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Reconceptualizing Nursing Ethics in Digital Health: A Relational Systems Model – A Conceptual Study

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Abstract

Introduction: Digital transformation through artificial intelligence (AI), telehealth, electronic health records, remote monitoring, and algorithmic systems is reshaping nursing practice and ethical responsibility. Existing approaches often address professional ethics, technology governance, or sociocultural context separately. This conceptual study addresses that fragmentation by integrating these perspectives.

Methods: A conceptual philosophical–hermeneutic design was combined with an integrative literature synthesis. The search covered literature published from 2015 to 2026 across PubMed, Scopus, Web of Science, and Google Scholar, supplemented by reference-list screening and iterative citation tracking. The final conceptual synthesis comprised 25 sources, including recent peer-reviewed journal literature, foundational works, and international frameworks. Because the original project file did not preserve exact database-level retrieval dates or screening counts, these historical details could not be reconstructed without speculation. Concepts were extracted into an analytic matrix, thematically compared across traditions, interpreted hermeneutically, and iteratively organized into model dimensions, layers, outcomes, and propositions.

Results: Three interdependent dimensions were synthesized: relational ethics, socio-technical integration, and sociocultural context. These dimensions operate through five analytically distinct layers—Person, Relational Ethics, Socio-Technical System,

Organizational Governance, and Societal Sustainability—and are associated with four proposed outcomes: ethical decision-making, professional autonomy, relational accountability, and workforce adaptability and sustainability.

Conclusions: The Relational Systems Model integrates moral, technological, organizational, and sociocultural perspectives into one conceptual architecture. Its contribution is theoretical rather than empirically established: the model offers propositions for future testing and should not yet be treated as a validated framework for governance or workforce development.

Keywords

Accountability; artificial intelligence; autonomy; sociocultural context; socio-technical systems; workforce adaptability

1. Introduction

Healthcare's digital transformation is reshaping not only care delivery and clinical decision-making but also the ethical conditions of nursing practice. Artificial intelligence (AI), telehealth, electronic health records (EHRs), remote monitoring, and predictive analytics can improve access, continuity, and efficiency while also altering professional autonomy, accountability, privacy, and relational care. Nurses increasingly work at the intersection of patients, technologies, algorithms, organizations, and health systems, making digital nursing ethics a socio-technical as well as interpersonal concern (Booth et al., 2021; Möllmann et al., 2021; Morley et al., 2020; Ronquillo et al., 2021).

Digital technologies can support clinical judgement while simultaneously redistributing responsibility. Nurses interpret algorithmic outputs, respond to remote-monitoring alerts, communicate through telehealth, and document care within structured information systems. Ethical practice therefore involves established principles such as autonomy, beneficence, non-maleficence, and justice, but also requires attention to relationships, data governance, algorithmic influence, human oversight, and distributed accountability (Beauchamp & Childress, 2019; Mittelstadt, 2019; World Health Organization, 2021).AI-related bias illustrates

the systemic nature of these concerns. Risks may arise from data representation, design assumptions, implementation environments, and institutional practices rather than from an

isolated clinical decision. Similarly, telehealth may expand access while exposing digital inequalities; EHRs may strengthen continuity while increasing privacy and documentation concerns; and decision-support systems may alter professional judgement and accountability (Booth et al., 2021; McCradden et al., 2020; Morley et al., 2020; Oh et al., 2021; Čartolovni et al., 2022).

These developments indicate that digital transformation is not simply a technological upgrade. Technologies are embedded in relationships, workflows, organizations, professional norms, and sociocultural environments. Digital-health and nursing literature therefore supports a socio-technical perspective in which ethical consequences emerge through interactions among people, technologies, tasks, and organizational arrangements (Greenhalgh et al., 2017; Abdolkhani et al., 2022; Reid et al., 2021).

Despite extensive scholarship on AI ethics, privacy, data governance, transparency, fairness, human oversight, nursing ethics, and digital health, these perspectives remain only partially integrated. AI ethics tends to emphasize governance principles; digital health ethics often emphasizes privacy, consent, and stewardship; and nursing ethics emphasizes professional values and relationships. What remains less developed is a conceptual account that explains how these dimensions interact with organizational conditions and workforce sustainability. Recent integrative reviews similarly identify privacy, professional relationships, human-centred care, and accountability as recurring concerns in eHealth and digital nursing (Jokinen et al., 2021; Reid et al., 2021).

The conceptual gap addressed in this study is therefore not the absence of ethical principles or digital-health frameworks, but the limited integration of relational, socio-technical, sociocultural, and workforce perspectives within nursing ethics. The objective of this study is to develop and articulate a Relational Systems Model that explains how these dimensions interact to shape ethical decision-making, professional autonomy, relational accountability, and workforce adaptability and sustainability in digitally mediated nursing practice.

2. Methods

2.1 Study Design

This study used a conceptual philosophical–hermeneutic design integrated with an integrative literature synthesis. The approaches were combined because the study addressed two complementary questions: how ethical meanings in digitally mediated nursing can be interpreted philosophically, and how concepts from nursing ethics, digital health, AI ethics, socio-technical systems, and workforce scholarship can be integrated into a coherent conceptual model. No human participants or primary empirical data were involved.

The methodological process comprised three iterative stages: (1) philosophical–hermeneutic interpretation of ethical concepts in digitally mediated care; (2) integrative identification and synthesis of relevant theoretical, conceptual, philosophical, and empirical literature; and (3) cross-theme comparison and iterative model construction. The stages were not treated as strictly linear. Interpretive insights were repeatedly compared with the literature, and emerging relationships were revised when concepts overlapped, conflicted, or required clearer boundaries.

2.2 Search Strategy and Eligibility

The literature search focused on publications from 2015 through 2026. Core concepts were combined using Boolean operators and searched in multiple health-science and multidisciplinary sources, including PubMed, Scopus, Web of Science, and Google Scholar, followed by reference-list screening and iterative citation tracking. The principal concept groups were: (i) nursing ethics; (ii) digital health, telehealth, electronic health records, and nursing informatics; (iii) artificial intelligence and AI governance; (iv) relational and care ethics; (v) socio-technical systems and systems thinking; (vi) professional autonomy and accountability; and (vii) workforce sustainability/adaptability.

Representative search strings included: (“nursing ethics” AND “digital health”); (“nursing” AND “artificial intelligence” AND ethics); (“relational ethics” AND nursing AND technology); (“socio-technical systems” AND healthcare AND ethics); (“AI governance” AND healthcare AND nursing); and (“digital health” AND nursing AND workforce). Search terms were adapted to the indexing conventions of each source.

Eligible sources addressed at least one of the conceptual domains and contributed directly to the interpretation or construction of the model. Peer-reviewed journal articles were

prioritized, while seminal books and authoritative international frameworks were retained when they supplied foundational concepts not adequately represented in recent journal literature. Sources were excluded when they were unrelated to healthcare/nursing ethics, lacked substantive conceptual or empirical relevance to digital transformation, or duplicated a more complete source.

A methodological limitation is that the original project file did not retain a database-level search log documenting exact retrieval dates, hit counts, duplicate removal, and screening numbers. Consequently, exact historical counts cannot be reconstructed reliably from the manuscript and are not fabricated in this revision. The final synthesis should therefore be read as an integrative conceptual synthesis rather than a systematic review with PRISMA-style quantitative reporting.

2.3 Source Screening and Concept Extraction

Titles and abstracts were considered first for conceptual relevance, followed by full-text assessment of potentially informative sources. During synthesis, each source was read for its contribution to one or more of the following analytic categories: ethical relationship and vulnerability; technology–human interaction; governance and accountability; professional autonomy; sociocultural conditions and inequality; and workforce adaptation/sustainability. Concepts were extracted into an analytic matrix and compared across disciplinary traditions.

2.4 Philosophical–Hermeneutic Interpretation

Hermeneutic interpretation was used to examine the meaning and implications of ethical concepts rather than to estimate effect sizes. Relational and care ethics informed interpretation of dignity, vulnerability, responsiveness, trust, and interdependence (Beauchamp & Childress, 2019; Jokinen et al., 2021). Digital-health ethics and nursing informatics literature were used to interpret how these meanings are conditioned by technologies, workflows, organizations, and information infrastructures (Jokinen et al., 2021; Reid et al., 2021). The interpretive cycle moved between individual concepts, their disciplinary contexts, and the emerging whole of the proposed model.

2.5 Thematic Synthesis and Model Construction

The synthesis followed four explicit analytic steps. First, recurrent concepts were coded into provisional themes. Second, overlapping concepts were compared and consolidated into higher-order dimensions. Third, relationships among dimensions, organizational layers, and outcomes were examined for directionality, reciprocity, and conceptual fit. Fourth, the model was iteratively redrawn until each proposed component had a distinct role and could be linked to identifiable literature. Hermeneutic interpretation informed model construction by clarifying the normative meaning of relational ethics, while socio-technical and systems concepts supplied the structural mechanisms through which ethical conditions are enabled or constrained.

No formal risk-of-bias or critical-appraisal instrument was applied because the study was designed as an integrative conceptual synthesis rather than a systematic effectiveness review. This is a limitation and is considered explicitly below.

3. RESULTS

The synthesis converged on three dimensions: relational ethics, socio-technical integration, and sociocultural context. These dimensions are analytically distinct but mutually influencing. They operate through five layers—Person, Relational Ethics, Socio-Technical System, Organizational Governance, and Societal Sustainability—and are associated with four proposed outcomes: ethical decision-making, professional autonomy, relational accountability, and workforce adaptability and sustainability. The dimensions explain the substantive content of the ethical system; the layers locate that content across levels; and the outcomes describe what the system may produce when the dimensions interact under enabling or constraining conditions.

3.1 Relational Ethics

Relational ethics emerged as the normative dimension of the model. It emphasizes dignity, vulnerability, attentiveness, trust, dialogue, interdependence, and contextual responsiveness. In nursing, ethical responsibility is constituted through relationships among nurses, patients, families, communities, and other professionals rather than through abstract principles alone (Locsin, 2017; Beauchamp & Childress, 2019). Recent nursing scholarship on digital care similarly emphasizes preserving human connection and ethical relationships as technologies become embedded in practice (Jokinen et al., 2021; Ali et al., 2022).

In digitally mediated care, technologies can alter the conditions under which these relationships occur. Telehealth, EHRs, remote monitoring, and AI-supported decisions may extend access and information while also introducing distance, surveillance, opacity, or new power asymmetries. The synthesis therefore positioned human connection and professional judgement as conditions that should remain visible when digital information is incorporated into care (Booth et al., 2021; Ali et al., 2022; Morley et al., 2020).

3.2 Socio-Technical Integration

Socio-technical integration emerged as the dimension describing reciprocal interactions among people, technologies, clinical tasks, workflows, organizations, and governance structures. Ethical consequences were not treated as properties of technology alone; they were understood as arising through implementation and use within particular organizational arrangements (Greenhalgh et al., 2017; Abdolkhani et al., 2022).

AI governance was a recurring concept, particularly transparency, explainability, fairness, privacy, human oversight, and accountability. Recent reviews also identify patient safety, bias, accountability, and the preservation of human-centred care as recurring ethical concerns in AI-enabled health services (Jobin et al., 2019; Oh et al., 2021; Čartolovni et al., 2022; Watson, 2024). The synthesis also highlighted professional participation in technology design and implementation and the need to examine workload, alert burden, documentation, and cognitive demands as ethical conditions rather than merely operational concerns.

3.3 Sociocultural Context

Sociocultural context emerged as a constitutive dimension of digital nursing ethics. Culture, power, digital literacy, socioeconomic conditions, infrastructure, institutional capacity, and community participation can influence how digital systems are accessed, interpreted, accepted, and governed. Digital inequality therefore concerns not only access but also representation, benefit, exclusion, and exposure to technological risk (Morley et al., 2020; Keenan et al., 2021; WHO, 2021; UNESCO, 2021).

The synthesis supports context-sensitive interpretation of autonomy and participation. Family or trusted others may have meaningful roles in decision-making in some settings, while individual rights and preferences remain important. The model consequently treats sociocultural context as a core component rather than an external modifier.

3.4 The Relational Systems Model

The model integrates the three dimensions through five layers. The Person layer identifies the patient and nurse as situated moral agents. The Relational Ethics layer captures trust, dignity, vulnerability, communication, and responsiveness. The Socio-Technical System layer encompasses digital tools, AI, EHRs, workflows, data governance, and human oversight. The Organizational Governance layer addresses institutional policies, professional accountability, implementation practices, resources, and leadership. The Societal Sustainability layer captures equity, workforce sustainability, public trust, infrastructure, and broader social conditions.

The architecture is deliberately non-linear. The three dimensions cut across all five layers, while feedback operates in both directions. For example, organizational governance can enable or constrain relational care; relational experience can reveal weaknesses in technology or governance; sociocultural conditions can influence adoption and design; and workforce conditions can influence the sustainability of digital implementation. The four proposed outcomes—ethical decision-making, professional autonomy, relational accountability, and workforce adaptability and sustainability—are therefore treated as emergent outcomes rather than as independent components.

4.Discussion

The principal contribution of the Relational Systems Model is integrative. It does not replace established ethical or digital-health frameworks; rather, it specifies how several traditions can be connected for nursing practice. Relational ethics supplies the moral vocabulary of dignity, vulnerability, responsiveness, and trust. Socio-technical scholarship explains the interaction of people, technologies, tasks, and organizational structures. AI-ethics literature supplies governance concerns such as transparency, fairness, safety, privacy, and human oversight. Nursing informatics emphasizes the practical integration of information and

technology into professional work (Reid et al., 2021; Watson, 2024). The proposed model adds a cross-level architecture that connects these perspectives to professional autonomy, relational accountability, and workforce sustainability.

4.1 Comparison with Existing Frameworks

Compared with principle-based ethics, the model retains autonomy, beneficence, non-maleficence, and justice but places their application within relationships and organizational systems. Compared with relational ethics, it retains attention to vulnerability and moral responsiveness but makes technological infrastructures and governance explicit. Compared with socio-technical systems theory, it retains attention to system interdependence but adds a normative account of dignity, trust, and ethical responsibility. Compared with human-centred AI frameworks, it translates human agency and oversight into nursing-specific relationships and professional accountability. Compared with nursing informatics approaches, it extends beyond technology competence and information management toward an explicit ethical architecture connecting person-level care to organizational and societal conditions.

The model's distinct explanatory claim is therefore not that any individual component is new, but that their relationships can be represented as one nursing-ethics architecture. Its boundary condition is equally important: the model is intended for conceptual analysis of digitally mediated nursing practice. It does not predict clinical outcomes, establish causal effects, or replace regulatory standards, institutional governance, or validated assessment instruments.

4.2 Human-Centred AI and the Nurse as Moral Agent

The synthesis supports human-centred AI in which digital systems augment rather than replace professional judgement. UNESCO's Recommendation on the Ethics of Artificial Intelligence emphasizes human dignity, human rights, transparency, fairness, and human oversight, while WHO guidance emphasizes human rights, transparency, accountability, and appropriate human oversight in health-related AI (UNESCO, 2021; OECD, 2019; WHO, 2021). Recent nursing and health-AI literature similarly emphasizes the need to preserve

human judgement, clarify accountability, and address bias, privacy, and trust (Ronquillo et al., 2021; O'Connor et al., 2023; Watson, 2024).

For nursing, the proposed augmentation principle means that AI may expand informational or cognitive capacity but should not be treated as the holder of moral responsibility. Nurses remain responsible for contextual interpretation, communication, escalation of uncertainty, and advocacy for patients. This position avoids both uncritical technological acceptance and blanket technological rejection.

4.3 Workforce Sustainability as an Ethical Systems Outcome

The model treats workforce sustainability as an ethical systems outcome rather than solely a human-resource metric. Digital implementation can support learning and access to information, but poorly integrated systems may increase documentation burden, alert fatigue, workflow disruption, or cognitive overload. Recent nursing evidence highlights the importance of workforce participation in digital design, implementation, and evaluation (Abdolkhani et al., 2022; Sodeau & Fox, 2022). Workforce sustainability therefore depends on professional participation, manageable work processes, digital competence, meaningful autonomy, and the capacity to sustain relational care.

4.4 Sociocultural Context and Boundary Conditions

The model can be relevant to resource-constrained and Global South settings, but the present study did not use Timor-Leste, Indonesia, or ASEAN as empirical cases. Accordingly, claims about those settings are treated as potential applications rather than findings. The model should be adapted to local evidence concerning infrastructure, connectivity, workforce capacity, digital literacy, language, cultural participation, and governance. It should not be assumed that one configuration of digital ethics applies uniformly across countries or communities; broader digital-health strategy also requires attention to health-system capacity, governance, and sustainability (World Health Organization, 2023).

4.5 Theoretical Propositions

Proposition 1: Ethical nursing practice in digital health emerges from interaction among relational ethics, socio-technical systems, and sociocultural context rather than from isolated application of individual ethical principles.

Proposition 2: Human-centred AI is more ethically compatible with nursing practice when it augments professional judgement while preserving meaningful human oversight, professional autonomy, and relational accountability. This proposition is consistent with recent work emphasizing that ethical AI in health care requires operational attention to human oversight, accountability, and the relationship between technological capability and professional judgement (Ning et al., 2024).

Proposition 3: Workforce adaptability and sustainability are more likely when digital transformation supports professional autonomy, continuous learning, manageable workloads, meaningful participation, and human-centred working environments.

Proposition 4: The ethical and equitable effects of digital health technologies depend on sociocultural and structural conditions, including digital literacy, infrastructure, power relations, participation, and representation in digital health data and AI systems. This proposition is also consistent with evidence that nurses' participation in implementation is shaped by contextual needs, organizational conditions, and representation of users in digital initiatives (Sodeau & Fox, 2022; Abdolkhani et al., 2022).

4.6 Limitations

This study has several limitations. First, the philosophical–hermeneutic approach is interpretive; alternative scholars could organize the same literature differently. Second, iterative searching and citation tracking may introduce selection bias because sources can be preferentially followed from influential or frequently cited works. Third, Google Scholar was included as a supplementary discovery source, which may introduce variability in indexing and reproducibility. Fourth, no formal critical-appraisal or risk-of-bias instrument was applied because the study was conceptual; consequently, the synthesis does not provide a comparative assessment of methodological quality across empirical studies. Fifth, the synthesis depends on published literature and may underrepresent unpublished, local, non-English, or practice-based knowledge. Sixth, the original search log did not preserve exact database-level dates, retrieval counts, or screening totals, limiting retrospective reproducibility. Finally, the Relational Systems Model has not been empirically validated. Its dimensions, layers, outcomes, and propositions should therefore be treated as conceptual

hypotheses for future Delphi, mixed-methods, measurement-development, and comparative studies rather than as established causal relationships.

Conclusions

This conceptual study developed the Relational Systems Model to address fragmentation between nursing ethics, digital health ethics, socio-technical systems thinking, and workforce sustainability. The model integrates three dimensions—relational ethics, socio-technical integration, and sociocultural context—across five layers: Person, Relational Ethics, Socio-Technical System, Organizational Governance, and Societal Sustainability. Four proposed outcomes—ethical decision-making, professional autonomy, relational accountability, and workforce adaptability and sustainability—are treated as emergent consequences of interactions across these dimensions and layers.

The model's contribution is theoretical and integrative rather than empirically established. It clarifies how relational values, technological infrastructures, organizational governance, and sociocultural conditions may jointly shape ethical nursing practice in digital health. Its propositions provide a basis for future empirical testing, but the model should not yet be presented as a validated framework for governance, workforce development, or clinical outcomes.

Declaration of generative artificial intelligence (ai) use

During preparation of this manuscript, the authors used generative artificial intelligence (AI) tools, including ChatGPT, for language editing, grammar checking, clarity enhancement, and refinement of academic expression. AI tools were not used to generate or fabricate research data, conduct empirical data analysis, or independently determine the scientific conclusions of the study. The authors retain full responsibility for the content, accuracy, originality, integrity, and final version of the manuscript. All AI-assisted text was critically reviewed and revised by the authors.

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