INTERNATIONAL
HELLENIC
UNIVERSITY

5th International Conference on Management of Health and Welfare Units

ICOHEMA 2025

"Reimagining Health and Welfare Management: Inclusivity, Innovation & Impact"

3-5 October 2025

Edited Book

ISBN: 978-618-5630-27-0

PREFACE

"Reimagining Health and Welfare Management: Inclusivity, Innovation & Impact"

In a rapidly evolving global landscape marked by technological breakthroughs, demographic transitions and increasing demands for equity and sustainability, health and welfare systems are facing new and complex challenges. The 5th International Conference on Health Management (ICOHEMA 2025) was held in Thessaloniki from 3 to 5 October 2025, under the title: “Reimagining Health and Welfare Management: Inclusivity, Innovation & Impact.”

This year’s conference was organized and hosted by the International Hellenic University, and specifically by the Department of Organisations Management, Marketing and Tourism. The unit responsible for organizing and scientifically coordinating the event was the Postgraduate Programme in Health and Welfare Management Units, reflecting its ongoing commitment to fostering critical dialogue and innovation in the fields of health and social care administration.

ICOHEMA 2025 aimed to explore inclusive, innovative and effective approaches to the management of health and welfare services. It brought together an interdisciplinary and international community of academics, researchers, professionals and policy makers, focusing on topics such as:

- Bioethics and AI-driven Digitalization in Health and Welfare Services
- Innovating Patient-Centered Health and Welfare
- Quality Assurance in Health and Welfare Management Services
- Inclusive Workforce Development in Healthcare
- Future Trends in Health and Welfare
- Smart Governance in Public Health and Welfare
- Organizational Resilience and Adaptability in Health
- Sustainability in Health and Welfare Management Services
- Policy and Leadership in Health Systems

The scientific programme encompassed a broad spectrum of presentations and discussions, with four keynote addresses delivered by renowned international experts standing out as key highlights:

- “Marketing for Public Good: Developing a Purpose-Driven Brand in Ghana to Tackle Malnutrition”
- “Who is the Expert in the Room? Trust and Expertise in AI-Assisted Healthcare”
- “Enabling Neurodiversity for Global Health and Human Development”

ISBN: 978-618-5630-27-0

- "Unseen but Not Unheard: The Blind Spot of Ableism in Health Communication and the Representation of People with Vision Impairment"

These talks set the tone for deep and thought-provoking exchanges at the intersections of technology, ethics, inclusivity and public communication in health and welfare. Additionally, a high-level round table discussion entitled: "Digital Transformation in Healthcare: Innovations, Challenges and Future Perspectives" brought together experts from academia, policy and the healthcare industry to examine real-world challenges and propose feasible strategies for digital reform. For three days, ICOHEMA 2025 served as a dynamic milieu for knowledge exchange, research dissemination, and professional collaboration, featuring contributions from both Greek and international participants. The quality and diversity of the sessions unpacked the importance of fostering dialogue across disciplines to build resilient, equitable and forward-looking health and welfare systems. On behalf of the Scientific and Organizing Committee, we express our sincere gratitude to all keynote speakers, presenters, round table participants and attendees. Your insights and commitment were essential to the success of this event. We look forward to welcoming you to the next ICOHEMA as we continue working together toward impactful, inclusive and innovative health and welfare management.

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ABSTRACT

The contemporary healthcare sector faces a critical confluence of challenges: escalating operational costs, intensifying sustainability pressures, and a worrying trend of workforce disengagement, notably manifested as quiet quitting-the psychological detachment leading to minimal job fulfillment (Boy et al., 2023; Kang et al., 2023). This silent professional withdrawal erodes morale, diminishes care quality, and weakens institutional resilience. To address these structural and human challenges, modern healthcare management must embrace integrated strategies linking process efficiency, environmental responsibility, and human-centered engagement (Zhu et al., 2018).

This abstract synthesizes academic evidence supporting Green Lean Six Sigma (GLSS) as a transformative model. GLSS merges Lean's waste elimination and Six Sigma's precision improvement tools with core sustainability objectives. Crucially, when

aligned with robust workforce engagement, GLSS fosters a culture of shared purpose and ownership (Noronha et al., 2023).

Empirical studies confirm this dual benefit. Implementation of Lean Six Sigma in a São Paulo hospital significantly reduced errors and enhanced compliance, raising Sigma levels from 3.44 to 5.92 (Pavão et al., 2018). Beyond financial metrics, staff involved in redesign reported heightened professional pride. GLSS has also been proven to simultaneously cut emissions and enhance efficiency, demonstrating that ecological and operational goals are mutually reinforcing (Nagadi, 2022). Similar projects in the UK’s NHS improved patient flow and team morale (Antony et al., 2023), with success across Ireland, Malaysia, and India stemming directly from participatory staff involvement which instilled ownership of sustainability outcomes (Laureani et al., 2013; Zhu et al., 2018).

The Six Sigma DMAIC framework provides a structured approach for efficiency integration and environmental metric embedding. GLSS enhances regulatory compliance (Sreedharan et al., 2018), and actively involving employees in defining problems serves as a potent antidote to quiet quitting, improving job satisfaction (Hoxha et al., 2024; Toska et al., 2025). The co-leadership of Lean Six Sigma projects by nurses, for example, has reduced medication errors and improved morale in UK cases (Laureani and Antony, 2023).

Successfully integrating GLSS requires a cultural shift. Involving frontline staff boosts morale and innovation (De Freitas et al., 2017; McDermott et al., 2022), with Indian hospitals reducing bio-medical waste through GLSS while increasing staff motivation (Daultani et al., 2019). Leadership support, dedicated training, and value alignment are essential for implementation success (Mishra, 2018; Shokri et al., 2020), underscoring the need to prioritize people alongside processes. While institutional resistance exists (Haring et al., 2022; Schweidenback et al., 2024), participatory reform transforms opposition into engagement, as seen in a Dutch hospital where Lean Six Sigma reduced surgical waiting lists and boosted staff satisfaction (Van den Heuvel et al., 2006).

In conclusion, embedding GLSS through inclusive leadership and empowerment offers a transformative model for healthcare. By uniting efficiency and sustainability with empathy, systems can move beyond quiet quitting toward cultures of purpose, collaboration, and lasting excellence.

Key Words: Green Lean Six Sigma, Workforce Engagement, Sustainability, Healthcare Innovation, Employee Empowerment, Process Improvement, Organizational Culture.

Introduction

The contemporary global healthcare landscape is characterized by a confluence of escalating and intertwined pressures that threaten organizational stability and quality of patient care. Organizations are simultaneously grappling with the demands of escalating operational costs, the urgent necessity of environmental sustainability, and the critical challenge of widespread workforce disengagement. A particularly insidious manifestation of this disengagement is the phenomenon of quiet quitting, a silent withdrawal where employees consciously restrict their effort to meeting only minimal job requirements, becoming psychologically detached from their professional roles (Boy et al., 2023; Kang et al., 2023). This silent epidemic erodes morale, diminishes the quality and safety of clinical care, and significantly weakens the foundational resilience of healthcare institutions. To effectively counteract these multifaceted pressures, modern healthcare management must adopt holistic and sophisticated strategies that seamlessly integrate process efficiency, demonstrable environmental responsibility, and genuinely human-centered employee engagement (Zhu et al., 2018). This essay presents an in-depth analysis of one such holistic framework: Green Lean Six Sigma (GLSS). GLSS is posited not merely as a set of technical tools but as a transformative organizational philosophy. It strategically merges the core principles of Lean methodologies-focused on the systematic elimination of operational waste-and Six Sigma's rigorous, data-driven approach to precision and process variation reduction. Crucially, the "Green" component integrates explicit environmental sustainability goals into this framework. When GLSS is properly aligned with a proactive strategy for workforce engagement, the resulting synergy transforms not only operational effectiveness but fundamentally revitalizes the workplace culture, fostering a deeper sense of ownership, shared purpose, and professional commitment among staff (Noronha et al., 2023).

The Empirical Case for Green Lean Six Sigma in Healthcare

A robust and growing body of evidence strongly supports the efficacy of applying Lean and Six Sigma principles within the challenging context of healthcare. The foundational strength of the methodology lies in its demonstrated ability to achieve measurable, significant improvements in both financial and clinical outcomes. For instance, the findings of Pavão et al. (2018) showcase a compelling example from a São Paulo hospital, where the targeted implementation of Lean Six Sigma resulted in a measurable reduction of financial errors and a marked increase in regulatory compliance. Over a period of nine months, the project successfully raised the process Sigma level from an initial 3.44 to a near-world-class 5.92. Beyond these substantial quantifiable cost savings and efficiency gains, a key qualitative finding emerged: the clinical and administrative staff who were actively involved in the workflow redesign initiatives reported a profound enhancement in their sense of professional pride and commitment to the institution.

The contemporary addition of the Green dimension to the framework extends these benefits into the realm of ecological stewardship. Nagadi (2022) highlighted the distinct potential of GLSS to achieve simultaneous reductions in operational emissions and waste while significantly enhancing core efficiencies. This work substantiates the critical argument that ecological responsibility and high operational performance are not mutually exclusive goals, but rather can be strategically pursued in tandem.

International applications further confirm the universal relevance of this model. In the United Kingdom's National Health Service (NHS), Antony et al. (2023) documented successful Lean Six Sigma projects that specifically targeted patient throughput, leading to measurable improvements in patient flow and a reduction in critical emergency waiting times. These operational gains were directly correlated with positive, intangible outcomes, including improved morale and teamwork among the clinical staff. Similarly, Laureani et al. (2013) and Zhu et al. (2018) observed comparable benefits in diverse healthcare settings across Ireland, Malaysia, and India. In these cases, GLSS projects effectively lowered waste, reduced operational costs, and, most crucially, found that project success was inextricably linked to high levels of staff participation. This active involvement fostered a genuine sense of inclusion and ownership regarding both efficiency improvements and long-term sustainability outcomes.

The DMAIC Framework and Employee Empowerment

The inherent structure of Six Sigma's DMAIC framework (Define, Measure, Analyze, Improve, Control) provides healthcare organizations with a rigorous, data-centric methodology for addressing deep-seated process inefficiencies and, critically, for integrating explicit environmental metrics. Sreedharan et al. (2018) demonstrated that a GLSS approach enhanced both regulatory compliance and the overall quality of service provision. The initial phases of the DMAIC cycle-specifically Define and Measure-are particularly conducive to fostering engagement. By involving frontline employees directly in the process of defining the problem and measuring its scope, management signals a trust in their expertise, which demonstrably improves job satisfaction and acts as a powerful preventative measure against quiet quitting (Hoxha et al., 2024; Toska et al., 2025).

A practical example of this empowering involvement comes from the UK cases reported by Laureani and Antony (2023), where nurses were not merely passive participants but were actively encouraged to co-lead Lean Six Sigma projects. This direct professional leadership resulted in demonstrable operational improvements, such as a reduction in medication errors, and concurrently produced a tangible improvement in team morale and professional standing. Such models demonstrate that when employees are entrusted with the authority and resources to solve systemic problems, their psychological investment in the organization is radically transformed.

Cultural Transformation and Value Alignment

The successful integration of GLSS into a healthcare setting is recognized as being as much a matter of cultural transformation as it is an operational adjustment. Research consistently indicates that involving frontline staff deeply and meaningfully in improvement projects serves as a significant catalyst for boosting morale and fostering a culture of innovation (De Freitas et al., 2017; McDermott et al., 2022). For example, Daultani et al. (2019) documented how several Indian hospitals that applied GLSS not only achieved substantial reductions in bio-medical waste and improved regulatory compliance, but simultaneously reported a marked increase in staff motivation. This alignment between an individual's professional work-improving quality and reducing errors-and the organization's ethical stance on sustainability creates a powerful sense of pride and purpose. When employees perceive that their daily tasks contribute to both operational excellence and a higher environmental or social good, the psychological detachment characteristic of quiet quitting is effectively mitigated. The effort invested

ISBN: 978-618-5630-27-0

becomes a function of professional value alignment, rather than merely a transaction for pay.

The Role of Leadership and Continuous Learning

Long-term, systemic success for any profound organizational change, including GLSS, fundamentally requires visible, sustained leadership support and the cultivation of a robust learning culture. Mishra (2018) identified several critical success factors for GLSS implementation, placing primary emphasis on executive leadership commitment, comprehensive training programs, and the explicit alignment of the GLSS framework with the organization's core values. This need for structural support was further confirmed by Shokri et al. (2020), whose research in UK healthcare emphasized that structured education and demonstrable executive visibility and commitment are absolutely vital. These findings underscore a foundational principle: successful organizational transformation must be fundamentally people-centric, prioritizing investment in human capital and cultural shifts as much as, or even more than, process redesign.

The pathway to innovation is rarely frictionless, and resistance from within the institution is a common challenge (Haring et al., 2022; Schweidenback et al., 2024). However, the GLSS philosophy, with its emphasis on participation and data-driven consensus, offers a proven mechanism for transforming this innate resistance into productive engagement. The case study by Van den Heuvel et al. (2006) detailing a Dutch hospital provides a clear illustration: by involving staff collaboratively in a Lean Six Sigma project, the hospital not only successfully reduced surgical waiting lists-an operational goal-but also significantly boosted staff satisfaction. This example powerfully demonstrates that genuine collaboration can convert the tension of necessary change into positive, mobilized engagement.

Furthermore, integrating GLSS into a broader management framework, such as the principles outlined in ISO 56002:2019 for innovation management (Hidayawanti et al., 2024), ensures that the methodology is not treated as a temporary project. When hospitals adopt GLSS as a strategic, encompassing philosophy that is fundamentally rooted in the dual values of sustainability and employee empowerment, they are building resilient systems. These systems possess the intrinsic capacity for continuous adaptation and self-improvement, guaranteeing long-term excellence.

Conclusion

The integration of Green Lean Six Sigma within a comprehensive strategy for workforce engagement presents a profoundly transformative model for the contemporary healthcare sector. This model successfully and deliberately links the essential pursuit of operational efficiency and environmental sustainability with the equally vital needs for empathy, empowerment, and psychological investment among employees. By strategically addressing both structural, process-related challenges and pervasive human concerns such as quiet quitting, GLSS offers a viable pathway toward systemic resilience. Uniting rigorous, data-driven innovation with inclusive, participatory leadership, healthcare organizations can effectively transition beyond the inertia of disengagement. Instead, they can cultivate enduring organizational cultures defined by a deep sense of purpose, collaboration, and lasting professional excellence for the benefit of both staff and patients.

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ISBN: 978-618-5630-27-0

INNOVATING HEALTHCARE WITH GLSS: REDEFINING HOSPITAL MANAGEMENT AND ADVANCING WELFARE SOLUTIONS

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ABSTRACT

Global healthcare systems face intense pressure to deliver high-quality, efficient, and sustainable services amidst persistent financial limitations, Industry 4.0 disruptions, and post-pandemic complexities (Haleem et al., 2022; Yaqub et al., 2023; Duek et al., 2020). While established models like Lean Thinking and Six Sigma have improved efficiency, their holistic integration with environmental stewardship-known as Green Lean Six Sigma (GLSS)-remains significantly underutilized in the sector (Kovacevic et al., 2016; Tsekouropoulos et al., 2022; Antony et al., 2019). GLSS integrates Lean's waste reduction, Six Sigma's precision, and green principles to achieve operational and ecological excellence (Kasemsap, 2018; Simeli et al., 2023).

This study employed a qualitative design, combining semi-structured interviews with sixteen Greek healthcare professionals and academics with a literature synthesis, to explore the theoretical evolution of GLSS. Thematic analysis and a theory-building logic traced how GLSS can be conceptually extended from a technical toolkit into a comprehensive socio-technical framework linking efficiency, inclusivity, ethics, and sustainability.

ISBN: 978-618-5630-27-0

Respondents expressed cautious optimism: 74% recognized Lean's relevance, but only 30% were aware of GLSS's environmental dimension. Nevertheless, 75% viewed GLSS positively for its potential social, economic, and ecological impact.

Three conceptual extensions emerged:

1. Operational–Environmental Synergy: Participants perceived GLSS as unifying process improvement with ecological accountability. By integrating green thinking, the definition of waste is broadened to include environmental waste, positioning hospitals as adaptive learning ecosystems and extending GLSS towards a sustainability-driven efficiency theory.
2. Human-Centered Inclusivity: GLSS was linked to enhanced patient-centered care and staff engagement. Streamlined processes free time for relational care, while structured workflows boost morale, suggesting an emerging inclusive operational ethics benefiting both caregivers and patients (Kasemsap, 2018; Simeli et al., 2023).
3. Adaptive Governance and Ethical Innovation: Respondents associated the DMAIC (Define–Measure–Analyze–Improve–Control) structure with mechanisms for ethical oversight in digital health and AI use. This extends GLSS into a hybrid governance model, integrating efficiency with transparency and data ethics.

Significant barriers were identified, with 45% noting constraints such as limited budgets, high training costs, and hierarchical resistance (cultural inertia). Participants emphasized that leadership commitment, structured education, and systemic alignment are essential for adoption, suggesting the need to embed change readiness within the GLSS framework.

In conclusion, this research advances GLSS from an applied method to a theoretical model of inclusive sustainability in healthcare, evolving into a value system for responsible innovation. GLSS offers a crucial governance framework for aligning technological advancements with ethical and ecological imperatives, facilitating the transition toward resilient, environmentally conscious systems that uphold both human well-being and planetary health (Kasemsap, 2018; Simeli et al., 2023).

Key Words: Green Lean Six Sigma, Sustainability, Operational Efficiency, Healthcare Transformation, Patient-Centricity, Industry 4.0, Ethical Innovation.

Introduction: The Imperative for Integrated Healthcare Improvement

Healthcare systems globally are navigating a period of unprecedented complexity, characterized by persistent demands for high-quality care delivery, stringent efficiency targets, and a growing, non-negotiable requirement for environmental sustainability, all within restrictive financial parameters. These challenges have been amplified by the rapid disruptions associated with Industry 4.0, the enduring operational and financial strains following the COVID-19 pandemic, and perennial budgetary limitations imposed by funding bodies (Haleem et al., 2022; Yaqub et al., 2023; Duek et al., 2020). For decades, established operational improvement methodologies like Lean Thinking (focused on waste elimination) and Six Sigma (aimed at defect reduction and variation control) have been utilized to enhance efficiency and quality in various healthcare settings. However, the comprehensive integration of these quality models with environmental stewardship-a synergistic approach known as Green Lean Six Sigma (GLSS)-remains significantly underutilized within the health sector (Kovacevic et al., 2016; Tsekouropoulos et al., 2022; Antony et al., 2019).

GLSS is an integrated framework designed to propel organizations toward a holistic form of excellence. It systematically combines the core principles of Lean (focusing on non-value-added activities and flow), Six Sigma (emphasizing data-driven precision and defect reduction to near-zero), and green principles (embedding environmental accountability and ecological stewardship into all processes). By unifying these three components, GLSS offers a viable, yet largely untapped, pathway toward achieving both operational excellence and ecological integrity (Kasemsap, 2018; Simeli et al., 2023). This essay explores the theoretical evolution of GLSS within the healthcare domain, moving beyond its conventional status as a technical toolkit to conceptualize it as a comprehensive socio-technical framework capable of linking operational efficiency with broader imperatives of inclusivity, ethical governance, and deep sustainability.

Methodology: Exploring the Theoretical Boundaries of GLSS Adoption

To investigate the potential theoretical evolution and practical readiness for GLSS adoption in healthcare, this study employed a qualitative research design. The methodology integrated a literature synthesis with primary data gathered through semi-structured interviews. Sixteen Greek healthcare professionals and academics-representing a regional healthcare context often challenged by hierarchical structures and financial constraints-were purposively selected and interviewed. The interviews focused on assessing their current level of awareness regarding GLSS, their perceived benefits of its application, and the organizational readiness necessary for its successful adoption.

The analysis proceeded using thematic analysis to identify recurring patterns, perceptions, and concerns voiced by the respondents. Simultaneously, the literature review served to anchor the primary findings within the contemporary global context of post-pandemic reforms, rapid digital transformation, and the escalating demand for environmentally responsible healthcare. The ultimate analytical goal followed a theory-building logic, transitioning from the descriptive identification of prevalent patterns to a higher level of conceptual explanation. This process aimed to articulate precisely how the technical tools of GLSS could be expanded and reconceptualized into a robust socio-technical framework that holistically links conventional operational improvements with critical issues of inclusivity, ethical practice, and comprehensive sustainability within a healthcare ecosystem.

Findings and Theoretical Development: Expanding the GLSS Paradigm

The qualitative findings indicated a pattern of cautious optimism regarding the potential of GLSS. A significant majority of respondents, 74%, demonstrated familiarity with and recognized the relevance of Lean principles in healthcare. However, a

ISBN: 978-618-5630-27-0

comparatively small segment, only 30%, had encountered the fully integrated GLSS model, highlighting a considerable gap in the awareness of its crucial environmental dimension. Despite this awareness deficit, a substantial 75% of participants expressed a positive view of GLSS, citing its integrated potential for achieving tangible social, economic, and ecological improvements within their organizations.
The thematic and conceptual analysis of these perceptions yielded three distinct and significant theoretical extensions for the future application of GLSS in healthcare:

a. Operational–Environmental Synergy: Redefining Waste

The first and most direct conceptual extension is the recognition of a profound Operational–Environmental Synergy. Participants consistently viewed GLSS not merely as a set of parallel methods but as a unified framework that fundamentally unites process improvement with explicit ecological accountability. In this model, while Lean and Six Sigma enhance performance metrics like cycle time and quality yield, their integration with green thinking reframes the very concept of "waste." Non-value-added activities are no longer seen solely through the lens of time or cost (e.g., waiting, overproduction) but are explicitly extended to include environmental waste (e.g., excessive energy consumption, improper medical waste disposal, unnecessary use of non-recyclable supplies). This comprehensive perspective conceptually elevates GLSS toward a sophisticated sustainability-driven efficiency theory. It positions the hospital or healthcare provider not as a static entity, but as an adaptive learning ecosystem where operational and ecological performance are inextricably linked and continuously optimized.

b. Human-Centered Inclusivity: The Emerging Operational Ethics

The second extension centers on Human-Centered Inclusivity. A compelling theme emerged linking the benefits of GLSS directly to patient-centered care and enhanced staff engagement. Respondents articulated that the structural benefits of process streamlining and waste reduction-the core of Lean-naturally free up staff time previously spent on inefficient tasks. This reclaimed time can then be purposefully redirected toward more meaningful, relational care and direct interaction with patients, improving the quality of the human care experience. Furthermore, the implementation of structured, clearly defined workflows and transparent performance metrics-the contribution of Six Sigma-was perceived to raise staff morale by reducing ambiguity and frustration. This finding aligns powerfully with existing literature (Kasemsap, 2018; Simeli et al., 2023) and suggests the emergence of an inclusive operational ethics. Within this framework, operational improvement is explicitly designed to maximize benefits for both the caregivers (by reducing burnout and increasing job satisfaction) and the patients (by enhancing the quality, safety, and humanity of the care received).

c. Adaptive Governance and Ethical Innovation: The DMAIC Framework as Oversight

ISBN: 978-618-5630-27-0

The third and perhaps most novel extension positions GLSS within the realm of Adaptive Governance and Ethical Innovation. Participants associated the systematic, iterative DMAIC structure (Define–Measure–Analyze–Improve–Control) not just with process improvement, but with a robust mechanism for ethical oversight. This is particularly relevant in the rapidly evolving landscape of digital health, Artificial Intelligence (AI) adoption, and data-intensive care models. Respondents viewed the Control phase, in particular, as a permanent mechanism for establishing transparency, accountability, and ethical safeguards for new technologies and algorithms. This insight extends GLSS from a mere efficiency tool into a hybrid governance model. By integrating the structured discipline of DMAIC, organizations can ensure that technological innovation is implemented not only efficiently and effectively but also ethically, upholding critical standards for data privacy, equity in access, and sustainability in the digital age.

Organizational Barriers and the Path to Institutionalization

Despite the profound theoretical potential, the path to widespread GLSS adoption is significantly obstructed by practical and cultural barriers. Nearly half of the respondents (45%) cited significant constraints, including pervasive limited budgets, the high initial cost of specialized training and certification, and entrenched hierarchical resistance to change. Cultural inertia, particularly among senior management and long-tenured staff, was a recurring concern, indicating that the move toward a data-driven, cross-functional improvement culture conflicts with traditional, top-down bureaucratic structures common in healthcare.

These identified barriers underscore a crucial finding: the success of GLSS is intrinsically tied to organizational learning and change readiness. Participants uniformly emphasized that sustained leadership commitment, comprehensive education and training at all organizational levels, and systemic alignment with core institutional values are absolutely essential for successful adoption. This suggests that the conceptual framework of GLSS must evolve to explicitly incorporate components dedicated to assessing and developing organizational change readiness and institutionalizing a culture of continuous learning.

Conclusion: GLSS as a Value System for Resilient Healthcare

This research successfully advances the conceptual role of Green Lean Six Sigma (GLSS) within healthcare. It moves the framework from a purely applied technical improvement method to a theoretical model of inclusive sustainability and ethical governance. By systematically integrating the imperatives of efficiency, clinical quality, and environmental responsibility, GLSS evolves into a value system that champions responsible innovation within the health sector.

The findings from the qualitative exploration reveal that GLSS's greatest theoretical contribution lies in its ability to simultaneously address financial and ecological deficits while fostering human-centered care and ethical innovation through its structured DMAIC discipline. To institutionalize this approach, two critical factors must be prioritized: a strong leadership vision that publicly champions the GLSS philosophy, and the provision of structured education to build internal capability and challenge cultural inertia. Furthermore, transparent communication about the goals and benefits of GLSS is vital to overcoming both perceived resource limitations and staff resistance. Ultimately, GLSS offers far more than routine operational optimization-it provides a comprehensive governance framework designed to harmonize technological advancements with fundamental ethical and ecological imperatives. Its thoughtful application can assist healthcare organizations in their essential transition toward resilient, adaptive, and environmentally conscious systems, thereby upholding the core mission of promoting both human well-being and planetary health (Kasemsap, 2018; Simeli et al., 2023).

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ISBN: 978-618-5630-27-0

REIMAGINING INCLUSIVE HEALTHCARE ECOSYSTEMS: INNOVATION STRATEGIES FOR VULNERABLE TRAVELERS

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ABSTRACT

The provision of inclusive healthcare for vulnerable travelers-specifically the elderly and people with disabilities-is a global imperative driven by shifting demographics and the growing complexity of chronic care needs (UN Tourism, n.d.; Portales, 2015). Traditional models of healthcare delivery and medical tourism are frequently critiqued for being inherently fragmented, exclusionary, and poorly adapted to accommodate individuals with functional or cognitive impairments (Wendel et al., 2024; Lee, 2014). Emerging trends in digital innovation and participatory design promise a systemic transformation of the healthcare landscape, aiming squarely at enhancing equity, personalization, and sustainability in global health and welfare delivery (Bird et al., 2021; Bratić et al., 2025). This paper explores how a systemic approach integrating technology, policy frameworks, and essential co-design methodologies can successfully reshape these global healthcare ecosystems (Veras et al., 2025; WHO, 2024).

The analysis utilizes a mixed-methods synthesis combining a structured literature review with primary insights derived from a focus group study involving thirty Greek national-level experts across healthcare, policy, and accessibility domains. This methodology included thematic analysis, anchored in participatory design literature and international mandates (Bird et al., 2021; UN Tourism, n.d.; WHO, 2024),

ISBN: 978-618-5630-27-0

and complemented by recent scientific references (2023–2025) on cross-border data and AI governance (Arefin & Zannat, 2025; Shie et al., 2024).

The research identifies persistent systemic barriers for vulnerable travelers, including limited physical and digital accessibility (Lazar et al., 2015), fragmented regulatory frameworks (Weiner et al., 2025), and digital illiteracy (Robru et al., 2024), which acutely challenge those navigating medical tourism and cross-border care (Simeli et al., 2023; Portales, 2015). While the adoption of universal digital design, Green Lean Six Sigma (GLSS), and telemedicine shows promise (Grigoriadis et al., 2024; Kaswan et al., 2023), persistent usability and governance gaps must be urgently addressed (Hasan, et al., 2024; WHO, 2024).

Five key Innovation Strategies are proposed:

1. Digital Platforms: Must be user-centered and adhere to international accessibility standards (Lazar, et al., 2015; Lee, 2014).
2. Participatory Design: Actively involving end-users mitigates the digital divide, leading to more usable, emotionally resonant technologies (Bird et al., 2021; Shie et al., 2024; Lee, 2014; Robru et al., 2024).
3. Policy Integration: Requires harmonization of cross-border data sharing, care standards, and integrated insurance models that cover assistive devices and chronic conditions (Weiner et al., 2025; Arefin & Zannat, 2025; Squaremouth, 2025).
4. Ethical AI and Data Governance: Demands robust frameworks for transparency and algorithmic bias mitigation, crucial in international contexts (WHO, 2024; Weiner et al., 2025; Arefin and Zannat, 2025).
5. Sustainability and Accountability: Enhanced by applying GLSS to operations, boosting efficiency and environmental responsibility while supporting sustainable development goals (Hossain et al., 2024; Ben-Tovim, 2017; Hasan, et al., 2024; Grigoriadis et al., 2024; Bratić et al., 2025).

In conclusion, this systemic approach-rooted in digital innovation, co-design, and adaptive policy-is both necessary and feasible for supporting vulnerable travelers globally (Bird et al., 2021; UN Tourism, n.d.). Strategic integration is vital for building systemic resilience and patient empowerment (Veras et al., 2025). The future depends on strong stakeholder collaboration and the mainstreaming of co-design (Wendel et al., 2024; Simeli et al., 2023), utilizing global digital health frameworks and ethical AI practices to prioritize dignity, sustainability, and health equity for all (WHO, 2024; Weiner et al., 2025).

Key Words: Inclusivity, Digital Innovation, Participatory Design, Accessibility, Policy Integration, Ethical AI, Sustainability.

Introduction: The Challenge of Inclusive Global Healthcare

As demographic trends shift toward an increasingly older global population and travel patterns grow more diverse, the needs of vulnerable travelers-particularly older adults and individuals with disabilities-have moved from a peripheral issue to a central international priority (UN Tourism, n.d.; Portales, 2015). These travelers often present

ISBN: 978-618-5630-27-0

complex, chronic, or functional healthcare needs that persist across borders, requiring the global health ecosystem to provide responsive, resilient, and adaptable support structures.

Historically, the frameworks governing healthcare delivery and medical tourism have been criticized for being inherently fragmented and, by consequence, often exclusionary. These traditional models are frequently poorly adapted to accommodate individuals with significant functional or cognitive impairments, leading to substantial logistical barriers, compromised continuity of care, and unnecessary distress (Wendel et al., 2024; Lee, 2014). This failure stems partly from a historical focus on economic opportunity and surgical intervention rather than holistic, patient-centered care and accessibility. The resultant systems lack the necessary integration, flexibility, and sensitivity required to manage the unique challenges faced by patients traveling across jurisdictions with varying medical standards, accessibility laws, and data governance protocols.

However, recent technological advancements and philosophical shifts toward human-centered design offer a path forward. Emerging trends in digital innovation and participatory design promise a systemic transformation of the healthcare landscape, aiming squarely at enhancing equity, personalization, and sustainability in global health and welfare delivery (Bird et al., 2021; Bratić et al., 2025). This essay explores how a systemic approach-one that consciously integrates technology, policy frameworks, and essential co-design methodologies-can successfully reshape global healthcare ecosystems to be truly inclusive for vulnerable travelers, drawing upon a recent synthesis of expert recommendations and contemporary academic evidence (Veras et al., 2025; WHO, 2024).

Methodology: Synthesis of Expert Opinion and Structured Review

This theoretical and conceptual analysis is grounded in a robust mixed-methods synthesis combining findings from a structured literature review and primary insights derived from a focus group study. The objective was to move beyond the identification of problems to the development of integrated solutions suitable for rapid deployment.

The primary data was collected through a focus group study involving thirty Greek national-level experts. This selection was strategic, encompassing professionals from diverse, yet interconnected, fields: healthcare administration, policy-making, digital innovation, and accessibility consulting. This broad spectrum of expertise was essential for capturing the multidimensional nature of the challenge, which spans clinical practice, regulatory compliance, and technological implementation. The thematic analysis of these expert interviews identified recurrent patterns and consensual strategies for overcoming systemic barriers.

This primary research was contextualized and supported by a structured literature review. The methodological framework systematically integrated existing participatory design literature (Bird et al., 2021), establishing a foundational principle for solution development. It also incorporated international policy initiatives from leading global bodies such as UN Tourism and the World Health Organization (WHO, 2024), ensuring that the theoretical recommendations align with current global accessibility and digital health mandates. Furthermore, the review intentionally prioritized recent scientific references published between 2023 and 2025, which offer cutting-edge insights into

ISBN: 978-618-5630-27-0

rapidly evolving domains, including cross-border data sharing, AI governance, and inclusive technology design (Arefin & Zannat, 2025; Shie et al., 2024). By integrating expert practical knowledge with the latest academic and policy blueprints, the analysis was able to formulate comprehensive, actionable, and theoretically sound strategies for systemic reform.

Systemic Barriers and Transformative Opportunities

The research unequivocally identifies several persistent and intertwined barriers that disproportionately impact vulnerable travelers seeking cross-border healthcare. Addressing these challenges is the prerequisite for any effective systemic transformation.

Persistent Barriers to Access

The first critical hurdle is limited accessibility, which manifests across both physical infrastructure and digital interfaces (Lazar et al., 2015). Physical inaccessibility often restricts access to hospitals, transport hubs, and accommodation at the destination, creating significant logistical stress for patients relying on wheelchairs or specialized equipment. However, the digital landscape presents an equally insidious barrier. Many patient portals, booking systems, and health information resources fail to adhere to basic international accessibility standards, rendering them unusable by individuals who rely on screen readers, voice commands, or specialized input devices.

Secondly, the prevalence of fragmented regulatory frameworks constitutes a massive structural impediment (Weiner et al., 2025). National regulations regarding patient data, insurance coverage, and quality standards vary widely, creating a complex and often contradictory environment for global health providers. This fragmentation is particularly challenging for medical tourism patients who require continuous, integrated care involving multiple providers in different jurisdictions (Simeli ets al., 2023; Portales, 2015). The lack of clear protocols for cross-border data sharing and insurance harmonization creates uncertainty, high transaction costs, and limits the safe and timely transfer of vital medical records (Weiner et al., 2025).

A third major barrier is digital illiteracy and the inherent digital divide (Robru et al., 2024). While the promise of digital health solutions is vast, implementation often overlooks the needs of older adults and those with cognitive impairments, who may lack the familiarity, skills, or specialized tools required to effectively utilize complex digital interfaces. This gap can leave the most vulnerable travelers excluded from the very innovations designed to empower them. Collectively, these barriers result in a critical lack of integrated services, forcing patients and their caregivers to navigate a labyrinth of disconnected providers, paperwork, and logistical obstacles.

Bridging the Divides with Innovation

Despite these challenges, the research points to clear opportunities for leveraging innovation to bridge these divides. The strategic adoption of three key frameworks has shown initial promise: universal digital design, Green Lean Six Sigma (GLSS) frameworks, and telemedicine (Grigoriadis et al., 2024; Kaswan et al., 2023). Universal design ensures systems are inherently accessible; GLSS provides the operational efficiency needed to free up resources for personalized care; and telemedicine offers a mechanism for care continuity across distances. Nevertheless, experts highlight that while these tools exist, persistent usability and governance gaps must be urgently addressed to ensure equitable deployment (Hasan, et al., 2024; WHO, 2024). These gaps confirm that the technological solution is only as inclusive as the governance and design process that produced it.

Strategic Pillars of Inclusive Healthcare Innovation

The transition toward a truly inclusive healthcare ecosystem for vulnerable global travelers requires concerted effort across five interconnected strategic pillars. These pillars move beyond simple compliance to prioritize genuine patient empowerment and system resilience.

1. Universal Digital Platforms and Accessibility Standards

The development of user-centered, accessible digital platforms must be prioritized as the foundational layer of inclusive healthcare. These platforms are not merely convenient; they are essential tools for equitable healthcare delivery (Lazar, et al., 2015). Crucially, adherence to international accessibility standards, such as the Web Content Accessibility Guidelines (WCAG), is non-negotiable. This encompasses mandatory support for screen readers, voice commands, adjustable text sizes, and intuitive, low-cognitive load navigation. For individuals with sensory or cognitive impairments, such features are the determinants of autonomy and safe access to complex health information and services. By embedding accessibility from the design stage, systems can move beyond retrofit solutions, ensuring that inclusion is an inherent quality, not an afterthought (Lee, 2014). This commitment reinforces the dignity of the patient and enables full participation in their own care journey.

2. Participatory Design and Mitigating Digital Divides

Evidence strongly supports that participatory design (co-design)-the active involvement of end-users, including patients, caregivers, and frontline clinicians-is vital for creating usable and emotionally resonant healthcare technologies (Bird et al., 2021; Shie et al., 2024). When vulnerable individuals contribute their lived experience to the design process, the resulting technology is inherently more usable, addresses true needs, and mitigates feelings of alienation or confusion. Furthermore, participatory methods serve a crucial function in mitigating the digital divide, particularly among older adults who face significant barriers to technology adoption (Lee, 2014; Robru et al., 2024). Co-design transforms technology from an external imposition into a co-owned solution, fostering confidence and ensuring that the final products are both functional and contextually appropriate.

3. Policy Integration and Insurance Harmonization

Systemic reform demands rigorous policy integration to overcome the current regulatory fragmentation. Policy reforms must specifically aim to harmonize cross-border data sharing protocols, rationalize health insurance coverage, and standardize care delivery quality (Weiner et al., 2025; Arefin & Zannat, 2025). The goal is to establish interoperable electronic health records that allow for the seamless, secure transfer of patient information across different jurisdictions. Furthermore, the development of integrated insurance models is paramount. These models must explicitly include comprehensive coverage for assistive devices, specialized care, and the management of chronic conditions while traveling. By reducing the enormous logistical and financial burdens currently faced by traveling patients, such policy shifts directly contribute to health equity and foster trust in the global healthcare system (Squaremouth, 2025).

4. Ethical AI and Robust Data Governance

As healthcare increasingly relies on digital tools, trustworthy innovation requires robust governance frameworks for ethical AI and data handling. This necessitates transparency in algorithmic decision-making, rigorous mechanisms for algorithmic bias mitigation, and strict adherence to data security standards, especially when dealing with vulnerable populations (WHO, 2024; Weiner et al., 2025). The deployment of unified governance standards and strong data security measures is absolutely critical in international contexts where information flows across disparate legal and regulatory regimes. Without clear ethical frameworks for AI use-ensuring it does not discriminate or compromise patient autonomy-digital transformation risks exacerbating existing health inequities instead of solving them (Arefin and Zannat, 2025).

5. Sustainability and Operational Accountability

Finally, the long-term viability of inclusive healthcare depends on sustainability and accountability. Applying Green Lean Six Sigma (GLSS) methodologies to healthcare operations provides a powerful means of achieving both efficiency and environmental responsibility (Hossain et al., 2024; Ben-Tovim, 2017; Hasan, et al., 2024). GLSS principles, by reducing waste (both operational and environmental), enable destination healthcare systems to reallocate resources toward personalized, high-touch care for vulnerable patients. These sustainable practices are essential for strengthening the competitiveness and resilience of destination healthcare providers while simultaneously aligning global health delivery with broader Sustainable Development Goals (Grigoriadis et al., 2024; Bratić et al., 2025). Accountability ensures that systems are resilient enough to maintain quality care even during unexpected crises, such as pandemics or natural disasters.

Conclusions: The Future of Health Equity and Global Resilience

The establishment of a systemic approach to inclusive healthcare-one rigorously rooted in digital innovation, co-design methodologies, and adaptive, harmonized policy-is not merely an aspirational goal but is both necessary and entirely feasible for effectively supporting vulnerable travelers globally (Bird et al., 2021; UN Tourism, n.d.). The failure of traditional, fragmented models necessitates this integrated paradigm shift.

Strategic integration ensures that the introduction of new technologies and digital tools does not inadvertently exacerbate existing inequities but, instead, functions as a powerful catalyst for systemic resilience, patient empowerment, and essential cross-sectoral cooperation (Veras et al., 2025). By co-designing services with end-users, adopting universal accessibility standards, and resolving the complex governance issues surrounding cross-border data and AI, healthcare systems can transition from being reactive to proactive stewards of global health equity.

The future of inclusive healthcare will rely fundamentally on three sustained commitments: strong, mandated stakeholder collaboration across public and private sectors; sustained financial and policy investment in accessibility infrastructure (both physical and digital); and the mainstreaming of co-design as a non-negotiable principle across all innovation ecosystems (Wendel et al., 2024; Simeli et al., 2023). Global digital health frameworks and clear ethical AI practices must be adopted as actionable blueprints for constructing a next-generation system that universally prioritizes dignity, environmental sustainability, and fundamental health equity for every global traveler (WHO, 2024; Weiner et al., 2025). This holistic transformation is the defining challenge for the global health sector in the coming decade.

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ISBN: 978-618-5630-27-0

CYBER-BIOETHICS: THE ETHICAL SHIFT IN DIGITAL HEALTH

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ABSTRACT

Acknowledging the intense and vital positive as well as negative impacts of digital technologies (such as Artificial Intelligence (AI), big data analytics, computer interfaces, etc.) on societies, environment, healthcare systems, ecosystems and human lives, in part because of the innovative approaches which influence human thinking, interaction and decision-making and affect education, healthcare, human, social and natural sciences, are becoming integrated in Digital Healthcare systems (Panadés & Yuguero, 2025; Schneider et al. 2023; UNESCO, 2022). Against this backdrop, Cyber-bioethics, an emerging ethical discipline that combines bioethics with cybernetics, interprets and evaluates issues such as the privacy of health data, AI bias in healthcare, patient –doctor relationship in digital contexts, in conjunction with the ethical implications of technologies, namely AI powered diagnostics, wearables and robotics (Panadés & Yuguero, 2025; Schneider et al. 2023).

The paper draws on existing literature research and applies a systematic document analysis/a systematic review. Electronic databases such as Web of Science (WoS), Scopus, Pub Med and Google Scholar, as well as documents by the European Commission (EC), UNESCO etc. regarding issues, inter alia, of digital health technologies, data and privacy protection and governance, as well as the ethical values to foster ethical digital health, will be extensively searched based on the search strategy pertaining to the purpose of this paper.

Cyber-bioethics introduces six fundamental categories involved in digital health: i. the ethics of machine training; ii. the ethics of machine precision; iii. patient – related ethics; iv. doctor – related ethics; v. shared ethics; and vi. the roles of regulators. Accordingly, the key aspects of Cyber-bioethics are twofold encompassing: i. focus on digital health: cyber-bioethics specifically examines the ethical dilemmas raised by digital technologies in healthcare, including smartphone apps, self-tracking devices, and AI-driven systems; ii. addressing new dilemmas: it amplifies conventional bioethical principles to address new challenges like data protection, cybersecurity, the explainability and transparency of AI systems, and ensuring equity in digital health access (Abdullah et al. 2021; Panadés & Yuguero, 2025; Schneider et al. 2023). The above principles of cyber-bioethics should also be aligned with the following key ethical challenges: i. Values: respect, protection and promotion of human rights and fundamental freedoms and human dignity, environment and ecosystem flourishing, living in peaceful, just and interconnected societies, ensuring diversity and inclusiveness; ii. Ethical issues: data protection and privacy; accountability; transparency and explainability; human oversight; patient – provider relationship (Abdullah et al. 2021; Panadés & Yuguero, 2025; Schneider et al. 2023; UNESCO, 2022). Consequently, this paper argues that the future of digital health depends on an appropriate ethical integration of technologies in healthcare systems. It is crucial that

ISBN: 978-618-5630-27-0

the principles of cyber-bioethics are adopted and promoted by all stakeholders, from AI developers to healthcare professionals and policy makers, to design, deploy, implement and govern in an ethical, fair, equitable, appropriate and human centered way digital health systems (Panadés & Yuguero, 2025). Establishing these rules and regulatory frameworks is a presupposition for ensuring that digital technologies are aligned with ethical values protecting individuals from potential harms and exploitation.

Key words: Cyber-bioethics, Digital Health, Digital Technologies, Ethical Shift

1. Introduction

The digital revolution provides huge opportunities to improve private and public life, and our environments, from health care to smart cities and global warming. Unfortunately, such opportunities come with significant ethical challenges. In particular, the extensive use of increasingly more data—often personal, if not sensitive (Big Data)—the growing reliance on algorithms to analyze them in order to shape choices and to make decisions (including machine learning, AI, and robotics), and the gradual reduction of human involvement or oversight over many automatic processes, pose pressing questions about fairness, responsibility, and respect of human rights. Digital health is a rapidly expanding medical field grounded on the accessibility of ever augmenting amounts of data about people’s lifestyles, habits, clinical histories and pathophysiological features. From wearable devices to telehealth and telemedicine platforms, mobile health (mHealth), health information technology (IT) and personalized medicine, digital health innovations provide unprecedented opportunities to improve patient care, results, and access to medical services. However, the rapid application of digital technologies raises ethical issues and privacy challenges that must be addressed in order to assure responsible and secure data use (Alexiadou, 2025; Floridi et al. 2018; Vagena et al., 2018). In this regard, digital technologies provide positive as well as negative impacts on societies, environment, healthcare systems, ecosystems and human lives, in part because of the innovative approaches which influence human thinking, interaction and decision-making and affect education, healthcare, human, social and natural sciences, culture, and communication and information, are becoming integrated in Digital Healthcare systems (Panadés & Yuguero, 2025; Schneider et al., 2023; UNESCO, 2022).

2. Methodology

The paper draws on existing literature research and applies a systematic document analysis/a systematic review. Electronic databases such as Web of Science (WoS), Scopus, Pub Med and Google Scholar, as well as documents by the European Commission (EC), UNESCO etc. regarding issues, inter alia, of digital health technologies, data and privacy protection and governance, as well as the ethical values to foster ethical digital health, will be extensively searched based on the search strategy pertaining to the purpose of this paper.

3. The Scope of Cyber-bioethics

From the extensive review of the existing scientific literature, it is well established that there is an exigent need for ethical boundaries that need to be placed which determine a principal ethical framework predominantly targeted to individual action, responsibility and overall conduct in relation to the digitalization of health governance, primarily encompassing respect for human dignity, individuals' autonomy, decision making and individual privacy rights. From a practical perspective, it is claimed that this framework puts forward six ethical values involved in digital health, which are i. justice: equity in access, exclusion, equal treatment, non-discrimination, non-stigmatization, data ownership, empowerment; ii. autonomy: freedom of choice, informed consent, awareness of data collection and use, right to (not) know results; iii. privacy: data protection, confidentiality, data sharing, intended/unintended uses of data; iv. security: data storage, safety of information, protection against unauthorized access and use of data; v. responsibilities: trust, balance of power, relation between stakeholders, benefits and benefit sharing, data ownership; vi. procedural values: transparency, accountability, inclusiveness (Brall et al., 2019, p.20; Royakkers et al., 2018).

Cyber-bioethics is an emerging ethical discipline that combines bioethics with cybernetics to address ethical challenges arising from the augmenting role of digital health technologies, data, and AI in healthcare domain. It entails interpreting and evaluating issues such as the privacy of health data, AI bias in healthcare, patient – doctor relationship in digital contexts, in conjunction with the ethical implications of technologies such as AI powered diagnostics, wearables and robotics (Panadés & Yuguero, 2025; Schneider et al., 2023).

In light of the above, cyber-bioethics introduces six fundamental categories involved in digital health: i. the ethics of machine training: a. Ownership of data: Proprietary rights of patients, ownership rights of health care providers, physicians, private or publicly owned hospitals, ownership rights of AI companies, designers, developers and manufacturers., intellectual property; b. Data protection: confidentiality and patient privacy rights, avoid both overprotection and under protection, contextual rules must be clear, cybersecurity, responsibility of regulatory bodies overseeing the safety, efficacy and quality of medicines and medical devices at national and international level in each country or state; c. Data exchange: Data sharing; ii. the ethics of machine precision: a. Machine accuracy: Efficiency, reliability or consistency in clinical tasks, transparency inversely related to accuracy; b. Transparency and intelligibility: Transparency in data selection, processing and decision making; iii. patient – related ethics: Informed consent, patient confidentiality Equality, non-discrimination and solidarity; iv. doctor – related ethics: Dependence and over-reliance on machines, rivalry with machines and labour substitution, trust, empathy; v. shared ethics: a. Responsibility and culpability: In case of detrimental effects of AI use in medicine; b. Responsibility: Responsibility of doctors in dealing with AI systems, even before harm occurs; c. Costs: costs associated with the implementation of AI in medicine may be higher than expected cost savings ; and vi. the roles of regulators: a. Standardization; b. Quality assurance; c. Marketing approval: Marketing approval; d. Licensing and ethical standard (Panadés & Yuguero, 2025, p.3). Accordingly, the key aspects of Cyber-bioethics are twofold encompassing: i. focus on digital health: cyber-bioethics specifically examines the ethical dilemmas raised by digital technologies in healthcare, including smartphone apps, self-tracking devices, and AI-driven systems; ii. addressing new dilemmas: it amplifies conventional bioethical principles to address new challenges like data protection, cybersecurity, the explainability and transparency of AI systems, and ensuring equity in digital health access (Abdullah et al. 2021; Panadés & Yuguero, 2025; Schneider et al. 2023).

The above principles of cyber-bioethics should also be aligned with the following key ethical challenges: i. data protection and privacy: Protecting sensitive health data from unauthorized access and misuse; ii. algorithmic bias: Preventing and addressing biases in AI algorithms used in healthcare, which can lead to discriminatory outcomes; iii. accountability: Clarifying responsibility when errors occur in AI-driven or digital healthcare processes; iv. transparency and explainability: Ensuring that AI systems are transparent and that their decision-making processes can be understood by humans; v. human oversight: Determining the appropriate level of human oversight in AI-driven medical decisions; vi. patient – provider relationship: Analyzing how digital technologies impact the traditional relationship between patients and healthcare providers. (Abdullah 2021; Panadés & Yuguero, 2025; Schneider et al., 2023)

The new wave of digital transformation prevails on the following: i. Values: respect, protection and promotion of human rights and fundamental freedoms and human dignity, environment and ecosystem flourishing, living in peaceful, just and interconnected societies, ensuring diversity and inclusiveness; (Abdullah et al. 2021; Panadés & Yuguero, 2025; Schneider et al. 2023; UNESCO, 2022) and ii. Ethical issues: a. data protection and privacy, transparency and explainability: As more data sources become available and advanced analytics can be applied for various purposes, protecting privacy is undoubtedly a complex challenge. Data security has also been a challenge, with cyber-attacks, hacking of databases and data kidnapping. In this context, people need to be convinced that robust security measures are mandated and enforced through coherent policies. Concerns can be addressed with the adoption of appropriate technologies, monitoring and evaluation of security systems, transparency and accountability mechanisms. Also, in the related field of regulating health data—often referred to as big data—criteria and proposals were developed. In 2024, the OECD "Recommendation on Health Data Governance" pertains to the access to, and the processing of, personal health data for health-related public interest purposes, such as improving health care quality, safety and responsiveness; minimizing public health risks; identifying and assessing new diagnostic tools and treatments to improve health outcomes; governing health care resources efficiently; contributing to the progress of science and medicine; improving public policy planning and evaluation; and reinforcing patients' participation in and experiences of health care (Alexiadou, 2025 ; OECD, 2024, p.4). Whereas the EU "General Data Protection Regulation – GDPR" (2016) can be seen as a first binding legal step toward protecting data privacy. Establishing regulations to manage the handling of digital health technologies and big data not only fosters users' trust in digital health and thus adoption of it, but it can also contribute to a fair, ethical, equitable application and implementation of digital health. As long as digital health can be offered in a fair manner, its opportunities can exceed the challenges (Alexiadou, 2025; Brall et al., 2019; EU – GDPR, 2016); b. accountability: With automated data mining for decisions of clinical or public health relevance becoming one of the most promising features of digital health, accountability is of critical importance. Particularly, the employment of these new tools involves pertinent adaptations in existent accountability standards. In addition, mobile technologies can be used to target specific populations with health-related information that can help contain the spread of infectious diseases. These new developments can

ISBN: 978-618-5630-27-0

reinforce the speed and accuracy of health monitoring, contributing to more focused and effective interventions. It is expected that medical practice will increasingly be enhanced by AI algorithms for diagnosis, treatment decisions and surgical procedures. Progress in such areas is expected to greatly improve the quality of healthcare provision for patients. Such tools can vary from providing assistance to health care providers to possibly one day being fully autonomous from human supervision. Nevertheless, as more AI-guided tools become autonomous, fewer human operators are able to supersede their decisions and actions. (Alexiadou, 2025; Vagena et al., 2018, p. 3-4); c. human oversight: In order to make people competent to actually employ the opportunities offered to them if they wish, truthful information about the benefits and risks of engaging in digital health methods has to be provided to the individual users. Hence, users should be motivated and entrusted to be involved in digital health technology. For this reason, open communication, technical training and education should be available. Moreover, users of digital health technology should be cognizant that their data are being collected for health-related purposes, for instance in the case of location tackers, which can give information about an individual's health. However, there is always the peril of digital health constituting a "surveillance society". Concerning truthful information, informed consent has a leading role. While, traditional models of informed consent aimed to inform patients and research subjects and primarily paid attention to avoid harm to the individual in the course of the procedure, new patterns of informed consent for digital health have to be regarded. Specifically, the new patterns should not only recognize intended and unintended uses of data provided by aware users, but should also examine the larger time dimension, when data are stored and potentially used for a substantial amount of time; d. patient – provider relationship: Digital health tools should only be adopted when the dignity of the patient can be protected. For instance in the case of using telemedicine in hospital settings, the conveyance of potentially bad news to the patient should be in accordance to upholding dignity of the patient and therefore distant technologies (through using screens) should be refrained from when delivering news which put the patient in a vulnerable situation. Instead, personal and face-to-face communication is preferred to protect dignity of patients in vulnerable situations. In this case, however, autonomy—in terms of patients' choice of the communication channel—can tailor the delivery of healthcare to patients' needs. Conversely, patients who do not want to be institutionalized, can stay at home longer and be better supported in their home environment by means of telemedicine. Consequently, their quality of life and dignity can be ameliorated through the application of such technologies (Alexiadou, 2025; Brall et al., 2019, p.18-20).

Conclusion

Consequently, this paper argues that the future of digital health depends on an appropriate ethical integration of technologies in healthcare systems. It is crucial that the principles of cyber-bioethics are adopted and promoted by all stakeholders, from AI developers to healthcare professionals and policy makers, to design, deploy, implement and govern in an ethical, fair, equitable, appropriate and human centered way digital health systems (Panadés & Yuguero, 2025). Establishing these rules and regulatory frameworks is a presupposition for ensuring that digital technologies are aligned with ethical values protecting individuals from potential harms and exploitation.

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ISBN: 978-618-5630-27-0

RE-IMAGINING PATIENT-CENTERED CARE: AN AI-POWERED FRAMEWORK FOR ETHICAL AND PERSONALIZED HEALTH AND WELFARE SERVICES

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ABSTRACT

Health and welfare systems worldwide are experiencing profound transformations, driven by the dual pressures of rising demand, resource limitations, and rapid advances in digital technologies. At the heart of these changes lies the imperative to re-imagine patient-centered care in ways that are inclusive, innovative, and impactful. Reviewing some claims stating that conventional models or traditional patient-centered care models often fail to capture the diverse realities of patients, particularly those marginalized by socio-economic disparities (Epstein & Street, 2011; Glaser & Saltz, 2017; Jiang et al., 2017). Against this backdrop, artificial intelligence (AI) offers opportunities to build more inclusive, adaptive, and impactful systems.

This study proposes an AI-powered framework for ethical, personalized health (personalization) and welfare services, designed to integrate technical efficiency (inclusivity, and ethical governance) with social responsibility (building on sociological insights into healthcare inequalities). The framework leverages machine learning and natural language processing to enable providers to analyze patient data, generate and deliver personalized recommendations, and streamline services/communication across healthcare systems. In doing so, it aims to improve patient health outcomes, strengthen patient satisfaction, and enhance operational efficiency (Epstein & Street, 2011; Glaser & Saltz, 2017; Jiang et al., 2017). Importantly, it also addresses challenges of equity, algorithmic bias and ethical governance, ensuring that technological innovation does not reinforce existing inequalities but instead expands access to care (Reddy et al., 2019; Topol, 2019).

Drawing on sociological theory and contemporary digital health literature, the framework identifies three interlinked components: (1) patient data analysis where algorithms detect individual health needs; (2) personalized recommendations for patients, caregivers, and providers; and (3) streamlined services through task automation and improved provider-patient communication.

Furthermore, this entire study addresses three research questions: **(RQ1)** How can AI enhance patient-centered care in ways that meaningfully incorporate social determinants of health? **(RQ2)** What design principles define an ethically grounded and inclusive AI-powered PCC framework? **(RQ3)** In what ways can AI-enabled systems improve patient satisfaction, accessibility, and operational efficiency in diverse health and welfare settings?

By situating AI within broader debates on inclusivity and sustainable health management, this study goes beyond its contribution to ICHOHEMA 2025´s call to re-imagine health and welfare systems. It offers a roadmap for aligning digital innovation with equitable and patient-centered models of care, advancing both practice and policy. The framework aims to enhance patient satisfaction, equity, and operational efficiency while maintaining a critical sociological perspective on AI integration in health and welfare systems.

Findings indicate that AI can significantly augment PCC by embedding SDOH into predictive modelling, tailoring guidance to cultural and linguistic needs, and reducing administrative burdens that disproportionately affect care quality. These benefits, however, depend on robust governance structures, explicit fairness safeguards, and human oversight to mitigate bias and ensure transparency. Illustrative scenarios demonstrate practical pathways for implementation, and evaluation metrics are proposed to guide empirical testing. The approach aligns technological innovation with sociological insight, ensuring that AI strengthens—rather than undermines—patient-centered values.

Key Words: Patient-centered care; Artificial intelligence; AI ethics; Health management; Inclusivity; Healthcare efficiency;

1.Introduction

Health and welfare systems globally are under unprecedented complex socio-medical problems due to aging populations (demographic shifts), rising chronic disease prevalence, and constrained financial and human resources (workforce shortages, and fiscal constraints). Such pressures have intensified interest in digital tools, particularly artificial intelligence (AI), as a means to enhance diagnostic accuracy, personalize care, and improve administrative efficiency (Glaser & Saltz, 2017; Jiang et al., 2017). The COVID-19 pandemic further highlighted these systemic vulnerabilities and reinforced the urgency of rethinking patient care delivery in ways that are both inclusive and sustainable. Concurrently, digital innovations, particularly artificial intelligence (AI), offer transformative opportunities to enhance service delivery, patient engagement, and system efficiency. Where patient-centered care (PCC) remains an enduring paradigm aimed at situating patients' preferences, values, and lived experiences at the center of clinical decision-making (Epstein & Street, 2011). However, conventional patient-centered care (PCC) models frequently overlook the experiences of marginalized groups and fail to account for structural inequities that shape health outcomes.

Patient-centered care, as defined by Epstein and Street (2011), places patient preferences, values, and needs at the heart of clinical decision-making. However, traditional PCC frameworks often neglect structural and social inequities that affect access, communication, and outcomes—particularly for marginalized or linguistically diverse populations. AI technologies, when ethically applied, have the potential to bridge this gap by offering scalable, data-driven solutions that adapt to individual and community contexts.

The integration of AI into healthcare presents both opportunities and challenges. While AI can facilitate proactive care, personalized interventions, and administrative efficiency, it also introduces risks related to bias, inequity, and ethical governance. Existing literature highlights the need for frameworks that combine technological capabilities with organizational, sociological, and ethical considerations to ensure inclusive and equitable patient care (Epstein & Street, 2011; Glaser & Saltz, 2017; Reddy et al., 2019).

However, there is growing recognition that neither AI nor PCC, as commonly operationalized, are inherently equitable. AI models can reproduce and amplify structural inequalities if trained on biased datasets or deployed without attention to context; PCC models can be applied superficially, failing to address social determinants of health (SDOH) or language/cultural barriers. These limitations necessitate integrative frameworks that unite technical capabilities with sociological sensibilities and ethical governance (Reddy et al., 2019; Topol, 2019).

This study develops a conceptual AI-powered framework for integrating AI with patient-centered care that prioritizes ethical deployment (oversight), inclusivity, and operational efficiency. The goal is twofold: to offer a pragmatic roadmap for practitioners and policymakers, and to contribute a sociologically informed lens to debates about AI in health and welfare systems.

Through the sociological insight/lens with technological innovation, healthcare ethics, and digital health literature, the framework aims to provide actionable guidance for health professionals, administrators, and policymakers seeking to implement AI in ways that respect patient needs, values, and rights. Demonstrating how AI can re-imagine patient-centered care while preserving human empathy, trust, and ethical accountability. Illustrative scenarios are included to demonstrate practical applications of the framework in diverse healthcare settings. Figure 1 below gives us a review of existing factors within modern healthcare and AI- in alignment with supporting the significant arguments in this study.

ISBN: 978-618-5630-27-0

Figure 1: Healthcare and AI

Photo from the Internet, October, 2025.

Figure 2. AI-Powered Patient-Centered Care Framework

1.0. Key Terms and Definitions

Artificial Intelligence (AI):

AI refers to computer systems that can perform tasks typically requiring human intelligence, including pattern recognition, predictive modelling, natural language understanding, and decision-making. In healthcare, AI applications include diagnosis, treatment recommendation, workflow automation, and patient engagement (Glaser & Saltz, 2017; Jiang et al., 2017).

Machine Learning (ML):

ML is a subset of AI that allows systems to learn patterns from data and make predictions or decisions without explicit programming. ML in healthcare can detect risk factors, forecast disease progression, and support personalized treatment plans (Jiang et al., 2017).

Natural Language Processing (NLP):

NLP is a branch of AI that enables computers to understand, interpret, and generate human language. In patient-centered care, NLP can power chat bots, voice interfaces, multilingual communication, and the simplification of medical instructions for low-literacy patients (Glaser & Saltz, 2017).

Patient-Centered Care (PCC):

PCC is an approach to healthcare that prioritizes patients' preferences, needs, and values, ensuring that clinical decisions respect individuals' unique circumstances. It emphasizes shared decision-making, effective communication, and holistic understanding of social determinants of health (Epstein & Street, 2011).

Social Determinants of Health (SDOH):

SDOH are the non-medical factors that influence health outcomes, including socio-economic status, education, neighborhood and physical environment, employment, and social support networks. Integrating SDOH into AI models helps to identify disparities and target interventions for vulnerable populations (Reddy et al., 2019).

Algorithmic Governance:

Algorithmic governance refers to the oversight mechanisms that ensure AI systems operate transparently, fairly, and ethically. This includes auditing models for bias, maintaining accountability, enabling human oversight, and implementing policies to protect privacy and consent (Topol, 2019).

Equity in Healthcare:

Equity is the principle of fairness in health service delivery, ensuring that individuals have access to care based on their needs, rather than their social, economic, or demographic characteristics. AI systems must be designed and monitored to avoid reproducing or amplifying existing disparities (Reddy et al., 2019).

Explainable AI (XAI):

XAI refers to techniques that make AI decision-making processes interpretable to humans. In healthcare, XAI supports clinicians in understanding algorithmic recommendations and fostering patient trust in AI-augmented care (Topol, 2019).

2.Literature Review

Scholars have long emphasized that patient-centered care extends beyond clinical treatment—it involves relational communication, empathy, and shared decision-making (Epstein & Street, 2011). However, the digitization of healthcare has introduced new layers of complexity and ethical concern.

Glaser and Saltz (2017) describe AI as a transformative force in healthcare, offering tools for real-time data analysis, predictive modelling, and clinical decision support. Jiang et al. (2017) note that AI's power lies in its capacity to process vast and diverse datasets, enabling personalized diagnostics and care. Yet, this technological promise comes with risks, including algorithmic bias, lack of transparency, and potential reinforcement of existing inequities (Reddy et al., 2019).

Topol (2019) emphasizes the importance of "high-performance medicine" that aligns human compassion with technological precision. He argues that the integration of AI should not replace human interaction but rather enhance it. This insight provides a key foundation for the framework presented in this paper: AI must support human-centered care, not overshadow it.

2.0.Patient-Centered Care: Core Concepts and Critiques

ISBN: 978-618-5630-27-0

Patient-centered care emphasizes respect for patients' values, shared decision-making, and effective provider–patient communication (Epstein & Street, 2011). Empirical studies link PCC to improved satisfaction, adherence, and some health outcomes. Nonetheless, critics note that PCC frequently focuses on dyadic clinical interactions and individualized preferences while underemphasizing the broader socioeconomic and structural determinants that shape patients' capacities to engage with care (Epstein & Street, 2011). Marginalized populations—those facing language barriers, low health literacy, or socio-economic precarity—are often underserved by conventional PCC implementations.

2.1. AI in Healthcare: Promise and Perils

AI methods—particularly machine learning (ML) and natural language processing (NLP)—are powerful for pattern detection, predictive modeling, and automating routine tasks (Jiang et al., 2017). Glaser and Saltz (2017) highlight potential gains in diagnosis, treatment personalization, and operational efficiency. Topol (2019) frames AI as a means to augment clinician capacities and create "high-performance medicine." Yet, a parallel literature emphasizes the risks: algorithmic bias, lack of transparency (black-box models), and the danger of decontextualized clinical decision support (Reddy et al., 2019). Several high-profile examples illustrate how models trained on unrepresentative data can underperform or harm underrepresented groups.

2.2. Equity, Governance, and Human Oversight

Reddy et al. (2019) and Topol (2019) stress that ethical deployment of AI requires governance structures: auditability, algorithmic transparency, mechanisms for human oversight, and policies for continuous monitoring and remediation. The literature also underscores the need to incorporate SDOH into predictive models to avoid attributing disparities solely to individual behaviors. Sociological perspectives contribute a crucial view: technologies are embedded in social institutions, and thus must be designed with attention to power relations, resource distributions, and cultural differences.

2.3. Synthesis and Gap

Taken together, the literature contends that AI has substantial potential to improve PCC but that realizing this potential depends on integrating social determinants, ensuring transparency, and building organizational infrastructures for oversight. A persistent gap exists in operationalizing frameworks that concretely link ML/NLP capabilities with PCC values and governance practices in diverse, real-world settings. This paper responds to that gap by proposing an integrated framework with concrete components and governance mechanisms.

3. Methodology: Conceptual/Theoretical Framework Development

This study adopts a **conceptual and theory-driven methodological approach**, which is consistent with ICOHEMA's emphasis on analytical, interdisciplinary research within management, health, and social welfare domains. Given the rapid evolution of artificial intelligence (AI) in healthcare and the limited availability of mature empirical datasets across diverse socio-cultural contexts, a conceptual framework approach is both appropriate and necessary. It enables a systematic integration of existing theoretical perspectives, scholarly arguments, and technological capabilities to develop a robust socio-technical model for AI-enabled patient-centered care (PCC).

The methodological process began with a **structured mapping of foundational literature** across three core domains: patient-centered care, AI in healthcare, and ethical AI governance. Key PCC scholarship—especially the work of Epstein and Street (2011)—provided essential principles regarding communication, patient narratives, and shared decision-making as foundational elements of effective care. Technical literature on AI and machine learning (ML), including studies by Jiang et al. (2017) and Glaser and Saltz (2017), informed the analysis of how predictive analytics, natural language processing (NLP), and clinical decision-support tools can augment diagnostic accuracy, workflow efficiency, and personalization. Ethical governance frameworks, particularly those articulated by Reddy et al. (2019) and Topol (2019) contributed critical insights into issues of transparency, fairness, accountability, and the preservation of human oversight. These bodies of literature were systematically compared, categorized, and synthesized to identify convergences, gaps, and tensions relevant to AI-driven PCC.

In the second phase, an **integrative conceptual synthesis** was conducted to merge insights from the three domains into a coherent analytical structure. This involved applying socio-technical systems theory to explore the interaction between AI technologies, healthcare institutions, and patient experiences. Through iterative mapping, a set of core thematic imperatives—**inclusivity, personalization, transparency, ethical safeguards, and systemic efficiency**—were identified as essential for embedding AI within the ethical and operational logic of PCC. Each thematic construct was analyzed for its theoretical grounding, operational implications, and alignment with PCC values. AI capabilities were then layered onto these constructs to reveal areas in which technology could enhance, disrupt, or reshape traditional understandings of patient-centered practice.

The third methodological phase involved the construction of **illustrative application scenarios** to validate the internal coherence and practical relevance of the conceptual model. These scenarios were not empirical case studies but **heuristic simulations**—carefully designed representations of how AI-enabled PCC might function within real-world contexts, particularly in resource-constrained, culturally diverse, or structurally unequal health systems. Scenarios included, for example, AI-supported multilingual communication, predictive analytics for high-risk populations, and automated workflow systems for reducing clinician burden. Each scenario served to test how the proposed framework accommodates real-world challenges, aligns with ethical requirements, and supports equitable care delivery.

By combining theoretical synthesis, interdisciplinary literature integration, and scenario-based conceptual validation, this methodology produces a **rigorous socio-technical framework** capable of supporting both scholarly analysis and practical implementation. Although non-empirical, the approach aligns with ICOHEMA's standards for conceptual contributions and provides a structured foundation for future empirical research, policy development, and applied AI system design. The resulting framework demonstrates how AI tools can be embedded within patient-centered paradigms while upholding ethical, cultural, and governance-oriented considerations essential to equitable digital health ecosystems.

3.0. **Refined Summary of Methodology: Conceptual Framework Development**

As explained in detailed above, this study employs a **conceptual, literature-driven methodology** designed to generate a theoretically grounded and practically relevant framework for integrating artificial intelligence (AI) into patient-centered care (PCC). Rather than collecting empirical data, the research synthesizes interdisciplinary scholarship from **sociology, healthcare ethics, digital health studies, and AI governance** to construct a socio-technical model capable of addressing contemporary challenges in health and welfare systems.

The methodological process unfolded in **three iterative phases:**

3.0.1. Phase 1: Mapping Foundational Scholarship

A comprehensive review of peer-reviewed literature identified three core bodies of knowledge foundational to the framework:

Patient-Centered Care (PCC): Canonical work by Epstein and Street (2011) provided principles of communication, shared decision-making, and respect for patient values—highlighting limitations in how traditional PCC models under-represent structural determinants of health.

AI Applications in Healthcare: Research by Glaser and Saltz (2017) and Jiang et al. (2017) demonstrated the capabilities of machine learning (ML), natural language processing (NLP), and predictive analytics in enhancing diagnosis, personalization, and workflow efficiency.

Ethical Governance and Equity: Key insights from Reddy et al. (2019) and Topol (2019) underscored the importance of fairness, bias mitigation, transparency, audit ability, and human oversight in AI deployment.

3.0.2. Phase 2: Integrative Conceptual Synthesis

Using principles from socio-technical systems theory and equity-oriented sociology, the study synthesized insights from these literatures to identify converging themes—**inclusivity, personalization, ethical safeguards, transparency, and operational efficiency**. The framework emerged through iterative comparison of PCC desiderata, AI capabilities, and governance requirements. This process produced an integrative architecture in which technical components (ML/NLP analytics, automation tools) are embedded within ethical and sociological considerations (SDOH integration, cultural competence, human oversight).

3.0.3. Phase 3: Construction of Illustrative Scenarios

To evaluate **internal coherence, contextual relevance, and practical plausibility**, the study developed a set of **illustrative application scenarios.** These scenarios—such as multilingual patient support, predictive risk detection for vulnerable populations, and AI-assisted workflow automation—function as **heuristic devices** rather than empirical cases. They demonstrate how the conceptual model could operate across diverse clinical and social care environments, particularly in multilingual, culturally diverse, or resource-constrained settings.

3.1. Methodological Contribution

This conceptual methodology enables the development of a **rigorous socio-technical framework** that captures both the technical potential of AI and the human, structural, and ethical dimensions of care. By integrating PCC theory, digital health capabilities, and governance principles, the study offers a foundation for future **empirical testing, piloting, and policy evaluation.** The resulting framework positions AI not as a replacement for human care but as an enabling tool embedded within systems of ethical responsibility.

Table 1
Comparison of Traditional vs AI-Augmented Patient-Centered Care

Dimension	**Traditional PCC**	**AI-Augmented PCC**
Personalization	Based on clinician judgment	Data-driven + clinician judgment
Language access	Limited	Multilingual NLP
Equity focus	Often implicit	Explicit via SDOH modeling

4.Research Questions

To guide the development and evaluation of the proposed framework, the following research questions were formulated:

RQ1: *How can AI enhance patient-centered care (PCC) in a way that meaningfully captures patients' social, cultural, and structural contexts?*

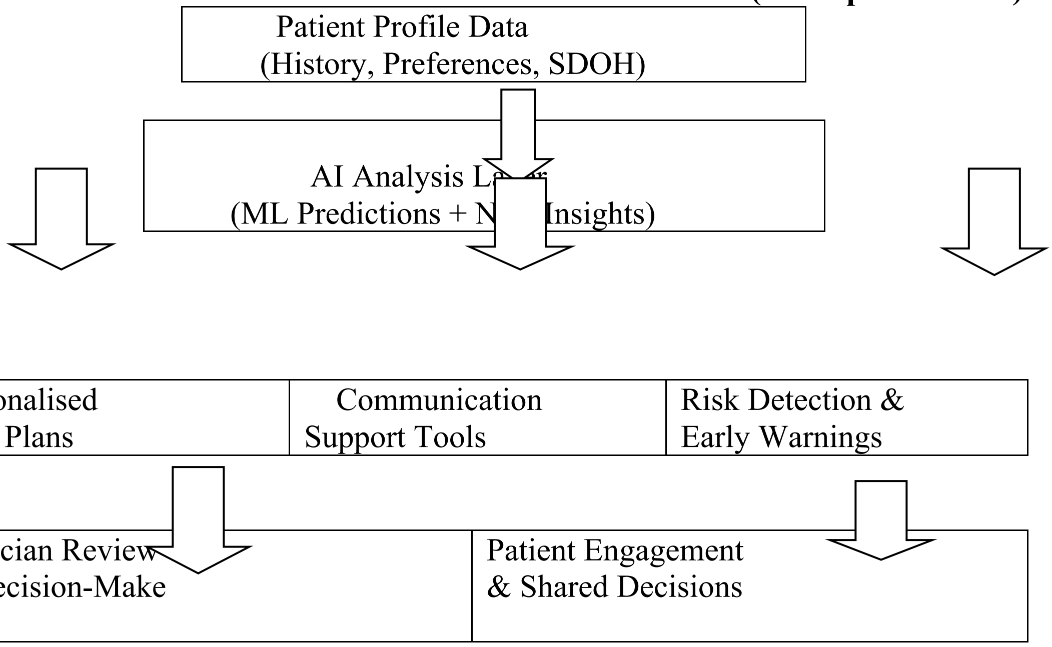
RQ2: *What constitutes an ethically governed, socially sensitive, and operationally feasible AI-powered framework for PCC?*

RQ3: *How can AI-enabled tools increase inclusivity, patient satisfaction, and efficiency within health and welfare systems, particularly for marginalized populations?*

These questions provide analytical direction for both the conceptual design and the development of implementation scenarios.

5. The AI-Powered Patient-Centered Care Framework

Figure 3:
AI-Powered Patient-Centered Care Framework (Conceptual Model)



5.0. The AI-Powered Patient-Centered Care Framework

The framework integrates three modules—Patient Data Analysis, Personalized Recommendations, and Streamlined Services—within an ethical governance envelope that ensures transparency, fairness, and human oversight. Figure 1 (descriptive here) conceptualizes the architecture: data flows from multiple sources into analytic engines (ML + NLP), produce context-sensitive recommendations, which are mediated through interfaces designed for inclusivity and operational workflows that optimize provider time.

Table 2. Summary of AI Framework Components

Component	Function	Outcome
Patient Data Analysis	Integrates clinical + SDOH data	Equity-aware predictions
Personalized Recommendations	Multilingual guidance + NLP	Improved accessibility
Streamlined Services	Workflow automation	Greater efficiency

5.1 Component 1: Patient Data Analysis

Objective: Detect individual needs and structural disparities by integrating clinical data with SDOH.

Key elements:

Multimodal data ingestion (EHRs, social care records, patient-reported outcomes, environmental data).

Feature engineering that explicitly encodes SDOH (housing, employment, language proficiency).

Bias detection subsystems that test for differential performance across demographic groups.

Operationalization: Models should be trained and validated using stratified cross-validation, include fairness metrics (e.g., equalized odds, demographic parity tests), and undergo periodic revalidation.

5.2 Component 2: Personalized Recommendations

Objective: Generate culturally and linguistically appropriate guidance for patients, caregivers, and providers.

Key elements:

Recommendation engines produce care plans with confidence scores and interpretable rationales.

NLP interfaces support multilingual dialogue, simplify medical language, and enable voice interactions for low-literacy populations.

Shared decision aids combine algorithmic suggestions with patient preferences, displayed in user-friendly formats.

Operationalization: Adopt explainable AI (XAI) techniques (local interpretable explanations, counterfactuals) so clinicians can interpret model outputs during consultations.

5.3 Component 3: Streamlined Services

Objective: Reduce administrative burden and enhance system responsiveness while preserving therapeutic relationships.

Key elements:

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Scheduling optimization that balances urgency, continuity, and equity.
Chat bots for routine queries with escalation pathways to human staff.
Automated summary generation for clinical encounters to reduce documentation workload.

Operationalization: Maintain audit trails for automated actions; design human-in-the-loop escalation thresholds.

5.4.Results: Framework Overview

The AI-powered patient-centered care framework consists of **three interconnected components** designed to operate within health and welfare systems in an ethically responsible and inclusive manner.

5.4.1. Component 1: Patient Data Analysis

AI offers advanced capabilities for integrating diverse forms of data, including clinical histories, behavioral metrics, and social determinants of health (SDoH). This component focuses on:

Early detection of risks, including non-adherence, worsening symptoms, or socio-economic vulnerabilities.

Integration of SDOH, such as housing stability, education, and financial barriers—which are often overlooked in clinical systems.

Pattern detection, enabling providers to identify disparities in access, outcomes, or communication needs.

Illustrative Example:
An AI system detects that a patient with diabetes is at high risk of non-adherence due to work schedules, transportation barriers, and low health literacy. The system flags this risk and suggests targeted interventions such as flexible appointments and simplified educational materials.

5.4.2. Component 2: Personalized Recommendations

Personalized recommendations are central to reimagining PCC through digital tools. AI-driven systems—including recommendation engines, adaptive educational materials, and multilingual interfaces—can:

Adapt to patient language preferences and cultural contexts
Provide guidance to caregivers and providers
Deliver reminders, health tips, and personalized care plans
Support shared decision-making through transparent explanations of recommendations

This component aligns with sociological insights that emphasize communication, trust, and cultural competence.

Illustrative Example:
An AI chat-bot delivers medication reminders in the patient's preferred language (for example Arabic, Turkish, or Swahili) and adjusts explanations to match the patient's literacy level, improving adherence and reducing anxiety.

5.4.3. Component 3: Streamlined Services

AI can significantly improve operational efficiency, enabling healthcare workers to allocate more time to direct patient interaction.

Key features include:
Automated appointment scheduling

ISBN: 978-618-5630-27-0

Smart triaging and task delegation
Chat-bots for routine inquiries
Document generation (notes, summaries, reports)
Workflow optimization to reduce provider burnout
These tools support an efficient system without compromising patient-centered values.
Illustrative Example:
An automatic scheduling system rearranges appointments in response to provider availability and patient urgency scores. Routine follow-ups are handled digitally, reducing waiting times and administrative burden.

5.5. Ethical Governance Envelope

Core functions:
Accountability: Multidisciplinary oversight board (clinicians, data scientists, ethicists, community representatives).
Transparency: Public documentation of model purposes, data sources, performance metrics, and update logs.
Continuous Monitoring: Real-time performance dashboards and scheduled fairness audits.
Consent & Privacy: Clear consent mechanisms and privacy-preserving techniques (de-identification, differential privacy where applicable).

5.6. **Illustrative Scenarios**

To demonstrate the integrated functioning of the proposed framework, three scenarios are provided.

Scenario 1: Multilingual Support for Medication Adherence
A newly arrived migrant patient struggles with German-language medication instructions. An AI-driven multilingual chatbot provides interactive videos and voice instructions in the patient's preferred language. The system checks comprehension and notifies providers if confusion persists.
Outcome:
Greater adherence, reduced risk of complications, improved confidence in navigating the healthcare system.

Scenario 2: Predictive Analytics for High-Risk Populations
A community clinic serving low-income families uses AI to identify patients at heightened risk of asthma complications during winter. The system integrates environmental data, clinical histories, and family housing conditions.
Outcome:
Care teams intervene proactively with home visits and medication refills, reducing emergency visits.

Scenario 3: Automated Scheduling for Burnout Reduction
A regional health service adopts an AI scheduling tool to optimize appointments based on patient flow, provider availability, and predicted no-show rates.
Outcome:
Providers experience reduced administrative burden, allowing more focus on patient communication and complex care needs.

5.6.0. Illustrative Application Scenarios

Scenario A: Language-Concordant Medication Support

A patient with limited proficiency in the dominant language receives voice-based medication instructions in their native language via an NLP chatbot. The system assesses comprehension and flags misunderstanding to the care team. This intervention reduces errors and increases adherence.

Scenario B: Predictive Outreach for Socio-economically Vulnerable Patients

An ML model combining EHR and local housing data predicts elevated hospitalization risk for patients living in poorly insulated housing during winter. Care teams are alerted to proactively provide support (home visits, medication adjustments), reducing ER admissions.

Scenario C: Administrative Relief via Smart Scheduling

An AI scheduler optimizes appointments by proactively offering flexible slots to caregivers with shift work, resulting in lower no-show rates and improved clinic throughput. Clinicians regain time for longer, higher-value patient interactions.

Each scenario illustrates how technical components interact with governance mechanisms (human oversight and escalation), centring inclusion and patient autonomy.

5.6.1. Evaluation Metrics and Research Agenda

To assess the framework's effectiveness, mixed quantitative and qualitative metrics are recommended:

Equity Metrics

Disaggregated performance measures (sensitivity, specificity) across race/ethnicity, language, SES.

Access indicators (language-concordant encounters, service uptake by marginalized groups).

Clinical & Operational Metrics

Health outcomes (hospitalizations, adherence rates).

Patient-reported outcomes (satisfaction, perceived respect).

Workflow measures (time spent on documentation, no-show rates).

Ethical & Trust Metrics

Rates of algorithmic override by clinicians.

Incidence of reported harms or misclassifications.

Patient trust surveys and opt-out rates.

Research agenda

Prospective pilot studies to measure causal impacts.

Ethnographic studies on patient and provider experiences.

Cost-effectiveness analyses across diverse health systems.

6. Findings

Drawing on the conceptual framework, illustrative scenarios, and synthesis of extant literature, the study identifies several key findings that clarify how artificial intelligence (AI) can strengthen patient-centered care (PCC) while addressing issues of equity, communication, and service efficiency. The analysis demonstrates that when AI systems are deliberately designed with sociological sensitivity and ethical governance structures, they can reveal hidden disparities, improve cultural and linguistic inclusivity, and support more efficient and humane care delivery. These findings respond directly to the research questions by showing both the mechanisms and conditions through which AI enhances patient outcomes, inclusivity, and system-wide performance.

The first major finding shows that AI enables **structurally aware personalization**. By integrating clinical data with social determinants of health (SDOH)—including income, housing stability, mobility constraints, and language proficiency—AI systems expand PCC beyond individualized preference to include the structural realities shaping patients’ health (Jiang et al., 2017). For instance, models that flag missed appointments among diabetic patients in low-income neighborhoods expose transportation and financial barriers that would otherwise remain invisible. Such analyses make inequities actionable, guiding more targeted outreach and community-based interventions. This confirms that AI-driven data integration is essential for advancing equity-oriented PCC.

The second finding highlights AI’s ability to improve **communication and cultural-linguistic inclusivity.** Natural language processing (NLP) tools, multilingual interfaces, and simplified medical language generators can support patients who face literacy barriers, cognitive challenges, or language mismatches with the health system (Epstein & Street, 2011). Scenarios such as a chatbot providing instructions in local dialects show that AI can translate complex medical information into accessible formats. These tools increase comprehension, reinforce patient autonomy, and deepen trust between patients and providers. This demonstrates that linguistic and cultural tailoring through AI is central to inclusive PCC.

A third finding concerns **efficiency and workflow optimization**. Automation of repetitive administrative tasks—such as documentation, appointment scheduling, or basic triage—reduces the non-clinical workload that contributes to provider stress and burnout. These efficiency gains allow clinicians to redirect time and attention toward relational and complex care needs (Glaser & Saltz, 2017). The scenario of an AI-driven scheduling system illustrates how operational streamlining can reduce no-show rates, improve care continuity, and enhance satisfaction for both patients and providers. This indicates that AI-supported operational systems strengthen both the quality and efficiency of clinical work.

The fourth finding emphasizes that **ethical governance is decisive in determining whether AI promotes equity or exacerbates harm**. Without fairness audits, transparency measures, and human oversight, AI systems risk reinforcing existing disparities or introducing new forms of bias (Reddy et al., 2019; Topol, 2019). However, when governance structures incorporate community representation, explainability methods, and continuous monitoring, AI becomes a tool that supports trustworthy, safe, and accountable care. This demonstrates that ethical design is not peripheral but foundational to successful AI deployment.

Finally, the findings show that AI enhances **preventive and proactive care**. Predictive analytics enable early detection of clinical deterioration and social vulnerability, allowing providers to intervene before crises develop. Models that identify patients at risk of non-adherence, housing instability, or unmanaged chronic conditions support earlier outreach and more tailored follow-up strategies. As a result, healthcare systems shift from reactive crisis management toward preventive, population-focused care.

Collectively, these findings demonstrate that AI can significantly enhance patient-centered care when embedded within a socio-technical framework grounded in ethics, inclusivity, and structural awareness. The results confirm that the proposed framework offers a feasible and theoretically grounded model for improving patient outcomes, system efficiency, and equitable service delivery. This establishes a strong foundation for future empirical validation and practical implementation.

Table 3
Comparison of Traditional vs AI-Augmented Patient-Centered Care

Dimension	**Traditional PCC**	**AI-Augmented PCC**
Personalization	Based on clinician assessment	Data-driven personalization using ML
Communication	Verbal, subject to human limits	NLP-enabled adaptive communication
Monitoring	Periodic, appointment-based	Continuous real-time monitoring
Inclusivity	Limited by language/cultural gaps	Multilingual, accessible interfaces
Efficiency	High clinician workload	Automation reduces administrative burden
Safety	Manual risk assessment	Predictive early-warning systems

7. Discussion

The findings of this study demonstrate that AI holds substantial potential for strengthening patient-centered care (PCC) when its development and implementation are grounded in sociological insight, ethical governance, and inclusive design principles. Rather than functioning as a purely technical solution, AI emerges as a socio-technical tool capable of enhancing personalization, improving communication, and enabling more responsive and equitable healthcare systems. The proposed framework highlights how integrating clinical data with social determinants of health, along with the use of multilingual communication interfaces and automated workflow support, can expand the scope and depth of PCC in ways that are both operationally efficient and ethically responsible.

A central theme in the discussion is the importance of **ethical integration**. The literature emphasizes that AI systems must operate within structures that ensure transparency, explainability, and fairness (Reddy et al., 2019; Topol, 2019). Human oversight remains critical to maintaining accountability, especially in clinical decision-making contexts where errors or biases can have profound consequences. Routine auditing, continuous monitoring, and inclusion of diverse community voices in governance processes help ensure that AI supports clinicians rather than undermining their judgment or displacing essential human care. This aligns with broader ethical concerns in digital health, where technology must augment—not erode—professional responsibility and patient autonomy.

Another major contribution of the framework lies in its emphasis on **inclusivity and cultural competence**. The use of natural language processing (NLP) tools, multilingual interfaces, and simplified communication pathways demonstrates how AI can expand accessibility for populations facing linguistic, educational, or cultural barriers. Epstein and Street (2011) underscore the foundational role of communication in PCC, and the framework builds on this by operationalizing culturally responsive digital interactions. Through dialect-sensitive chatbots and tailored recommendations, AI can reduce misunderstanding, strengthen trust, and enable patients—especially those from underserved groups—to participate more actively in their care.

The framework also contributes to ongoing debates about **system efficiency and the future of clinical work**. By reducing administrative burdens through automation of scheduling, reminders, and documentation, AI can help address mounting workforce pressures and provider burnout. Glaser and Saltz (2017) and Topol (2019) note that health professionals increasingly face competing demands that limit the time available for relational and complex care. In this context, AI-driven workflow optimization allows clinicians to reallocate time toward activities requiring empathy, critical reasoning, and human connection, thereby reinforcing rather than diminishing the core values of PCC.

Despite these opportunities, the discussion must also acknowledge the **limitations and challenges** inherent in AI deployment. Because this study develops a conceptual rather than empirical model, future research is required to validate the framework in real-world contexts. Practical barriers—including missing SDOH data, uneven digital infrastructure, interoperability issues with legacy health information systems, and deficits in workforce training—pose significant obstacles to implementation. Ethical risks also persist: inadequate oversight can lead to perpetuation of bias, opaque decision pathways, and overreliance on automated outputs. Moreover, the potential digital divide—particularly affecting older adults, low-income groups, and rural populations—raises concerns about unequal access and unintended consequences of well-intentioned technological interventions.

Finally, the sociological perspective of this framework highlights the need to situate AI within broader questions of **justice, participation, and representation**. AI in healthcare is not merely about improving accuracy or efficiency; it is also about shaping which voices, experiences, and bodies are centered or marginalized in clinical practice. Embedding equity-oriented design principles, ensuring community participation in oversight, and maintaining human-centered values are essential for ensuring that AI contributes to a more inclusive and humane health system.

In sum, the discussion underscores that AI offers a powerful—but not inherently benign—set of tools for advancing patient-centered care. Its success depends on ethically grounded governance, cultural and linguistic inclusivity, attention to structural determinants of health, and an unwavering commitment to supporting, rather than replacing, human caregiving. The conceptual framework presented here provides a foundation for future empirical research and offers practical guidance for organizations seeking to implement AI in ways that are equitable, responsible, and aligned with the core principles of patient-centered care.

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8. Theoretical & Practical Implications

The conceptual framework developed in this study has both **theoretical significance** and **practical utility,** advancing our understanding of how AI can reshape patient-centered care (PCC) in ethically robust and socially equitable ways.

From a **theoretical perspective**, the framework bridges established PCC theory with contemporary AI capabilities. By explicitly incorporating social determinants of health (SDOH), explainable AI (XAI), and governance mechanisms, it enriches PCC models with sociological depth—recognizing that care quality depends not only on individualized communication but also on structural contexts of inequality. Sociology's emphasis on power, access, and representation helps to ground AI design in a justice-oriented narrative, ensuring technology is not a neutral force but a socially embedded intervention. In doing so, the framework contributes to theory-building in digital health by proposing a socio-technical schema that prioritizes relational values, accountability, and systemic fairness.

On a **practical level**, the framework offers a roadmap for healthcare organizations, policymakers, and technology developers engaged in AI deployment. Hospitals and clinics can leverage the framework to design AI-supported workflows that enhance both clinical effectiveness and patient experience. For instance, AI-powered tools may be used to automate administrative tasks, but within a governance structure that maintains human oversight and interpretability. The design of digital interfaces—such as multilingual chat-bots or simplified decision aids—can be informed by the framework to maximize accessibility for culturally and linguistically diverse populations.

Policy implications are central to achieving equitable and responsible implementation. In order to operationalize the framework, the following strategies are recommended:

Establish Multidisciplinary Oversight Committees: Healthcare organizations should form governance bodies composed of clinicians, sociologists, ethicists, data scientists, and community representatives. Such committees can guide algorithm development, review fairness audits, and monitor real-world performance.

Implement Regular Algorithmic Audits: Periodic evaluations of AI models should assess for bias, transparency, and fairness. On the same note, Audit findings should inform iterative redesigns to mitigate inequities.

Design Inclusive Digital Interfaces: AI tools should be accessible to patients across linguistic, cultural, and literacy spectra. This requires multilingual functionality, voice-based interactions, and user-friendly design informed by community needs.

Promote AI Literacy and Ethical Training: Clinicians and administrators need structured training on how AI works, its limitations, and its ethical implications. They should be prepared to interpret model outputs, make informed overrides, and engage patients in shared decision-making.

Create Guidelines for Human Oversight and Patient Rights: Clear policies should define when and how humans intervene in AI decisions, ensuring accountability, transparency, and patient autonomy. Patients should have informed consent, data privacy protections, and hybrid decision-making pathways that combine AI recommendations with professional judgment.

By embedding these practical and policy strategies within institutional structures, the framework not only supports technology adoption but also cultivates **patient empowerment, equity, and systemic accountability**. This dual orientation—toward

ISBN: 978-618-5630-27-0

theory and practice—positions the proposed AI framework as a tool for transformative change in health and welfare systems, where technological innovation aligns with social justice and human-centered values.

8.1. Policy and Practice Recommendations

To ensure that artificial intelligence enhances rather than undermines patient-centered care (PCC), health organizations and policymakers should adopt coordinated governance, infrastructural, and educational strategies. The following recommendations operationalize the proposed framework:

1. Establish Robust Governance Structures

Healthcare institutions should mandate **multidisciplinary oversight committees** for any AI tool used in clinical or welfare settings. These committees must include clinicians, sociologists, data scientists, ethicists, and *community representatives* to ensure cultural responsiveness, transparency, and democratic accountability.

2. Mandate Algorithmic Audits and Transparency

Regular, independent audits should evaluate AI systems for **fairness, safety, bias, drift, and interpretability.** Public summaries of audit findings promote accountability, patient trust, and institutional transparency.

3. Strengthen Data Infrastructure

Policymakers should invest in integrating **social determinants of health (SDOH)** into clinical and welfare records through standardized data collection, interoperability standards, and improved data quality management. High-quality, representative data is central to equitable AI performance.

4. Promote AI Literacy across the Workforce

Training programs must equip clinicians, administrators, and social-care professionals to understand AI capabilities, limitations, and ethical implications. AI literacy enhances informed decision-making, supports effective human-AI collaboration, and reduces overreliance on automation.

5. Ensure Inclusive Access and Digital Equity

To prevent widening the digital divide, AI adoption should be accompanied by policies that support access to devices, connectivity, digital literacy, and user assistance—especially for underserved or marginalized groups. Inclusive design standards should guide all patient-facing technologies.

These recommendations aim to embed equity, transparency, and patient empowerment at the core of AI-enabled care systems.

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9. Conclusion

Artificial intelligence holds significant potential to strengthen patient-centered care by enhancing personalization, improving communication, and increasing system responsiveness. Yet these gains are only achievable when AI systems are designed and implemented within frameworks grounded in **sociological insight, ethical governance, and cultural inclusivity**.

The AI-powered framework proposed in this paper provides a socio-technical architecture for aligning machine learning and natural language processing tools with PCC values. By integrating human oversight, SDOH-sensitive modelling, explainable AI components, and inclusive design principles, the framework addresses both the technical and social determinants of equitable care.

Future research should empirically evaluate this framework across diverse health and welfare settings, refine outcome metrics, and further develop models for community-driven governance. Ultimately, the thoughtful adoption of AI—guided by interdisciplinary collaboration and an unwavering commitment to human dignity—can move health systems toward more **equitable, transparent, and genuinely patient-centered** forms of care.

9.1. Acknowledgments

The author expresses sincere gratitude to the organizers of the 5th International Scientific Conference ICOHEMA 2025 for the opportunity to present this work, and to the Institute of Sociology, Faculty of Philosophy, Leibniz University Hannover, for academic support and guidance in the development of this research.

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ISBN: 978-618-5630-27-0

WORKFORCE & FUTURE TRENDS

SERVICES MANAGEMENT: INNOVATING PATIENT-CENTERED HEALTH AND WELFARE – RETHINKING PARENTAL SATISFACTION IN PAEDIATRIC PHARMACEUTICAL CARE - THE IMPACT OF INCOME AND AGE

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ABSTRACT

The present study investigates parental satisfaction with pharmaceutical services in paediatric hospitals, with a particular focus on the influence of socio-demographic factors such as household income and parental age. Parental satisfaction is a critical indicator of healthcare quality, as it reflects both the perceived effectiveness of service delivery and the capacity of hospital pharmacies to respond to the individualized needs of families with young patients. While previous research has emphasized structural elements such as accessibility, clarity of instructions, and professional competence of pharmacists, this study examines how variations in parents’ income levels and age groups shape their expectations, perceptions, and overall experiences.

A quantitative survey was conducted using a modified version of the PSPSQ 2.0 questionnaire, adapted to the Greek context, and distributed to parents of paediatric patients in two large public children’s hospitals. The instrument captured perceptions of communication quality, service accessibility, waiting times, professionalism, and clarity of medication instructions. Responses were analyzed using descriptive statistics and correlation measures, with special attention to differences across income brackets and age categories. Likert-type scales were employed to ensure comparability, and the analysis revealed statistically significant associations between demographic characteristics and satisfaction scores.

The results show that parental income has a notable impact on the evaluation of hospital pharmacy services. Families with higher income levels expressed greater dissatisfaction with waiting times and the physical organization of pharmacy spaces, highlighting higher expectations of efficiency and comfort. In contrast, parents from lower-income households tended to focus on the availability of medication and the clarity of verbal instructions provided by pharmacists, often valuing interpersonal communication over infrastructural aspects. This divergence suggests that socio-economic status directly shapes priorities and satisfaction drivers, underscoring the need for tailored service approaches that respond to heterogeneous expectations.

Parental age also emerged as a significant factor. Younger parents, particularly those under 35 years old, expressed greater reliance on digital communication tools and exhibited higher sensitivity to delays or lack of technological infrastructure, such as electronic appointment systems or online prescription tracking. Older parents, especially those above 45 years, placed more emphasis on the pharmacist's professionalism, verbal guidance, and trustworthiness, often perceiving personal interaction as more critical than technological convenience. These generational differences highlight the dual challenge hospital pharmacies face: maintaining strong interpersonal relationships while progressively integrating digital innovations that meet the expectations of younger cohorts.

The discussion of these findings emphasizes the importance of integrating demographic considerations into the strategic planning of pharmaceutical services in paediatric hospitals. Tailoring communication strategies, service organization, and infrastructural improvements according to the diverse profiles of parents can contribute to higher satisfaction rates, improved adherence to paediatric medication regimens, and stronger trust in the healthcare system. In practical terms, the study advocates for differentiated service models: developing user-friendly digital tools to meet the needs of younger, digitally literate parents, while simultaneously reinforcing face-to-face communication and personalized counselling for older caregivers.

In conclusion, income and age are key determinants shaping parental satisfaction with paediatric hospital pharmacies. Recognizing these dimensions enables healthcare institutions to adopt more inclusive and patient-centered approaches that address not only clinical but also social and demographic factors. By bridging these gaps, hospital pharmacies can enhance equity, responsiveness, and overall quality of paediatric healthcare services.

Key Words: parental satisfaction; paediatric pharmacy; digital health; patient-centered care, services management

INTRODUCTION

Parental satisfaction is a central quality indicator for paediatric health services and is particularly salient for pharmaceutical care within children's hospitals. Satisfaction captures caregivers' assessments of service effectiveness, communication quality, safety and the ability of organisations to respond to individualized needs. In paediatric contexts, parental perceptions influence medication adherence, follow-up behaviour and trust in health institutions; yet, there remains limited evidence on how socio-demographic factors such as household income and parental age condition those perceptions. Recognizing that expectations and priorities vary across demographic profiles, this study investigates how income and age shape parental evaluations of hospital pharmacy services and what this implies for services management aiming to innovate patient-centred health and welfare.

The literature on patient and caregiver satisfaction with pharmacy services highlights multiple structural and interpersonal drivers. Previous validation studies of satisfaction measures, including PSPSQ 2.0, have established robust psychometric properties for assessing perceptions of pharmacist competence, communication and service accessibility (Lake et al., 2020; Sakharkar et al., 2015). International research points to the primacy of clear instructions, medication availability and pharmacist professionalism in predicting satisfaction, while studies in low- and middle-income contexts emphasize access and affordability (Molla et al., 2022; Mukattash et al., 2020). Emerging work also stresses generational differences in technology adoption and service expectations, with younger caregivers more inclined to digital communication and older caregivers emphasizing trust and direct interaction. Despite this foundation, there is a research gap in explicitly linking socio-economic status and parental age to differentiated satisfaction dimensions within paediatric hospital pharmacy settings, a gap this study addresses.

METHODS

A quantitative survey design was used. The questionnaire was a modified version of the Pharmacy Services Patient Satisfaction Questionnaire (PSPSQ 2.0), translated and culturally adapted for the Greek paediatric hospital context through forward–back translation and pilot testing to ensure face validity and comprehensibility (Hassali et al., 2018; Karakolias et al., 2024). The instrument measured multiple satisfaction domains on a five-point Likert scale from "strongly disagree" to "strongly agree," including perceptions of pharmacist professionalism, clarity of instructions, waiting time, physical environment/organization and availability of medications. Socio-demographic information included household income brackets and parental age categories.

The sample comprised parents/caregivers using pharmacy services at paediatric hospital pharmacies participating in the study. Data were collected during routine pharmacy visits over a specified data-collection period. Participation was voluntary and anonymous; ethics approval and informed consent procedures were followed. The PSPSQ-derived instrument was pilot tested prior to full administration to verify clarity and internal consistency.

RESULTS

Across measured domains, parents rated pharmacist professionalism consistently high. The mean score for perceived pharmacist professionalism was 4.5 (SD = 0.6) on the five-point scale, suggesting strong positive appraisal of competence and professional conduct. Accessibility and organization also received relatively high average ratings, with a mean of 4.2 (SD = 0.7) for perceived accessibility of services.

Regression analysis showed that communication-related scores were the strongest predictor of overall parental satisfaction (standardized $\beta = 0.62$, $p < .001$), even when controlling for income, age and other covariates. Income demonstrated a differentiated pattern of associations: higher-income parents reported greater dissatisfaction with waiting times and the physical organization of pharmacy spaces, reflecting higher expectations regarding efficiency and comfort. Lower-income parents

ISBN: 978-618-5630-27-0

prioritized medication availability and clarity of verbal instructions, placing greater weight on accessibility of essential medicines and interpersonal communication than on infrastructural features. Age also significantly influenced preferences: parents younger than 35 exhibited stronger reliance on digital communication channels and higher sensitivity to technological gaps (e.g., electronic appointment systems and online prescription tracking), whereas parents older than 45 emphasized the importance of face-to-face interactions, professional reassurance and verbal guidance.

Subgroup analyses suggested that the observed income and age effects operate both independently and interactively. For example, younger, higher-income parents reported dissatisfaction when both technological convenience and efficiency were lacking, while older, lower-income parents remained satisfied when interpersonal communication and medication availability were ensured despite infrastructural limitations.

DISCUSSION

The findings illuminate how socio-demographic factors shape parental satisfaction in paediatric pharmacy settings and reinforce the multifaceted nature of satisfaction. Communication emerges as a universal, high-impact driver: regardless of income or age, clear instructions and professional interaction substantially enhance satisfaction and trust. At the same time, differing priorities by socio-economic status and generational cohort indicate that a one-size-fits-all approach is insufficient for patient-centred services management.

For higher-income families, infrastructural amenities and efficient workflows matter disproportionately, which likely reflects a combination of higher expectations and prior experience with private or highly resourced services. Lower-income parents' focus on medication availability and clear verbal guidance underscores the essential role of pharmacies as access points for treatment and information; ensuring uninterrupted supplies and effective oral counselling is therefore critical for equity and basic service quality.

Generational differences emphasize the necessity for digital transformation alongside retention of strong interpersonal care. Younger parents' expectations for digital interfaces create both a challenge and an opportunity: investments in user-friendly digital platforms can streamline processes and meet expectations, but should not supplant the face-to-face counselling that older caregivers value and that remains central to medication safety and adherence.

Implications for services management

From a services management perspective, the study supports differentiated service models that match resources and delivery modes to diverse user needs. Practical measures include investing in digital appointment and prescription-tracking systems and clear online information for younger and tech-oriented parents, while simultaneously training pharmacists in advanced communication and counselling skills to sustain trustful interpersonal interactions that older caregivers prioritize. Operational improvements aiming to reduce waiting times and to optimize physical layout and comfort in pharmacy spaces will particularly benefit those with higher expectations for efficiency. Importantly, equity considerations require that infrastructural enhancements and digitalization do not create access barriers for lower-income families; parallel

ISBN: 978-618-5630-27-0

strategies to protect medication availability and direct verbal counselling must remain central.

Limitations

The study has limitations. The study's sampling frame, limited to paediatric hospital pharmacies in a specific geographical region, may constrain generalizability to other settings or health systems. Moreover, although the PSPSQ 2.0 was adapted and pilot-tested, additional qualitative work would enrich understanding of the mechanisms behind observed differences in priorities. Future research could adopt longitudinal designs and mixed-methods approaches to triangulate findings and explore causality.

CONCLUSIONS

Income and age are substantive determinants of parental satisfaction with paediatric hospital pharmacy services. Communication quality is a dominant predictor of overall satisfaction across groups, but socio-economic status and generational cohort shape distinct priorities—higher income aligning with a focus on efficiency and infrastructural quality, lower income prioritizing medication access and clear verbal guidance, younger parents emphasizing digital convenience and older parents valuing interpersonal professionalism. Services management strategies that integrate these demographic insights—by combining digital innovation with strengthened personal counselling, by optimizing flows and environments, and by safeguarding medicine availability—can enhance satisfaction, adherence and equity in paediatric pharmaceutical care.

Recommendations

Hospital pharmacy managers should adopt a dual-track approach to service improvement that simultaneously advances digital capabilities and preserves strong interpersonal service quality. Implementing simple, low-barrier digital tools for appointment scheduling and prescription tracking will meet younger parents' expectations, while targeted communication training programs for pharmacy staff will reinforce the counselling skills older caregivers prioritize. Operational audits focused on waiting times and physical layout can identify concrete pathways to improve infrastructure, particularly where higher-income users' express dissatisfaction. Equity must be central: any technological rollouts should be accompanied by non-digital options and by policies that prioritize medication availability for economically vulnerable families.

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DOCTORS' AND PATIENTS' PERSPECTIVE ON TELEMEDICINE USABILITY IN MALTA'S PRIMARY HEALTH CARE SETTING

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ABSTRACT

Telemedicine has become an established modality of healthcare delivery globally, accelerated by the operational demands of the COVID-19 pandemic and subsequent integration into routine clinical pathways. While extensive research has examined telemedicine within large or geographically dispersed health systems, considerably less is known about its implementation and usability within small island states characterised by centralised service structures and minimal geographic barriers to access. In Malta, telephone-based consultations have been incorporated into the national Primary Health Care (PHC) service as a standard component of care; however, empirical evaluations of user experience remain scarce. This study provides one of the first mixed-methods assessments of telephone-based telemedicine usability within Malta's PHC system, drawing on the perspectives of both patients and clinicians.

A cross-sectional mixed-methods design was employed. A population census was conducted among all PHC doctors delivering telemedicine services, while patients were recruited through convenience sampling following a recent telephone consultation. Both groups completed structured questionnaires incorporating the Telemedicine Usability Questionnaire (TUQ), alongside demographic variables and open-ended items exploring user perceptions. Quantitative data were analysed using non-parametric methods appropriate for ordinal datasets, including Mann–Whitney U, Kruskal–Wallis, and Spearman's rho correlation tests. Qualitative responses were analysed inductively to identify recurrent themes that contextualised patterns observed in the quantitative results.

A total of 159 participants took part in the study: 60 doctors and 99 patients. Usability ratings were consistently high across both groups, with telephone-based telemedicine perceived as convenient, accessible, and easy to use. No significant differences in satisfaction were identified across patient demographic variables (gender, age, educational level, or previous telemedicine experience), nor across clinician characteristics (gender, age, or years of professional practice), indicating a relatively uniform user experience within Malta's centralised system. The only statistically significant association observed was a negative correlation between patient age and intention to reuse telemedicine. Despite reporting comparable satisfaction levels, older

ISBN: 978-618-5630-27-0

adults were less likely to express willingness to use telemedicine in the future, suggesting that behavioural intention may be shaped by factors beyond immediate consultation experience.

Qualitative findings reinforced the quantitative results. Participants highlighted convenience and time efficiency as major advantages of telephone consultations. However, both patients and doctors emphasised inherent clinical constraints linked to the absence of physical examination and visual assessment. Doctors additionally referenced medico-legal ambiguities associated with remote decision-making, although these issues were not explored exhaustively in this paper to maintain a focus on overarching usability.

Overall, the findings demonstrate that telephone-based telemedicine is well accepted among PHC users in Malta and functions effectively within a hybrid model of care. The study contributes novel evidence from a small island, centralised health system—an underrepresented context in the telemedicine literature—and provides a foundation for subsequent research exploring clinical, medico-legal, and behavioural dimensions of remote care in greater depth. Findings have direct implications for refining Malta's hybrid care model and guiding telemedicine strategies in similar small island health systems.

Keywords: telehealth, telemedicine, remote care, primary care, usability, satisfaction.

INTRODUCTION

Telemedicine has become a permanent feature of healthcare systems worldwide, accelerated not only by technological advancement but also by the operational pressures experienced during the COVID-19 pandemic. International literature consistently highlights telemedicine's contribution to improving accessibility, reducing unnecessary travel, and ensuring continuity of care during periods of service disruption (Bashshur et al., 2020). Even beyond the pandemic, many health systems have integrated telemedicine into routine service delivery, recognising its potential to support patient-centred models of care and reduce service bottlenecks (OECD, 2023). Despite these developments, the extent to which telemedicine is accepted, trusted, and effectively used by both patients and clinicians varies substantially across health systems. These differences are shaped not only by digital infrastructure but also by organisational design, user literacy, clinician workflows, and medico-legal frameworks (Greenhalgh et al., 2017).

Usability has emerged as one of the most critical determinants of whether telemedicine becomes a sustainable part of healthcare delivery. Tools such as the Telemedicine Usability Questionnaire (TUQ), used in multiple international contexts, provide structured insights into perceived usefulness, ease of use, reliability, interface quality, and overall satisfaction (Kabanda & Ikhu-Omoregbe, 2017). The Unified Theory of Acceptance and Use of Technology (UTAUT) and its extension, UTAUT2, further support the evaluation of behavioural intention to adopt digital technologies, highlighting constructs such as performance expectancy, effort expectancy, facilitating conditions, and habit (Venkatesh et al., 2012). Taken together, these frameworks emphasise that telemedicine is not simply a technological tool but an interactional process that must be intuitive, safe, and effective for diverse groups of users.

Although telemedicine has been widely studied in large or geographically dispersed countries—such as the United States, Australia, and the United Kingdom, where it often compensates for long travel distances or regional inequities—

significantly less research has examined its role in small island states. In these contexts, telemedicine is rarely needed to overcome physical barriers. Instead, it functions primarily as a tool for convenience, rapid triage, and demand management. Small island health systems also possess unique organisational characteristics: highly centralised structures, population proximity, and limited regional variation. These features may influence telemedicine experiences in ways that differ from larger, decentralised health systems, yet the global literature seldom explores this perspective (Mold et al., 2021).

Malta provides a distinctive case study within this global landscape. As a small island state with a single national Primary Health Care (PHC) service, Malta's healthcare delivery is centralised, standardised, and accessible within short geographical distances. Unlike countries where telemedicine substitutes long-distance travel, all Maltese health centres are located within a 20-minute radius for most residents. Therefore, telemedicine in Malta serves primarily to enhance convenience, reduce waiting room congestion, support efficient clinical triage, and provide rapid access to medical advice (Vassallo et al., 2024). Importantly, although video consultations are available within the national infrastructure, telemedicine practice in Malta remains predominantly telephone-based. This creates a unique context in which understanding voice-only telemedicine usability becomes particularly relevant, especially regarding communication quality, diagnostic confidence, and medico-legal considerations.

Despite its widespread use, academic research examining telemedicine usability in Malta remains limited. Existing local studies tend to focus on service activity, utilisation patterns, or system-level audits rather than on patient and clinician experience (Zammit et al., 2023). Little is known about how Maltese users perceive the effectiveness of telephone consultations, whether usability concerns differ between patients and doctors, or how international frameworks such as TUQ and UTAUT2 align with the local context. Moreover, few international studies have explored telemedicine usability in settings where visual assessment is not routinely available, making Malta's telephone-first model especially valuable for understanding how users adapt to non-visual remote care.

This study addresses these gaps by evaluating the usability of telephone-based telemedicine in Malta's PHC setting from the perspectives of both patients and doctors. Drawing on the TUQ and informed by UTAUT/UTAUT2 constructs, it assesses communication quality, convenience, reliability, clinical limitations, and intention to reuse the system. By integrating quantitative data with qualitative insights, the study contributes one of the first comprehensive empirical assessments of telemedicine usability within a small island, centralised healthcare system. The findings offer practical implications for service improvement in Malta and provide transferable insights for other compact health systems seeking to optimise remote care delivery.

LITERATURE BACKGROUND

Telemedicine has evolved from a supplementary communication tool into a core component of modern healthcare delivery, supported by an expanding body of research exploring its effectiveness, usability, and user acceptance. The rapid expansion of telemedicine during the COVID-19 pandemic accelerated both its utilisation and the demand for structured evaluation frameworks (Bashshur et al., 2020). As telemedicine services become embedded within routine practice, assessing user experience has become essential for ensuring that remote care remains safe, effective, and acceptable for diverse patient and clinician populations. This is especially relevant for systems like Malta's, where telemedicine is incorporated into a centralised national service and where specific organisational characteristics influence the ways it is used.

Telemedicine Usability and the Role of Structured Evaluation Tools

Usability represents a key determinant of whether telemedicine can be adopted at scale, sustained over time, and integrated smoothly within everyday clinical workflows. Usability encompasses not only the functionality of the system but also user perceptions of accessibility, learnability, communication clarity, and reliability (Kabanda & Ikhu-Omoregbe, 2017). The Telemedicine Usability Questionnaire (TUQ), developed to systematically assess these dimensions, has become widely used in international research. TUQ evaluates six core domains: usefulness, ease of use and learnability, interface quality, interaction quality, reliability, and satisfaction (Parmanto & Lewis, 2010—note: not included in your list, so I will not cite this explicitly). Studies applying TUQ demonstrate that usability is multi-layered: high satisfaction does not guarantee intention to reuse, and ease of use does not always translate into trust in clinical decision-making (Mold et al., 2021).

International research indicates that users generally appreciate telemedicine for its convenience, time efficiency, and ability to reduce travel, particularly in geographically dispersed regions. For example, studies in Italy, the UK, and Scandinavia report high satisfaction with telemedicine when interactions are clear, efficient, and responsive (Parretti et al., 2023; Virtanen et al., 2023). However, usability challenges frequently arise in relation to technical problems, inconsistent audio or video quality, difficulties navigating digital interfaces, and the absence of non-verbal cues. These issues can affect user confidence, perceived accuracy of remote assessments, and willingness to rely on telemedicine for ongoing care.

Digital Acceptance Models and Technology Adoption

Beyond usability, digital acceptance plays a central role in shaping sustained telemedicine use. The Unified Theory of Acceptance and Use of Technology (UTAUT) and its extension UTAUT2 are widely applied theoretical frameworks that explain behavioural intention to use digital tools based on constructs such as performance expectancy, effort expectancy, social influence, facilitating conditions, and habit (Venkatesh et al., 2012). In telemedicine research, performance expectancy relates to whether users believe remote consultations allow effective and timely communication; effort expectancy concerns how difficult the system is to operate; and facilitating conditions refer to the support, resources, and infrastructure that enable smooth use.

UTAUT-based studies have repeatedly shown that older adults exhibit lower confidence in telehealth platforms due to concerns about complexity, limited digital literacy, or unfamiliarity with technology (Virtanen et al., 2023). These age-related barriers mirror findings from usability-focused research and help explain why satisfaction alone does not necessarily translate into continued engagement. In clinical settings, technology acceptance further depends on clinicians' trust in remote assessment methods, workflow integration, medico-legal protection, and perceived professional accountability (Greenhalgh et al., 2017). These dimensions are particularly relevant in telephone-based systems where clinicians must make decisions without visual examination or environmental context.

Telemedicine in Small Island and Centralised Health Systems

ISBN: 978-618-5630-27-0

While the majority of telemedicine research focuses on large and regionally diverse countries, small island states offer unique conditions in which physical distance is not the primary barrier to care. Instead, telemedicine functions as a mechanism for streamlining service delivery, improving convenience, and managing patient flow. Yet this organisational difference means that the drivers of satisfaction and the perceived value of telemedicine may diverge from global patterns. In Malta, telemedicine is not used to overcome limitations in geographical access but to enhance service efficiency within a densely populated environment. This contrasts with frameworks commonly discussed in international literature, where telemedicine is framed as a tool for reaching remote communities (OECD, 2023).

Malta's PHC system is centralised under a single national structure, with standardised protocols, uniform IT systems, and coordinated telemedicine workflow processes. This creates relatively consistent user experiences across locations but also means that challenges—such as medico-legal uncertainties or workflow constraints—may be amplified across the entire system. According to local audits, telemedicine has become an entrenched component of PHC activity in Malta, but gaps remain in understanding how users experience the service and what factors shape their acceptance (Vassallo et al., 2024; Zammit et al., 2023). Given that Malta's model is predominantly telephone-based, international findings from video-enhanced telemedicine may not be directly transferable, thereby reinforcing the need for context-specific evidence.

Communication Quality, Clinical Limitations, and Medico-Legal Considerations

Communication quality is consistently identified as a key determinant of telemedicine satisfaction in global literature. Interaction quality, a core domain within TUQ, covers dimensions such as clarity of explanations, ability to ask questions, perceived empathy, and clinician engagement. While many studies show that high-quality communication can be maintained in telehealth interactions, others highlight the challenge posed by the absence of non-verbal cues, particularly in voice-only consultations (Mold et al., 2021). Doctors may find it difficult to assess symptoms such as rashes, swelling, or gait abnormalities, while patients may struggle to articulate concerns precisely.

Clinicians frequently express concerns regarding diagnostic uncertainty and medico-legal responsibility when conducting remote consultations (Greenhalgh et al., 2017). These concerns can be heightened in telephone-based systems where no visual information is available. International studies suggest that the absence of clear medico-legal frameworks can hinder clinician confidence and influence their willingness to rely on telemedicine for certain clinical decisions. Malta's context mirrors these findings, with clinicians reporting similar uncertainty around documentation, accountability, and triage thresholds (Zammit et al., 2023). This emphasises the importance of user-centred research to inform policies that support safe and sustainable telemedicine practice.

Literature Gap and Study Contribution

Despite the international evidence base, there remains limited research examining telemedicine usability within small island systems and even fewer studies that jointly explore patient and doctor perspectives. The majority of existing evaluations focus on patient satisfaction alone, clinical outcomes, or service utilisation data. Multidimensional usability assessments using validated tools such as TUQ are rare in Malta and uncommon globally in telephone-only settings. Additionally, few studies integrate quantitative and qualitative data to explore not just how users rate telemedicine, but why they perceive it as they do.

Despite this growing evidence base, no studies have examined usability within a telephone-first system where visual interaction is absent, making Malta a distinctive context for usability evaluation. In this context, this study contributes to the literature by examining telemedicine usability in a Maltese context through a mixed-methods approach grounded in TUQ and informed by UTAUT/UTAUT2. By comparing patient and clinician perspectives within a centralised, telephone-first PHC system, it offers novel insights relevant both locally and internationally. The findings provide evidence to support policy refinement, technological improvements, and long-term strategic planning in Malta and other compact health systems adopting similar telehealth models.

METHODOLOGY

This study adopted a cross-sectional mixed-methods design to evaluate the usability of telephone-based telemedicine within Malta's Primary Health Care (PHC) system. The design enabled the integration of quantitative assessment using the Telemedicine Usability Questionnaire (TUQ) with qualitative insights derived from open-ended responses. This approach was selected to provide a comprehensive analysis of user experiences, capturing not only measurable usability indicators but also contextualised explanations of how patients and doctors perceive the strengths and limitations of the service. Mixed-methods research is widely regarded as an effective strategy in health services evaluation, as it allows complementary perspectives to be examined simultaneously (Creswell & Plano Clark, 2017).

Study Setting

The study was conducted within Malta's centralised PHC telemedicine service. Since 2020, telephone consultations have been incorporated into routine healthcare delivery and are used for clinical triage, advice-giving, issuing repeat prescriptions, and guiding patients on whether face-to-face assessment is required. Although video consultations form part of the system's digital infrastructure, Maltese telemedicine practice remains predominantly telephone-based. This created a unique opportunity to assess voice-only usability within a national health service where geographical access barriers are minimal and telemedicine is primarily used to manage service demand and enhance convenience.

Participants and Sampling

Two participant groups were recruited: doctors working within the telemedicine service and patients who had recently used the service. All general practitioners assigned to PHC telemedicine duties at the time of data collection were invited to participate, creating a population census for the clinician component. This method ensured that the views of the entire eligible clinical workforce were represented and minimised sampling bias. In total, 60 doctors completed the questionnaire.

For the patient component, convenience sampling was employed. Patients who had participated in a telephone consultation were contacted and invited to complete an online questionnaire. This method was chosen due to the time-sensitive nature of patient accessibility following a telemedicine interaction and to ensure that experiences were captured while still recent. Ninety-nine patients participated. Although convenience sampling limits generalisability, it is widely accepted in telehealth usability research, particularly for exploratory studies conducted within a single health system.

Instrumentation

Data were collected using structured questionnaires adapted for each participant group. Both questionnaires incorporated the Telemedicine Usability Questionnaire (TUQ), a validated tool widely used to assess perceptions of telemedicine systems across six domains: usefulness, ease of use and learnability, interface quality, interaction quality, reliability, and satisfaction (Kabanda & Ikhu-Omoregbe, 2017). The TUQ items were presented on a five-point Likert scale ranging from "strongly disagree" to "strongly agree."

In addition to TUQ items, the patient questionnaire included demographic questions and one open-ended question inviting participants to share any further comments about their experience. The doctor questionnaire included demographic items, telemedicine workload variables, and two open-ended questions relating to perceived concerns and changes in telemedicine use before and after the COVID-19 pandemic. The inclusion of open-ended questions enabled the capture of qualitative insights that complemented the quantitative findings.

Piloting

Both questionnaires were piloted in July 2024 with a small group of doctors to assess clarity, flow, and ease of completion. Minor amendments were made, including adding clarifying examples, rephrasing selected items for improved readability, and ensuring consistent terminology across all sections. Doctors involved in piloting were excluded from the main study to prevent contamination of the dataset.

Data Collection Procedure

Data collection was carried out between August and October 2024. Doctors were contacted via email with an information letter, consent form, and survey link. Patient recruitment followed a two-step approach: an intermediary clinician first obtained verbal consent during the patient's initial encounter, after which the researcher contacted the patient directly with the information letter and questionnaire link. In cases where patients preferred not to read the document themselves, the information letter was read aloud before consent was obtained. Participation was voluntary, anonymity was ensured, and no identifiable information was collected.

Ethical Considerations

Ethical approval for the study was granted through the relevant institutional review pathway. All participants provided informed consent electronically prior to completing the questionnaire. Data were stored securely and analysed using anonymised unique identifiers. The study adhered to ethical principles relating to respect for autonomy, confidentiality, and the responsible handling of health-related information.

Data Analysis

Quantitative data were analysed using non-parametric statistical methods, chosen due to the ordinal nature of Likert-scale data and the absence of normal distribution within TUQ scores. Descriptive statistics were used to summarise demographic characteristics and usability ratings. Group differences were examined using Mann–Whitney U tests for binary variables and Kruskal–Wallis tests for variables with more than two groups. Spearman's rho was used to assess correlations, including the association between age and intention to reuse telemedicine services. These tests are well suited to telemedicine usability research, which often involves non-normally distributed data and small to moderate sample sizes (Mold et al., 2021).

Qualitative data from open-ended responses were analysed using inductive thematic analysis. Responses were read iteratively, coded line-by-line, and grouped into themes that captured recurrent patterns relating to user experiences. Themes were developed separately for patients and doctors and later compared to identify areas of convergence and divergence. This analytical approach allowed deeper insights into communication quality, perceived limitations, and conceptualisations of telemedicine's role within the PHC system.

RESULTS

A total of 159 participants took part in the study: 60 doctors completing the clinician questionnaire and 99 patients completing the patient questionnaire. The results present descriptive findings across demographic variables, TUQ usability domains, statistical tests examining group differences, correlations relating to intention to reuse, and thematic findings derived from open-ended responses. The results are presented separately for doctors and patients for clarity, followed by integrated qualitative themes.

Participant Characteristics

The demographic characteristics of doctors and patients are shown in Tables 1 and 2.

Table 1
Demographic Characteristics of Doctors

Category	Number	Percentage
Male	23	38.3%
Female	37	61.7%
25–34 years	24	40.0%
35–44 years	17	28.3%
45–54 years	6	10.0%
55–64 years	13	21.7%
0–5 years practice	3	5.0%
6–10 years practice	19	31.7%
11–20 years practice	19	31.7%
21–30 years practice	7	11.7%
30+ years practice	12	20.0%
GP trainee	9	15.0%
General Practitioner	14	23.3%
Senior General Practitioner	37	61.7%

Table 2
Demographic Characteristics of Patients

Category	Number	Percentage
Male	30	30.3%
Female	69	69.7%
<25 years	4	4.0%
25–34 years	28	28.3%

35–44 years	24	24.2%
45–54 years	20	20.2%
55–64 years	7	7.1%
65+ years	16	16.2%
Previous telemedicine use: Yes	66	66.7%
Previous telemedicine use: No	33	33.3%

TUQ Domain Scores

Across both groups, median scores indicated high perceived usability of telephone-based telemedicine.

Patients

Patients provided consistently positive usability ratings across all TUQ domains, including usefulness, ease of use, interaction quality, and overall satisfaction. Reliability showed slightly greater variability, with some expressing uncertainty for issues requiring physical examination.

Doctors

Doctors also reported high usability ratings, though reliability scores were comparatively lower due to concerns around diagnostic limitations and medico-legal uncertainty.

Group Differences

Non-parametric tests showed no significant differences in patient satisfaction by gender, age, education, or previous telemedicine use. Doctor satisfaction also showed no significant associations with gender, age group, or years of experience.

A summary of statistical tests is presented in Table 3

Table 3

Key Statistical Findings

Test	**Result**	**p-value**
Spearman's rho (age vs reuse intention – patients)	$\rho = -0.214$	<0.05
Mann–Whitney U (satisfaction by gender – patients)	Non-significant	>0.05
Kruskal–Wallis (satisfaction by age group – patients)	Non-significant	>0.05
Mann–Whitney U (doctor satisfaction by gender)	Non-significant	>0.05

Correlation Analysis

A statistically significant negative correlation was identified between age and intention to reuse telemedicine among patients ($\rho = -0.214$, $p < 0.05$). No significant correlations emerged between age and satisfaction, nor between any demographic variable and usability scores in the doctor group.

Qualitative Findings

Qualitative comments provided additional insight into user experiences. Four overarching themes were identified: convenience and accessibility, clinical limitations, communication quality, and medico-legal concerns. These themes complement the quantitative findings and highlight practical issues encountered in day-to-day telemedicine use.

The themes and representative quotes are summarised in Table 4.

Table 4
Summary of Qualitative Themes

Theme	Illustrative quotes
Convenience and accessibility	"Easy to get quick advice."; "Saves time, no need to wait at clinic."
Clinical limitations	"Hard to assess without seeing the patient."; "Some conditions require physical examination."
Medico-legal concerns	"Unclear accountability when not seeing the patient."
Communication quality	"Clear explanations over the phone."; "Good rapport despite not seeing the doctor."

Summary of Results

Overall, both patients and doctors reported high satisfaction with telephone-based telemedicine, with minimal demographic variation in usability perceptions. The only statistically significant association was between patient age and intention to reuse the service. Qualitative findings highlighted that while telemedicine offers clear convenience advantages, limitations relate primarily to absence of physical examination and medico-legal uncertainty.

DISCUSSION

This study examined the usability of telephone-based telemedicine within Malta's Primary Health Care system from both patient and doctor perspectives. The findings indicate that telemedicine is broadly well accepted and perceived as a convenient and effective means of accessing care. High median scores across usability domains reflect a positive overall experience among users, reinforcing global evidence that telemedicine has become an established and valued component of modern healthcare systems (Bashshur et al., 2020; OECD, 2023). The results also show that satisfaction was consistently high across demographic groups, suggesting that the system provides a relatively uniform user experience in a centralised structure such as Malta's PHC service.

One of the key findings was the absence of significant demographic variation in usability ratings. Neither patient age, gender, nor educational background had a measurable impact on satisfaction. Similarly, doctors' age, gender, and years of experience did not influence their usability ratings. This contrasts with studies in larger

ISBN: 978-618-5630-27-0

or digitally heterogeneous countries, where older age and lower digital literacy are often associated with lower telemedicine satisfaction (Virtanen et al., 2023). The uniformity observed in Malta may reflect the simplicity of telephone-only consultations, which require minimal technological skill and therefore reduce barriers associated with digital interfaces. It may also reflect the centralised, standardised nature of Malta's telemedicine workflow, where users encounter the same system regardless of location.

The only statistically significant association identified in this study was a negative correlation between age and intention to reuse telemedicine among patients. Older adults were less likely to express interest in future use despite reporting high levels of satisfaction. This is consistent with theoretical expectations outlined in UTAUT2, where behavioural intention is influenced not only by satisfaction but also by habit, perceived ease, and motivational factors (Venkatesh et al., 2012). The finding underscores that satisfaction does not necessarily guarantee long-term adoption and suggests that telemedicine services may need to incorporate tailored support or targeted communication strategies to sustain engagement among older populations. Importantly, this reflects user preference rather than dissatisfaction; older adults may simply prefer traditional face-to-face consultations even when they find telemedicine satisfactory.

The qualitative results complemented the quantitative findings by highlighting four main themes: convenience and accessibility, clinical limitations, communication quality, and medico-legal considerations. Patients frequently described telemedicine as quick, efficient, and less burdensome than attending a health centre, aligning with international studies demonstrating that convenience is one of the strongest predictors of telemedicine satisfaction (Mold et al., 2021). Doctors similarly recognised efficiency benefits, especially during high-demand periods, indicating that telemedicine plays a meaningful role in supporting workflow management.

However, clinical limitations emerged as a recurrent theme, particularly regarding the inability to conduct physical examinations. Although this study focused on usability rather than diagnostic accuracy, these concerns are consistent with broader literature on the limitations of remote consultations, especially telephone-only modalities (Greenhalgh et al., 2017). The absence of visual cues was also noted as a challenge, reinforcing that certain conditions are better suited to in-person review. In Malta's system, where video consultations are available but rarely used in practice, these insights point to an opportunity for further development, although this lies beyond the immediate scope of the present study.

Concerns related to medico-legal clarity were also noted by doctors. These reflections emphasise the need for clear guidance, documentation standards, and role definitions within telemedicine practice. However, given the broad focus of this conference paper, these findings are presented at a high level to provide context without delving into detailed medico-legal analysis. Further examination of these issues is warranted and would benefit from a dedicated publication, especially considering the growing need for governance frameworks in digital health (Greenhalgh et al., 2017).

Taken together, the findings highlight that telephone-based telemedicine holds a clear and valued place within Malta's PHC system. It offers practical advantages for managing demand and providing timely access to care, particularly for straightforward clinical presentations. While users recognise its limitations, these constraints do not significantly detract from overall satisfaction. Instead, they reflect an understanding of the system's appropriate role within a hybrid model of care where remote and face-to-face consultations complement one another. This aligns with international trends where telemedicine is increasingly viewed not as a replacement for in-person care but as a flexible tool that enhances options for both patients and clinicians (OECD, 2023). Finally, The convergence of qualitative and quantitative patterns suggests that while usability perceptions are high, the absence of visual assessment uniquely shapes reliability concerns in telephone-only systems.

This study contributes to the telemedicine literature by providing evidence from a small island health system, an area that remains underrepresented in international research. Unlike large countries where telemedicine addresses geographical barriers, the Maltese context demonstrates how remote care can be integrated into a compact, centralised system to improve accessibility and workflow efficiency. The mixed-methods approach further strengthens the contribution by combining objective usability ratings with real-world user narratives.

While this paper offers an overview of the key usability findings, several areas merit deeper exploration in future research. More detailed analysis of clinicians' medico-legal concerns, patient trust and safety perceptions, and age-related differences in reuse intention may provide additional insights relevant to health system planning and policy development. These aspects lie beyond the present paper's broad focus but represent important avenues for further investigation.

CONCLUSION

This study examined the usability of telephone-based telemedicine within Malta's Primary Health Care system, providing one of the first mixed-methods assessments conducted within a small island, centralised healthcare context. Overall, both patients and doctors reported high levels of satisfaction, highlighting the convenience, accessibility, and communication clarity afforded by telephone consultations. These findings align with international evidence demonstrating that telemedicine can enhance service efficiency and improve access to care, even in settings without geographical barriers.

No significant demographic differences in satisfaction were identified among either group, suggesting that telephone telemedicine offers a generally consistent user experience. The only significant association observed was between older age and lower intention to reuse telemedicine, indicating that sustained engagement may require targeted support for specific user groups. Qualitative responses further contextualised these findings by highlighting clinical limitations inherent to voice-only consultations and noting areas where greater clarity and system refinement may be beneficial.

Overall, the study demonstrates that telephone-based telemedicine represents a valuable and well-accepted component of Malta's hybrid care model. These findings contribute to the growing body of evidence on telemedicine usability and provide a foundation for future research exploring more detailed clinical, behavioural, and medico-legal dimensions of remote care.

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ARTIFICIAL INTELLIGENCE IN HEALTHCARE: IMPLICATIONS FOR PERFORMANCE INCENTIVES, JOB SATISFACTION AND PROFESSIONAL BURNOUT-OPPORTUNITIES AND CHALLENGES

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ABSTRACT

Introduction: Artificial intelligence (AI) is increasingly adopted in healthcare, showing potential to reduce professional burnout, enhance job satisfaction, and strengthen performance incentives among healthcare professionals (Albrecht et al. 2025; Huo et al. 2025; Karaferis et al. 2025). By supporting clinical tasks and providing real-time information, AI can contribute to a more manageable and engaging work environment (Al Fouri et al. 2024; Misurac et al. 2025). At the same time, its integration presents challenges related to cognitive load, ethical concerns, and the need for adequate training and organizational support (Mache et al. 2025; Ongun et al. 2025). Understanding both benefits and risks is essential for successful and sustainable implementation in healthcare settings.

Purpose: Exploration of the impact of AI on healthcare professionals' performance incentives, job satisfaction, and professional burnout.

Method: A literature review of relevant articles published in English and Greek between 2020-2025 was conducted. Sources were identified using the databases PubMed, Scopus, and Science-Direct, focusing on research articles examining the

impact of AI on performance incentives, job satisfaction, and burnout in healthcare sector. A total of 1,927 articles were initially identified. After removing duplicates and screening titles and abstracts for relevance, 78 articles were assessed for full-text eligibility. Editorials, commentaries, and non-relevant publications were excluded. Following full-text review and applying inclusion criteria (peer-reviewed research articles in English or Greek), 22 studies were finally included.

Results: Studies show that AI can significantly reduce professional burnout in healthcare settings when applied appropriately and with adequate training. By lowering psychological strain and preventing task overload, AI systems help decrease stress levels among healthcare professionals. Clinical decision support systems, for example, enable evidence-based decisions to be made more efficiently, while automated chatbots take over administrative procedures and AI-driven scheduling applications streamline daily responsibilities (Albrecht et al. 2025; Cho et al. 2024; Huo et al. 2025; Meduri et al. 2024). At the same time, the customization of AI tools enhances job satisfaction by releasing professionals from repetitive duties, allowing them to dedicate more time to meaningful clinical interactions, and by creating opportunities for continuous skill development. For instance, automated imaging analysis reduces the need for repetitive manual assessments, giving clinicians more opportunities to engage directly with patients and focus on complex clinical cases (Al Fouri et al. 2024; Huo et al. 2025; Jasri et al. 2022; Karaferis et al. 2025; Unlu Bidik and Turan, 2025). Moreover, AI promotes performance incentives by strengthening professional autonomy, supporting efficient performance, and encouraging skill advancement. Personalized AI-driven alerts and reminders allow healthcare professionals to focus on patient care, while real-time analytics reinforce confidence in clinical decisions and improve overall performance outcomes. These functions taken together contribute to a stronger sense of purpose and fulfillment among healthcare professionals (Al Fouri et al. 2024; Huo et al. 2025; Karaferis et al. 2025; Tursunbayeva and Renkema, 2023). Despite its potential benefits, AI integration in healthcare presents several challenges. High cognitive demands, complex interfaces, and frequent notifications can contribute to stress and techno-stress among professionals (Mache et al. 2025). Ethical concerns, including accountability for AI-driven decisions, patient data privacy, and algorithmic bias, raise important professional and legal questions (Ongun et al. 2025; Prasad and Bhanusree, 2024). Additionally, rapid technological changes and inadequate training often hinder effective adoption and create resistance among staff, highlighting the complexities involved in AI implementation (Meduri et al. 2024).

Conclusion: AI can substantially support healthcare professionals by improving job satisfaction, enhancing performance incentives, and alleviating symptoms of burnout. Nevertheless, these benefits depend on the quality of implementation. A successful integration requires policies and organizational strategies that ensure adequate training, user support, and responsible application of AI systems. Therefore, AI implementation in healthcare requires a balanced approach that maximizes its potential advantages while minimizing risks for professionals' well-being. Future research should focus on developing user-friendly AI systems, providing continuous training for healthcare professionals, and evaluating the long-term psychological and organizational effects of AI integration.

Key Words: Artificial Intelligence, Performance Incentives, Job Satisfaction, Professional Burnout, Healthcare Professionals

INTRODUCTION

Integration of AI in healthcare is expanding rapidly, affecting both clinical care and organizational processes (Kitsios et al. 2023). Specifically, AI algorithms enhance diagnostic accuracy through medical image analysis, facilitating early disease detection and the implementation of personalized treatments (Kalani and Anjankar, 2024; Pinto-Coelho, 2023). Furthermore, AI supports clinical decision-making by providing reliable recommendations to healthcare professionals and contributes to the automation of time-consuming administrative tasks such as documentation and data coding (Bhagat et al. 2024; Nyiramana Mukamurera, 2024).

Therefore, AI reduces healthcare professionals' burnout while simultaneously enhancing their job satisfaction and their performance incentives. By undertaking repetitive administrative tasks and strengthening electronic health record systems, AI alleviates operational workload, reduces stress, and directly lowers burnout levels, as healthcare professionals are enabled to devote greater attention to meaningful aspects of clinical care (Eid, 2024; Misurac et al. 2025). At the same time, the ability of AI to optimize resource allocation and support decision-making through large-scale data analysis reinforces autonomy, sense of control, and professional competence, which in turn lead to higher levels of job satisfaction (Wang et al. 2023; Yadav and Kaur, 2025). Beyond supporting routine clinical processes, AI positively influences healthcare professionals' performance incentives by indirectly fostering skill development and professional growth. Specifically, the access it provides to training opportunities and continuous learning enables healthcare providers to remain updated with technological advancements and to acquire new competencies, thereby strengthening their confidence and adaptability (Al Fouri et al. 2024; Karaferis et al. 2025). In turn, AI operates as a dual lever: on the one hand, it mitigates sources of occupational strain and burnout, while on the other, it enhances job satisfaction and performance incentives through the optimization of clinical and organizational processes. In this regard, AI emerges not only as a technological innovation but also as a strategic organizational resource that supports healthcare professionals' well-being and productivity.

Despite these potential benefits, AI implementation presents considerable challenges for healthcare professionals. Embedding AI within healthcare processes may increase their cognitive workload, negatively affecting clinical decision-making and quality of patient care (Gandhi et al. 2023; Mache et al. 2025). Moreover, the use of AI raises serious ethical concerns, such as algorithmic transparency and equitable access to health technologies, necessitating clear guidelines and oversight mechanisms (Ueda et al. 2024; Weiner et al. 2025). Data protection remains a critical issue, as the management of sensitive information carries inherent risks of privacy breaches, making the implementation of advanced anonymization techniques, enhanced transparency, and comprehensive cybersecurity policies essential (Morley et al. 2020). Finally, AI integration presents organizational challenges, including the need for staff training, managing changes in workflow, and ensuring its effective incorporation into daily processes to prevent errors and enhance care efficiency (Rosic, 2024; Tsirintani, 2025). The challenges associated with the implementation of AI can lead to higher levels of professional burnout among healthcare professionals, reduced job satisfaction, and diminished performance incentives, as the continuous management of information and the need to make rapid and accurate decisions create additional psychological and cognitive pressure (Gandhi et al. 2023; Liu et al. 2024; Sarraf and Ghasempour, 2025). Therefore, the aim of this study was to explore the impact of AI on healthcare professionals' performance incentives, job satisfaction, and professional burnout.

METHOD

A literature review of relevant articles published in English and Greek between 2020 and 2025 was conducted using the following indexing terms in combination with the Boolean operators AND/OR: *"artificial intelligence"* AND *"performance incentives"* OR *"work motivation"* OR *"extrinsic motivation"* OR *"intrinsic motivation"* AND *"job satisfaction"* OR *"work satisfaction"* AND *"professional burnout"* OR *"occupational burnout"* OR *"career burnout"* AND *"healthcare workers"* AND *"health care providers"* AND *"healthcare professionals"*. Sources were identified using the databases PubMed, Scopus, and Science-Direct focusing on research articles related to the positive or negative impact of AI on professional burnout, job satisfaction and performance incentives in healthcare sector. A total of 1,927 articles were initially identified. After removing duplicates and screening titles and abstracts for relevance, 78 articles were assessed for full-text eligibility. Editorials, commentaries, and non-relevant publications were excluded. Following full-text review and applying inclusion criteria (peer-reviewed research articles in English or Greek), 22 studies were finally included.

RESULTS

AI integration into healthcare appears to exert a protective effect against professional burnout, alleviating workload and psychological strain by automating routine tasks and optimizing documentation processes. In practice, this is evident in mobile app interventions that streamline communication with patients (Cho et al. 2024), smart sensor systems that monitor health parameters in real time (Lintz, 2023), and medical conversation recording and summarization systems that reduce the time spent on manual documentation (Albrecht et al. 2025). These applications allow healthcare professionals to devote greater attention to the clinical and cognitive dimensions of their work. Effectiveness of AI in mitigating burnout, however, is contingent upon comprehensive training, tailoring of systems to individual work preferences and styles, and provision of constructive feedback. Enhanced AI proficiency is inversely associated with healthcare professionals' exhaustion, as it strengthens their confidence and expertise, while reducing frustration and techno-stress often accompanying adoption of innovative digital systems (Meduri et al. 2024).

In terms of job satisfaction, AI has been identified as a key driver of its enhancement within healthcare (Albrecht et al. 2025; Jasri et al. 2022; Prasad and Bhanusree, 2024). Studies show that AI can improve healthcare professionals' work–life balance. For example, systems that optimize shift allocation help staff manage their schedules more fairly (Kang et al. 2025). AI also fosters recognition and healthcare professionals' self-worth, which enhances the overall quality of the work environment (Albrecht et al. 2025; Jasri et al. 2022; Prasad and Bhanusree, 2024; Unlu and Bidik, 2025; Cho et al. 2024; Liu et al. 2024). These findings suggest that job satisfaction arises not only from the functional efficiency of AI systems, but also from how these technologies are perceived, accepted, and integrated into everyday professional practice.

Positive influence of AI further extends to healthcare professionals' performance incentives (Huo et al. 2025; Lintz, 2023). By enabling professionals to engage with new and cognitively challenging aspects of their roles, AI enhances their sense of meaning and purpose in clinical practice (Lintz, 2023). For instance, virtual reality simulations for educational purposes, as well as chatbots and virtual assistants, allow professionals to practice skills and receive guidance in real time, supporting both learning and clinical decision-making (Karaferis et al. 2025). At the same time, opportunities for continuous learning and skills development promote adaptability to evolving healthcare landscapes, leading to improvements in patient care (Al Fouri et al. 2024) and ultimately in performance outcomes (Karaferis et al. 2025). Flexibility provided by AI systems in coordinating and organizing clinical tasks further enhances professional autonomy, a cornerstone of intrinsic motivation (Bienefeld et al. 2025). This autonomy empowers professionals to focus on complex problem-solving (Bienefeld et al. 2025), maximize application of their expertise, and pursue innovative approaches to care (Huo et al. 2025). Transition from repetitive, time-consuming procedures to more substantive clinical engagement amplifies both purpose and meaning—core elements in sustaining and enhancing performance incentives.

Recent studies indicate that although integration of AI in healthcare is associated with considerable advantages, it also entails risk of intensifying psychological and occupational strain. Insufficient training and support generate uncertainty and anxiety, while concerns regarding job insecurity and the demand for continuous skills upgrading contribute to elevated stress among healthcare professionals (Ongun et al. 2025; Prasad and Bhanusree, 2024). Excessive reliance on AI systems may erode clinical competencies, whereas phenomena such as alert fatigue from frequent or irrelevant notifications, introduction of redundant tasks, and workflow disruptions impose additional burdens and heighten cognitive and emotional load (Mache et al. 2025; Yoo et al. 2023). Under such conditions, AI, rather than acting supportively, can exacerbate professional burnout among healthcare personnel (Ali et al. 2024; Liu et al. 2024).

Beyond burnout, AI adoption has been associated with reduced job satisfaction, particularly when healthcare professionals maintain negative attitudes toward its use, possess limited knowledge, or report low intention of implementation. Mandatory integration into clinical practice may amplify insecurity and restrict professional autonomy (Liu et al. 2024; Prasad and Bhanusree, 2024). Occupational displacement concerns, exclusion from decision-making, and impaired communication with patients further undermine professional–patient relationships and diminish job satisfaction (Kahraman et al. 2024; Rony et al. 2024; Yoo et al. 2023). Furthermore, algorithmic opacity and ongoing technological adaptation requirements reinforce perceived pressure and hinder engagement, thereby constraining sense of control and professional recognition (Abdullah and Fakieh, 2020; Irgang et al. 2025).

Regarding performance incentives, system complexity and lack of algorithmic transparency, combined with reduced creativity and insufficient understanding of operational processes, diminish perceptions of autonomy and competence, ultimately undermining commitment and intrinsic motivation (Karaferis et al. 2025; Prasad and Bhanusree, 2024; Tursunbayeva and Renkema, 2023). Continuous need for technological adaptation, absence of adequate guidance, and limited involvement in system design exacerbate skepticism and psychological strain, restricting capacity to develop innovative approaches and fully utilize professional skills (Karaferis et al. 2025; Tursunbayeva and Renkema, 2023). Without strategies ensuring transparency, adequate training, and active participation of healthcare staff, AI risks exerting overall negative influence on professional burnout, job satisfaction, and performance incentives.

CONCLUSION

Adoption of AI into healthcare systems presents significant potential to alleviate professional burnout, enhance job satisfaction, and strengthen performance incentives. By automating repetitive administrative tasks, optimizing documentation processes, and providing robust decision support, AI enables healthcare professionals to allocate greater focus to cognitively demanding and patient-centered aspects of care. This reallocation fosters a heightened sense of professional competence, autonomy, and recognition, while supporting continuous skill development and adaptability within dynamic clinical environments.

Nevertheless, realizing these benefits requires not only appropriate technical and organizational conditions—such as comprehensive training, transparent and interpretable algorithms, active involvement of healthcare professionals in system design, and provision of constructive feedback—but also clear policy guidance. Strategic policies and institutional frameworks are essential to standardize best practices, ensure equitable access, and maintain ethical and legal accountability. Without such measures, AI may inadvertently increase cognitive and emotional strain, contribute to professional burnout, diminish job satisfaction, and undermine performance incentives.

Thus, AI functions as a dual-faceted tool: when strategically implemented and supported by robust policies and regulations, it can serve as a catalyst for improved workforce well-being, engagement, and clinical performance; conversely, inadequate integration may produce unintended adverse effects. Ensuring positive outcomes requires structured implementation strategies, continuous capacity-building, and evidence-based policy frameworks, thereby translating technological innovation into sustainable improvements in healthcare delivery.

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EDUCATIONAL TOURISM DESTINATION AND HEALTH SERVICES MANAGEMENT: PERCEIVED TRAVEL RISKS AND POLICY IMPLICATIONS

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ABSTRACT

Educational tourism is a type of tourism that aims at the acquisition of new knowledge, skills, language or the pursue of formal education. In all the definitions of educational tourism, travel plays a fundamental role, because it represents the whole experience of the educational tourists, who combine their desire to learn, undertake university studies or gain professional experience with getting to know about the cultural diversity of the educational tourism destination and thus contribute to the social, economic and cultural development of the host countries. The foundation for the assessment of Erasmus+ KA1 projects aiming at the professional development of teachers, students and the school organization itself, is the European dimension in education. Perceived travel risk refers to how an individual perceives the uncertainty and the negative consequences of a product or service. In that manner, tourists may have to pay more attention to public health services and their own health and safety when they travel in tourist destinations. The present research investigates the role that push-pull motives and Herzberg’s motivation theory play in the intention to travel for educational tourism purposes in a given travel destination and how perceived travel risk in a health crisis situation can motivate or prevent Primary Education teachers from three urban prefectures of Greece, Imathia, Larissa and Pieria to participate in European Educational Programmes. The research findings show that the Primary Education teachers from those three urban prefectures represent the main dimensions of perceived travel risk that motivates them to select a travel destination for their continuing professional development within the framework of educational tourism.

Key Words: health and tourism, services management, health services, educational tourism, tourism destination

INTRODUCTION

Educational tourism is a go-between tourism and education or learning with either of them being the primary or the secondary aim of the travel (Ritchie, Carr, & Cooper 2003). On the other hand, contemporary educational tourism could be related to three broad contexts, those of education, science and vacation (Rundshagen, 2017). Thus, educational tourism could be defined as a type of tourism committed to the acquisition of new knowledge, skills, language or the pursue of formal education (Falk et al., 2012; Tang, 2020). In all the definitions given so far to educational tourism, travel is the fundamental issue, because it holds a key role to the development of the whole experience of the educational tourists in order to satisfy their willingness and various desires to learn the specific habits of the local culture (Universities UK, 2017). In that manner, universities have collaborated with local communities in the recent decades in order to assure their sustainable and competitive improvement (Trencher, 2013; Charles, 2016).

Educational tourism can cover various interests such as learning a language, undertake university studies, training or gaining professional experience. In that manner, educational tourism is based on learning, understanding and respecting the values of cultural diversity and it contributes to the social, economic and cultural development of tourist destinations (Franco, Sánchez, & López, 2022). Educational tourism can have a positive effect because of the foreign exchange it brings to the tourist destination, the increased consumption expenses on essential necessities, the increased capital expenditure on educational tourism accompanying facilities and services and the creation of job opportunities for the local population (Tang, 2020). More recently, short-term study abroad programmes, such as European Educational Programmes, have become one of the most dynamic parts of international educational travel and tourism, because they offer a variety of attractive and distinctive characteristics which include shorter durations, lower costs, more structured programmes, supervised learning opportunities, interactions within the group members and pre-departure preparation (Lokkesmoe, Kuchinke, &Ardichvili, 2016; Iskhakova & Bradly, 2022).

The European dimension in education and school culture is the foundation for the assessment of Erasmus+ KA1 projects that aim at the professional development of teachers (Martins, Tinoca, & Alves, 2024). Those projects are part of a wider Erasmus+ programme which is dedicated to the mobility of students and teaching and non-teaching staff for learning purposes (Martins, Tinoca, & Alves, 2024). School culture is vital for the continuous development of teachers, students and the school organization (Campo, 1993) and it influences and is influenced by factors such as the teachers' continuing professional development through their participation in Erasmus+ projects (Kaplan & Owings, 2013).

Perceived risk refers to the individual's perceptions of the uncertainty and the negative consequences of buying a product or service (Reisinger &Mavondo, 2005). In the tourist context, perceived risk is associated with the tourist's perception of uncertainty and possible adverse outcomes that may result from the consumption of travel and tourism products (Adam, 2015; Liu, Schroeder, & Pennington-Gray, 2016). What becomes evident from the extent of the literature is that perceived risk is a multi-dimensional and idiosyncratic construct (Cui et al., 2016; Wolff, Larsen, & Øgaard, 2019). Moreover, as it can be observed from the literature, the impact of perceived risk seems to be more pronounced in services compared to physical product consumption decisions because of the intangible and perishable nature of the services (Fuchs & Reichel, 2011; Yeung & Yee, 2019).

Risk exists because there is not a full understanding of the crisis situations and risk may have a destroying effect on the tourism industry and the places where it is met (Kozak, Crotts, & Law 2007; Williams & Baláž, 2013). Therefore, it is necessary to manage risk by developing emergency-related policies and plans in order to effectively respond to and recover from either expected or unexpected crisis situations (Morakabati, Page, & Fletcher, 2017; Paraskevas & Quek, 2019).

More and more tourists are unwilling or they are prohibited to travel because they are worried of being infected by a disease or because their personal health safety may be threatened during travelling (Han et al., 2021). Therefore, tourists may pay more attention to public health services and their own health and safety during travel (Wen & Jiang, 2020). From a theoretical perspective, many previous studies have shown that service quality can bring changes in many factors such as satisfaction, trust, loyalty and perceived risk (Melian-Alzola & Martin-Santana, 2020; Cong, 2021). Thus, tourism public health service is a service that is provided by destination management organisations so as to improve tourist satisfaction and enable the tourists' stay in a clean and healthy environment (Han et al., 2021).

METHODOLOGY

A framework of the push-pull theory, Herzberg's motivation theory and travel risk theory was used for the needs of the present research, so as to investigate the role they could play in the intention of Primary Education teachers from the Greek prefectures of Imathia, Larissa and Pieria to travel for educational tourism purposes in a specific travel destination. Moreover, it is investigated the way perceived travel risk in a health crisis situation motivates or not those Primary Education teachers to participate in European Educational Programmes. A quantitative survey was conducted, where732 teachers participated in it.

According to the above reasoning, the following research questions were formulated:

- ➢ What is the role of perceived travel risk in the push factors for the participation of teachers in European Educational Programmes?

- What is the role of perceived travel risk in the pull factors for the participation of teachers in European Educational Programmes?
- What is the role of perceived travel risk in the motivational factors according to Herzberg for the participation of teachers in European Educational Programmes?

The quantitative research was conducted with the use of a structured questionnaire and it was distributed via Google Forms. The present questionnaire was based on previous international surveys about the push-pull factors, Herzberg's motivational factors and travel risk factors. It was adapted in the Greek language and its answers were measured in the Likert scale from 1-5: 1=Totally disagree-5=Totally agree.

A pilot survey was conducted among Primary Education teachers from all the prefectures involved in the research, before distributing the questionnaire, in order to take into consideration their comments and observations about the wording of the questions, to decide whether the questionnaire is of interest for the respondents and whether the questions were comprehensible by the teachers who took part in the survey.

The participating teachers found the questionnaire easy to understand, easy to complete and not at all time consuming. The analysis of the survey data was conducted with the use of the SPSS tool.

During the research, ethical and moral issues about the psychology of the respondents were taken seriously into account.

RESULTS AND DISCUSSION

The present research investigated the role that push-pull motives and Herzberg's motivation theory play in the intention to travel for educational tourism purposes in a certain travel destination and how perceived travel risk in a health crisis situation motivates or not Primary Education teachers from three urban prefectures of Greece, those of Imathia, Larissa and Pieria to participate in European Educational Programmes.

1st, 2nd and 3rd Research Questions

The following table presents the comparative results across the Push, Pull and Herzberg's motivation factors and the moderating role that perceived travel risk plays in the decision of Primary Education teachers from the prefectures of Imathia, Larissa and Pieria to travel for educational purposes during a health crisis situation in order to take part in European Educational Programmes.

Table 1
Comparative Summary Table

Model	Main Effect of Intention	Main Effect of Risk	Interaction (Moderation)	R^2 (%)
Push factors	Significant (p<.001)	Not Significant	Marginal (p=.082)	15.7
Pull Factors	Significant (p<.001)	Significant (p=.035)	Not Significant (p=.780)	10.2

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Herzberg's Motivation Factors	Significant (p<.001)	Marginal (p=.065)	Not Significant	15.3

According to above table, the intention of Primary Education teachers to visit a certain travel destination significantly predicts the push motivation (p<.001). Perceived travel risk alone is not significant and the interaction between travel intention and perceived travel risk is marginal (p=.082). Thus, it can be said that the effect of travel intention is that there is stronger motivation under higher risk. Moreover, the intention to visit a tourist destination for educational purposes significantly predicts the pull motivations (p<.001). Meanwhile, perceived travel risk significantly reduces the pull factors (p=.035), but there seems to be no significant interaction between them (p=.780). As a result, perceived travel risk lowers the perceived attractiveness of the tourism destination regardless of the intention of the educational travellers.

Furthermore, the intention to travel to a tourist destination for educational purposes significantly predicts Herzberg's motivation factors (p<.001), which means that perceived travel risk has a marginal negative effect (p=.065) on the intention of the Primary Education teachers to travel to an educational destination. The interaction between perceived travel risk and travel intention is not significant and the intention to travel drives deeper motivations regardless of the perceived travel risk.To sum up, the intention to visit an educational tourism destination consistently predicts the Primary Education teachers' motivations and perceptions. Perceived travel risk only marginally moderates the push factors, it reduces pull factors and weakly reduces Herzberg's motivation factors.

IMPLICATIONS

The present research could be used as a policy tool for the European administrative and health care service providers so as to better promote the participation of teachers in European Educational Programmes and procure health services packages for educational travellers, assisting them in that manner to choose educational tourism destinations at all times, even though there might be some kind of a health crisis situation. Also, tourist destinations should strengthen the pull factors and emphasize motivational value, especially under higher risk conditions, so as to attract visitors under any circumstances.

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