barchiesi et al. (2025) identified substantial barriers to widespread adoption in a systematic review of T2DM patients. Cost and reimbursement policies remain primary hurdles, but "alarm fatigue" and skin irritation from adhesives were also cited as significant factors leading to device discontinuation. The study emphasized that while clinical efficacy is high in controlled trials, real-world effectiveness is often dampened by these usability challenges.

3.2. Cardiovascular Outcomes: Mortality and Rehospitalization

In the domain of cardiology, the shift from episodic Holter monitoring to continuous Remote Patient Monitoring (RPM) has generated compelling evidence regarding patient survival and hospital utilization.

Heart Failure Management:

Ezimoha et al. (2025) performed a meta-analysis specifically targeting the impact of RPM on clinical outcomes in heart failure (HF) patients. Analyzing data from multiple clinical trials, the study found a statistically significant reduction in hospital readmission rates among patients monitored remotely compared to standard care. The intervention typically involved a multiparametric approach—monitoring weight, blood pressure, heart rate, and thoracic impedance to detect fluid congestion. The pooled risk ratio indicated that RPM acts as an effective early warning system, allowing clinicians to titrate diuretics or vasodilators in the home setting, thereby aborting the trajectory toward decompensation and hospitalization.

Real-World Telemedicine Impact:

Complementing trial data with real-world evidence, Saeed et al. (2024) conducted a retrospective cohort study in Saudi Arabian hospitals. The study compared health indicators of cardiac patients before and after the implementation of a structured telemedicine and remote monitoring program. The results were profound: the post-implementation cohort exhibited a marked improvement in hemodynamic stability and, most critically, a decrease in all-cause mortality rates. The authors attributed this survival benefit to the immediacy of care; continuous data transmission allowed for the rapid identification of arrhythmias and ischemic events that might otherwise have gone undetected until a fatal cardiac arrest occurred.

Ischemia Detection and Wearable Evolution:

Cricco et al. (2025) and Sadiq et al. (2025) detailed the technological evolution facilitating these outcomes. Modern wrist-worn devices now integrate photoplethysmography (PPG) with single-lead ECG capabilities. Cricco et al. highlighted that advanced algorithms can now analyze ST-segment deviations in real-time, offering the potential to detect "silent ischemia" in patients with Chronic Coronary Syndrome (CCS). This capability transforms the management of coronary artery disease from reactive (treating angina) to proactive (preventing infarction), although Sadiq et al. warn that signal noise from motion artifacts remains a challenge for diagnostic accuracy in ambulatory settings.

3.3. Expansion into Neurological Monitoring: Predicting the "Freeze"

While metabolic and cardiovascular applications rely on biochemical and bio-signal monitoring, a significant emerging trend involves the kinematic monitoring of neurodegenerative disorders.

Haussler et al. (2025) presented ground-breaking work on the detection and prediction of "Freezing of Gait" (FoG) in Parkinson's Disease (PD). FoG is a debilitating symptom where patients feel their feet are "glued" to the floor, often leading to falls. Using wearable inertial measurement units (IMUs) containing tri-axial accelerometers and gyroscopes placed on the lower limbs, the researchers refined an algorithm capable of distinguishing FoG episodes from normal stops or hesitations.

Critically, Haussler et al. moved beyond detection to prediction. The study demonstrated that specific spectral features in the gait signal change milliseconds before a freeze occurs. By identifying this "pre-freeze" signature, the system can trigger a cue (auditory metronome or haptic vibration), helping the patient maintain their gait rhythm and avoid the freeze entirely. This represents a sophisticated "closed-loop" system where monitoring directly triggers a therapeutic intervention without human mediation.

3.4. The Technological Frontier: AI and Digital Twins

The integration of Artificial Intelligence (AI) and the concept of the "Digital Twin" represents the apex of current technological trends, moving the field from monitoring to high-fidelity simulation.

Digital Twin Architectures:

Jameil and Al-Raweshidy (2025) proposed and validated a Digital Twin (DT) framework for real-time healthcare monitoring. In their study, a cohort of 20 participants was continuously monitored for key physiological parameters (Heart Rate, SpO₂, Body Temperature), and this live data was augmented with 1177 anonymized medical records from the MIMIC-III dataset to train robust machine learning models.

The researchers utilized a hybrid AI model combining Multi-Layer Perceptron (MLP) neural networks with XGBoost (Extreme Gradient Boosting). This combination achieved a remarkable diagnostic accuracy of 98.9% in identifying health anomalies. The Digital Twin acts as a virtual dynamic replica of the patient; it not only reflects current status but can simulate future trajectories based on historical data. Jameil and Al-Raweshidy demonstrated that this architecture reduced model training time by 25% and testing time by 33%, proving that high-performance, real-time predictive modeling is computationally feasible even with the high velocity of data generated by wearable sensors.

AI in Sensor Fusion:

Supporting this framework, Kumar et al. (2025) and Tsvetanov (2024) emphasized the role of AI in "Sensor Fusion." Wearable devices now collect heterogeneous data types—optical (PPG), electrical (ECG), and mechanical (accelerometry). AI algorithms are essential for fusing these distinct data streams to provide context. For example, distinguishing a heart rate spike caused by arrhythmia from one caused by climbing stairs requires the simultaneous analysis of ECG and accelerometer data. Kumar et al. highlighted that AI-driven noise cancellation is what allows modern wearables to function in "noisy" real-world environments, filtering out motion artifacts that would render traditional medical devices useless.

Ethical AI Implementation:

However, the push for more data raises privacy concerns. Moore et al. (2024) addressed the challenge of adding visual context to fall detection. While inertial sensors detect an impact, they do not explain why a patient fell. Moore et al. proposed the use of "Ethical AI" in video monitoring. In this system, computer vision algorithms process video feeds at the edge (on the device) to identify fall mechanics while automatically blurring faces and sensitive background details before data transmission. This approach balances the clinical need for contextual data with the patient's right to privacy, a critical consideration for the acceptance of continuous monitoring in the home.

3.5. Behavioral Mechanisms of Adherence: From Motivation to Capability

While the technological capacity to monitor physiological parameters is well-established, the clinical utility of these devices is fundamentally contingent upon **treatment adherence**. The review identified that the most successful digital health interventions are those that transcend passive data collection to actively engineer behavioral change through specific psychological mechanisms.

Motivational Strategies and Gamification:

Lu et al. (2025) conducted a systematic review targeting the effectiveness of digital strategies in motivating adherence to chronic illness self-care, particularly in cardiovascular diseases and diabetes. Analyzing 17 studies spanning two decades (2004–2024), the authors identified a taxonomy of motivational features. The synthesis revealed that interventions utilizing gamification—the application of game-design elements in non-game contexts—were significantly more effective than static monitoring.

Specific effective strategies included:

- **Goal-Setting and Feedback Loops:** Digital platforms that allowed users to set personalized targets (e.g., step counts, glycemic ranges) and provided real-time visual feedback (e.g., color-coded graphs) created a "mastery experience." The immediate gratification of seeing a "green" indicator reinforced positive health behaviors.
- **Social Connectivity:** Applications that facilitated social interaction—either through competition (leaderboards) or support (sharing data with family)—leveraged social norms to improve medication adherence.
- **Rewards Systems:** The provision of virtual badges or tangible rewards for maintaining streaks of adherence (e.g., logging blood pressure for 30 consecutive days) was found to activate the brain's reward system, sustaining engagement over time.

Health Literacy as a Prerequisite:

However, motivation alone is insufficient without capability. Guo et al. (2023) provided critical evidence from a development and evaluation study concerning "Mobile eHealth Literacy" (mHL). The study posits that a patient's ability to benefit from continuous monitoring is directly proportional to their literacy in interpreting digital health data.

Guo et al. implemented an educational mobile eHealth program for patients with diabetes. The results showed that the intervention group, which received structured training on how to interpret digital data and navigate health apps, demonstrated statistically significant improvements in self-care skills and disease knowledge compared to the control group. This finding underscores that continuous monitoring technology cannot be simply "handed out"; it must be accompanied by educational scaffolding to bridge the gap between raw data and actionable health decisions.

3.6. The Dual Impact on Quality of Life: Empowerment vs. Anxiety

A central finding of this review is the complex, often bidirectional impact of continuous monitoring on the patient's Quality of Life (QoL). The literature reveals a distinct dichotomy between the "Peace of Mind" hypothesis and the phenomenon of "Digital Hypochondria."

3.6.1. Empowerment and Safety (The "Peace of Mind" Hypothesis)

For conditions characterized by acute, life-threatening instability, continuous monitoring acts as a profound psychological buffer. Kłak et al. (2021) performed a systematic review and meta-analysis focusing on adults with Type 1 Diabetes Mellitus (T1D). The analysis of 23 studies (including 15 RCTs) unequivocally demonstrated that the use of real-time CGM significantly reduced the Hypoglycemia Fear Survey (HFS-II) scores.

The fear of nocturnal hypoglycemia—a potentially fatal event—is a primary source of distress for T1D patients, often leading to "defensive snacking" and sleep disturbances. Kłak et al. found that the predictive alerts provided by CGM systems restored a sense of safety, improved sleep quality for both patients and their partners, and allowed for greater flexibility in daily activities (e.g., driving, exercising). Similarly, S.Y. Tan et al. (2024) highlighted that in the context of hospital-to-home transitions, remote patient monitoring (RPM) interventions fostered a sense of "connectedness," reducing the isolation and anxiety typically associated with discharge.

3.6.2. The Paradox of Surveillance (Anxiety and "Digital Hypochondria")

Conversely, Rosman et al. (2024) presented compelling data on the "dark side" of monitoring in a retrospective, propensity-matched study of patients with Atrial Fibrillation (AF). The study compared patients using consumer wearables (e.g., smartwatches with ECG) against non-users.

The results revealed a "nocebo" effect of connectivity. Wearable users reported:

- **Higher Symptom Preoccupation:** A statistically significant increase in the frequency of checking their pulse and thinking about their heart rhythm ($P=0.03$).
- **Treatment Concerns:** Greater worry about the efficacy of their anticoagulation therapy ($P=0.02$).
- **Increased Informal Healthcare Use:** Wearable users were more likely to send portal messages or make telephone calls to providers regarding benign data fluctuations.
- **Critically,** 20% of wearable users reported experiencing anxiety directly related to the device's notifications. This suggests that for a specific patient phenotype—likely those with high baseline trait anxiety—continuous monitoring can exacerbate distress, transforming asymptomatic physiological variance into a source of constant worry.

3.7. The Broader Social Unit: Impact on Caregivers

Chronic disease management occurs within a social context, often relying heavily on informal caregivers. Alaboson et al. (2025) synthesized evidence from 47 studies regarding "Connected Health" (CH) interventions in Multiple Sclerosis (MS), a condition characterized by unpredictable neurological decline.

The review found that CH technologies benefit the caregiver-patient dyad by increasing the visibility of the disease. For caregivers, the ability to track the care recipient's symptoms (e.g., fatigue, gait stability) via a dashboard reduced subjective burden and uncertainty. Furthermore, online peer-support interventions identified in the review were instrumental in mitigating caregiver isolation. By connecting caregivers with others facing similar challenges, digital platforms provided emotional validation and practical advice, thereby improving the overall resilience of the care unit.

3.8. User Experience (UX) as a Determinant of Efficacy

Huberts et al. (2025) and Pong et al. (2024) emphasized that the User Experience (UX) of the monitoring interface is a clinical variable.

In a qualitative assessment of mobile health applications, Huberts et al. identified that "one-size-fits-all" solutions frequently fail. Patients expressed frustration with:

- **Data Overload:** Dashboards that presented raw numbers without interpretation.
- **Lack of Customization:** The inability to adjust alarm thresholds or notification frequency, leading to "alarm fatigue."
- **Aesthetic Stigma:** Wearable devices that looked too "medical," marking the user as "sick" in public spaces.
- The study concluded that for continuous monitoring to support long-term Quality of Life, devices must be designed with "invisibility" in mind—integrating seamlessly into the patient's lifestyle rather than demanding constant attention.

4. Discussion

The findings of this narrative review underscore a pivotal transition in the management of chronic diseases: the shift from episodic, reactive care to a paradigm of continuous, proactive surveillance driven by the Internet of Medical Things (IoMT). The evidence synthesized from 2020 to 2025 demonstrates that while continuous monitoring (CM) technologies—such as CGM, remote ECG, and kinematic sensors—offer indisputable clinical benefits, their integration into the social fabric of patients' lives introduces complex sociotechnical challenges. This discussion interprets these findings through the lens of a changing healthcare ecosystem, balancing the clinical "signal" against the psychological and systemic "noise."

4.1. The Clinical Promise vs. The Integration Gap

The synthesized data from systematic reviews and meta-analyses confirm that CM technologies are clinically potent tools. The significant reductions in HbA1c observed in diabetes management (Y.Y. Tan et al., 2024; Alhaiti, 2025) and the decreased hospital readmission rates in heart failure (Ezimoha et al., 2025; Saeed et al., 2024) provide empirical validation for the "Digital Health" hypothesis. The mechanism of action appears to be the **compression of the feedback loop**: rather than waiting months for an HbA1c test or a hospitalization event to signal deterioration, patients and providers receive actionable data in real-time.

However, a critical dichotomy exists between technological capability and systemic integration. Jayousi et al. (2025) aptly characterize this as the "Integration Gap." While sensors can detect silent ischemia (Cricco et al., 2025) or predict freezing of gait in Parkinson's disease (Haussler et al., 2025), the healthcare infrastructure required to act on this data is often lacking. The data silos created by proprietary device ecosystems mean that a patient's wearable data rarely populates their Electronic Health Record (EHR) in a meaningful, standardized way. Consequently, the burden of interpretation often falls on the patient or results in "data dumping" on clinicians, potentially contributing to provider burnout.

Thus, the clinical efficacy of CM is currently capped not by sensor sensitivity, but by organizational interoperability. As Adepoju et al. (2025) argue, without a unified framework for data governance and interoperability, continuous monitoring risks becoming a fragmented "add-on" rather than a core component of the care continuum.

4.2. The Psychological Paradox: Empowerment and "Digital Hypochondria"

From a social science perspective, the most profound finding of this review is the bidirectional impact of monitoring on Quality of Life (QoL). The technology acts as a double-edged sword, capable of both alleviating and inducing distress.

On one side, the **"Peace of Mind"** hypothesis is strongly supported by Kłak et al. (2021) and S.Y. Tan et al. (2024). For conditions characterized by acute, life-threatening instability—such as hypoglycemia in Type 1 Diabetes or post-surgical cardiac complications—surveillance serves as a safety net. The externalization of vigilance (allowing the algorithm to "worry" so the patient does not have to) allows for a restoration of normalcy and sleep quality. This empowerment aligns with the findings of Lu et al. (2025), where gamified feedback loops fostered a sense of mastery over the disease.

Conversely, Rosman et al. (2024) expose the "Nocebo Effect" of connectivity. The finding that 20% of Atrial Fibrillation patients using wearables experience device-related anxiety challenges the assumption that "more data is better." This phenomenon, which can be termed "Digital Hypochondria" or symptom preoccupation, suggests that for a subset of patients, the device transforms a background physiological

condition into a foreground obsession. Constant alerts, false positives, and the visualization of minor, non-pathological physiological variances can trigger a cycle of anxiety and unnecessary healthcare utilization.

This paradox necessitates a shift towards "Precision Monitoring." Just as medication is dosed based on renal function or weight, monitoring intensity should be "dosed" based on the patient's psychological resilience. Clinicians must evaluate not only the cardiovascular risk but also the "techno-stress" potential before prescribing continuous surveillance.

4.3. The Future Horizon: Digital Twins and Predictive Modeling

Moving beyond current applications, the integration of Artificial Intelligence (AI) and the concept of "Digital Twins" represent the next frontier. Jameil and Al-Raweshidy (2025) describe a framework that transcends simple monitoring. By creating a virtual replica of the patient's physiology using cloud-based algorithms (e.g., XGBoost), healthcare providers can move from monitoring to predictive modeling.

A Digital Twin allows for "in silico" clinical trials for the individual patient. For instance, a clinician could simulate how a specific patient's heart rate variability would respond to a new beta-blocker dosage within the Digital Twin model before administering the drug in reality. This predictive capability could drastically reduce adverse drug reactions and optimize titration schedules. However, this level of personalization requires massive datasets, raising questions about data ownership and the computational energy costs of maintaining millions of high-fidelity virtual twins.

4.4. Ethical Frontiers: The "Black Box" and Contextual Privacy

The reliance on AI and expanded data capture introduces ethical complexities that cannot be ignored. Moore et al. (2024) highlight the tension between context and privacy in the era of sensor fusion. Inertial sensors might detect a fall, but they cannot explain why it happened (e.g., did the patient trip over a rug, or did they faint?). Adding video data provides this context but constitutes a massive invasion of privacy.

Moore et al.'s proposal of "Ethical AI"—where algorithms process video data at the edge to identify events while automatically blurring faces and sensitive background details before data transmission—represents a necessary evolution in privacy-preserving design. Furthermore, Kumar et al. (2025) warn against algorithmic bias. If the datasets used to train fall-detection or arrhythmia-prediction models lack diversity (e.g., underrepresenting certain ethnicities, body types, or age groups), the resulting AI will be biased, potentially leading to algorithmic disparities in care. The "Black Box" nature of some deep learning models also complicates liability; if an algorithm fails to predict a heart attack, it is unclear who—the doctor, the developer, or the AI—is responsible.

4.5. The Socio-Economic Imperative: Addressing the Digital Divide

Finally, this review highlights a critical sociopolitical challenge: the Digital Divide. As noted by Kassaw et al. (2024) and Pong et al. (2024), the uptake and benefits of continuous monitoring are heavily skewed towards those with higher socioeconomic status, digital literacy, and reliable infrastructure.

In resource-limited settings, the lack of high-speed internet, electricity, or the cost of wearable devices creates a definitive barrier to entry. If continuous monitoring becomes the standard of care, there is a risk of creating a "two-tier" health system: a data-rich, proactive tier for the affluent, and a data-poor, reactive tier for the underserved.

Faizan et al. (2025) argue for Policy-Driven Digital Health Interventions. Governments and payers must view connectivity not as a luxury, but as a Social Determinant of Health (SDOH). Reimbursing remote monitoring at parity with in-person visits and subsidizing broadband access for vulnerable populations are essential steps to ensure that the "Digital Health Revolution" promotes equity rather than exacerbating disparity. Additionally, considering the environmental impact of digital technologies—such as the e-waste generated by disposable sensors and the energy consumption of data centers—aligns with the broader social responsibility of sustainable healthcare development.

4.6. Limitations of the Review

This review has several limitations inherent to the narrative design. The heterogeneity of the included studies—ranging from small pilots to large meta-analyses—makes direct statistical comparison of outcomes difficult. Furthermore, the rapid pace of technological obsolescence means that specific device models mentioned in studies from 2020 may already be outdated by 2025. Finally, while the search strategy was rigorous, the restriction to English-language publications may have excluded valuable insights from non-English speaking regions where digital health innovation is also accelerating.

5. Conclusions

The digital transformation of healthcare, epitomized by the rapid proliferation of continuous monitoring (CM) technologies, represents a paradigm shift from reactive disease treatment to proactive, personalized health management. This narrative review has synthesized evidence from 2020 to 2025, demonstrating that technologies such as Continuous Glucose Monitoring (CGM), remote Electrocardiography (ECG), and wearable kinematic sensors are not merely passive data collectors but active agents of clinical, behavioral, and social change.

Synthesis of Findings:

Clinically, the evidence is robust. The transition to continuous surveillance has yielded measurable improvements in objective health outcomes, most notably the reduction of HbA1c in diabetes and the decrease in hospital readmission rates for heart failure. The expansion of these technologies into neurology, specifically for the prediction of gait freezing in Parkinson's disease, illustrates the untapped potential of wearables to restore patient independence.

However, the "human factor" remains the variable of greatest consequence. This review highlights a critical psychological paradox: while monitoring technologies empower patients by reducing the fear of acute events (e.g., hypoglycemia), they concurrently introduce new burdens. The phenomenon of "digital hypochondria" and device-induced anxiety underscores that connectivity is a double-edged sword. Furthermore, treatment adherence is not an automatic byproduct of technology availability; it requires the active engineering of behavior through gamification, social feedback loops, and, crucially, the mediation of healthcare professionals.

Future Perspectives and Recommendations:

To realize the full social and clinical potential of continuous monitoring, future developments must transcend hardware innovation to address systemic sociotechnical challenges.

1. **From Innovation to Integration:** The "Integration Gap" identified by Jayousi et al. remains the primary barrier to scalability. Stakeholders must prioritize interoperability standards that allow wearable data to flow seamlessly into Electronic Health Records (EHRs), preventing data silos.

2. **Personalization via Digital Twins:** The field is moving towards the adoption of AI-driven Digital Twins. This framework offers a pathway to hyper-personalized medicine, where interventions can be simulated in a virtual environment before application, thereby optimizing safety and efficacy.

3. **Prescribing "Precision Monitoring":** Clinicians should adopt a nuanced approach to prescribing monitoring technologies. Assessments of a patient's psychological resilience and digital literacy should be as routine as assessing their physical symptoms, ensuring that the intensity of surveillance matches the patient's capacity to cope with data.

4. **Equity as a Design Principle:** Finally, the "Digital Divide" poses a threat to health equity. Policymakers must view digital connectivity as a social determinant of health, ensuring that access to life-saving monitoring tools is not contingent upon socioeconomic status.

In conclusion, continuous monitoring is a powerful catalyst for optimizing treatment adherence and quality of life. However, its ultimate success depends on a holistic approach that balances technological precision with human-centric design, ethical AI implementation, and unwavering commitment to social equity.

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REFERENCES

1. Adepoju, V. A., Jamil, S., Biswas, M. S., & Chowdhury, A. A. (2025). Wearable technology in the management of chronic diseases: A growing concern. *Chronic Diseases and Translational Medicine*. Advance online publication. <https://doi.org/10.1002/cdt3.156>
2. Alaboson, J., Coffey, L., Shrivastava, S., Ade-Alao, A., & Maguire, R. (2025). Impact of connected health on the psychological wellbeing and quality of life of people with multiple sclerosis and their caregivers: A systematic review. *Digital Health*, 11, 1–20. <https://doi.org/10.1177/20552076251326230>
3. Alhaiti, A. (2025). Integrative technologies in nursing-led interventions for diabetes management: A systematic review of efficacy and outcomes. *BMC Nursing*, 24, Article 846. <https://doi.org/10.1186/s12912-025-03435-9>
4. Barchiesi, M. A., Calabrese, A., Costa, R., Di Pillo, F., D'Uffizi, A., Tiburzi, L., & Zahid, E. (2025). Continuous glucose monitoring in type 2 diabetes: A systematic review of barriers and opportunities for care improvement. *International Journal for Quality in Health Care*, 37(3), Article mzaf046. <https://doi.org/10.1093/intqhc/mzaf046>
5. Cricco, R., Segreti, A., Ferro, A., Beato, S., Castaldo, G., Ciancio, M., Sacco, F. M., Pennazza, G., Ussia, G. P., & Grigioni, F. (2025). Advancements in sensor technology for monitoring and management of chronic coronary syndrome. *Sensors*, 25(15), Article 4585. <https://doi.org/10.3390/s25154585>
6. Ezimoha, K., Faraj, M., Hanumantharayudu, S. K., Surendraiah, P. K. M., Hassan, M. Z., Ibrahim, A. D., Jaber, M., Shah, S., Mefti, M., Niftalieva, G., Ahmed, B., & Rizwanullah, U. (2025). The impact of remote patient monitoring on clinical outcomes in heart failure patients: A meta-analysis. *Cureus*, 17(9), Article e92812. <https://doi.org/10.7759/cureus.92812>
7. Faizan, M., Han, C., & Lee, S. W. (2025). Policy-driven digital health interventions for health promotion and disease prevention: A systematic review of clinical and environmental outcomes. *Healthcare*, 13(18), Article 2319. <https://doi.org/10.3390/healthcare13182319>
8. Guo, S. H.-M., Lin, J.-L., Hsing, H.-C., Lee, C.-C., & Chuang, S.-M. (2023). The effect of mobile eHealth education to improve knowledge, skills, self-care, and mobile eHealth literacies among patients with diabetes: Development and evaluation study. *Journal of Medical Internet Research*, 25, Article e42497. <https://doi.org/10.2196/42497>
9. Haussler, A. M., Tueth, L. E., May, D. S., Earhart, G. M., & Mazzoni, P. (2025). Refinement of an algorithm to detect and predict freezing of gait in Parkinson disease using wearable sensors. *Sensors*, 25(1), Article 124. <https://doi.org/10.3390/s25010124>
10. Huberts, A. S., Long, P., Porth, A.-K., Fierens, L., Carney, N. C., Koppert, L., Kautzky-Willer, A., de Rooij, B. H., & Stamm, T. (2025). Tracking chronic diseases via mobile health applications: Which user experience aspects are key? *Healthcare*, 13(16), Article 3272. <https://doi.org/10.3390/healthcare13163272>
11. Jakubczyk, N., Leszczyńska-Knaga, E., Kurowski, M., Kuczapska, K., Gliwa, A., Ryglewicz, M., Fabian, D., Kwaśniewska, P., Moczydłowski, P., & Michalczuk, K. (2025). The role of wearable devices in tracking the wellbeing of patients suffering from chronic conditions: The review. *Journal of Education, Health and Sport*, 79, Article 58310. <https://doi.org/10.12775/JEHS.2025.79.58310>
12. Jameil, A. K., & Al-Raweshidy, H. (2025). A digital twin framework for real-time healthcare monitoring: Leveraging AI and secure systems for enhanced patient outcomes. *Discover Internet of Things*, 5, Article 17. <https://doi.org/10.1007/s43926-025-00135-3>
13. Jayousi, S., Barchielli, C., Guarducci, S., Alaimo, M., Caputo, S., Zoppi, P., & Mucchi, L. (2025). From innovation to integration: Bridging the gap between IoMT technologies and real-world health management systems. *Sensors*, 25(20), Article 6660. <https://doi.org/10.3390/s25206660>
14. Kajzar, M. (2024). Wearable devices for training and patient monitoring: A comprehensive review. *Quality in Sport*, 29, Article 55667. <https://doi.org/10.12775/QS.2024.29.55667>
15. Kassaw, M., Amare, G., Shitu, K., Tilahun, B., & Assaye, B. T. (2024). Willingness to use remote patient monitoring among cardiovascular patients in a resource-limited setting: A cross-sectional study. *Frontiers in Digital Health*, 6, Article 1437134. <https://doi.org/10.3389/fgdh.2024.1437134>

16. Khan, U. (2024). Remote patient monitoring and telehealth: The future of cardiac care. *International Journal of Engineering Technology Research & Management*, 8(6). <https://www.ijetrm.com/>
17. Kłak, A., Mańczak, M., Owoc, J., & Olszewski, R. (2021). Impact of continuous glucose monitoring on improving emotional well-being among adults with type 1 diabetes mellitus: A systematic review and meta-analysis. *Polish Archives of Internal Medicine*, 131(9), 808–818. <https://doi.org/10.20452/pamw.16047>
18. Klupa, T., Czupryniak, L., Dzida, G., Fichna, P., Jarosz-Chobot, P., Gumprecht, J., Mysliwiec, M., Szadkowska, A., Bomba-Opon, D., Czajkowski, K., Malecki, M. T., & Zozulinska-Ziolkiewicz, D. A. (2023). Expanding the role of continuous glucose monitoring in modern diabetes care beyond type 1 disease. *Diabetes Therapy*, 14, 1241–1266. <https://doi.org/10.1007/s13300-023-01431-3>
19. Kumar, A., Goel, S., Chaudhary, A., Dutt, S., Mishra, V. K., & Kumar, R. (2025). Artificial intelligence-based wearable sensing technologies for the management of cancer, diabetes, and COVID-19. *Biosensors*, 15(11), Article 756. <https://doi.org/10.3390/bios15110756>
20. Liu, J.-C., Cheng, C.-Y., Cheng, T.-H., Liu, C.-N., Chen, J.-J., & Hao, W.-R. (2024). Unveiling the potential: Remote monitoring and telemedicine in shaping the future of heart failure management. *Life*, 14(8), Article 936. <https://doi.org/10.3390/life14080936>
21. Lodewyk, K., Wiebe, M., Dennett, L., Larsson, J., Greenshaw, A., & Hayward, J. (2025). Wearables research for continuous monitoring of patient outcomes: A scoping review. *PLOS Digital Health*, 4(5), Article e0000860. <https://doi.org/10.1371/journal.pdig.0000860>
22. Lu, L., Zhang, J., Xie, Y., Gao, F., Xu, S., Wu, X., & Ye, Z. (2020). Wearable health devices in health care: Narrative systematic review. *JMIR mHealth and uHealth*, 8(11), Article e18907. <https://doi.org/10.2196/18907>
23. Lu, T., Lin, Q., Yu, B., & Hu, J. (2025). A systematic review of strategies in digital technologies for motivating adherence to chronic illness self-care. *npj Health Systems*, 2, Article 13. <https://doi.org/10.1038/s44401-025-00017-4>
24. Moore, J., McMeekin, P., Parkes, T., Walker, R., Morris, R., Stuart, S., Hetherington, V., & Godfrey, A. (2024). Contextualizing remote fall risk: Video data capture and implementing ethical AI. *npj Digital Medicine*, 7, Article 61. <https://doi.org/10.1038/s41746-024-01050-7>
25. Okeme, A. B. K., Enyejo, L. A., & Ibrahim, A. I. (2025). Exploring the impact of wearable health devices on chronic disease management. *International Journal of Advance Research Publication and Reviews*, 2(2), 43–69.
26. Pong, C., Tseng, R. M. W. W., Tham, Y. C., & Lum, E. (2024). Current implementation of digital health in chronic disease management: Scoping review. *Journal of Medical Internet Research*, 26, Article e53576. <https://doi.org/10.2196/53576>
27. Rosman, L., Lampert, R., Zhuo, S., Li, Q., Varma, N., Burg, M., Gaffey, A. E., Armbruster, T., & Gehi, A. (2024). Wearable devices, health care use, and psychological well-being in patients with atrial fibrillation. *Journal of the American Heart Association*, 13(2), Article e033750. <https://doi.org/10.1161/JAHA.123.033750>
28. Sadiq, I., Ijaz, A., & Imran, A. (2025). Wrist-worn devices for remote monitoring of cardiovascular disease: A survey. *IEEE Access*, 13, 151136–151155. <https://doi.org/10.1109/ACCESS.2025.3602893>
29. Saeed, A., AlQahtani, A., AlShafea, A., Bin Saeed, A., & Albraik, M. (2024). The impact of telemedicine on cardiac patient outcomes: A study in Saudi Arabian hospitals. *AIMS Medical Science*, 11(4), 439–451. <https://doi.org/10.3934/medsci.2024030>
30. Tan, S. Y., Sumner, J., Wang, Y., & Yip, A. W. (2024). A systematic review of the impacts of remote patient monitoring (RPM) interventions on safety, adherence, quality-of-life and cost-related outcomes. *npj Digital Medicine*, 7, Article 192. <https://doi.org/10.1038/s41746-024-01182-w>
31. Tan, Y. Y., Suan, E., Koh, G. C. H., Suhairi, S. B., & Tyagi, S. (2024). Effectiveness of continuous glucose monitoring in patient management of type 2 diabetes mellitus: An umbrella review of systematic reviews from 2011 to 2024. *Archives of Public Health*, 82, Article 231. <https://doi.org/10.1186/s13690-024-01459-2>
32. Tsvetanov, F. (2024). Integrating AI technologies into remote monitoring patient systems. *Engineering Proceedings*, 70, Article 54. <https://doi.org/10.3390/engproc2024070054>