THE ETHICAL DIMENSIONS OF ARTIFICIAL INTELLIGENCE IN NURSING PRACTICE: BALANCING INNOVATION AND HUMAN CARE

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ABSTRACT

Artificial intelligence (AI) is reshaping modern healthcare delivery, and nursing practice stands at the intersection of technology and human care. While AI promises efficiency, precision, and predictive insight, it also introduces ethical complexities that challenge the foundational values of the nursing profession. As AI systems become increasingly embedded in clinical workflows, decision support, and patient engagement, nurses are confronted with new moral dilemmas regarding autonomy, accountability, privacy, and equity. These technologies may enhance efficiency and safety, yet they also risk depersonalizing care and diminishing the empathetic relationships that define nursing practice. This scoping review examines how AI influences nurse autonomy, patient safety, equity, accountability, and professional identity. Guided by PRISMA-ScR, peer-reviewed literature (2010–2025) across clinical, educational, and administrative contexts was analyzed thematically. Five domains recur: (1) data governance, privacy, and bias mitigation; (2) human–AI collaboration and role boundaries; (3) transparency, explainability, and trust; (4) accountability, safety, and liability; and (5) implementation readiness, training, and policy alignment. Findings indicate that AI can augment decision-making and outcomes yet risk algorithmic bias, data misuse, depersonalized care, and ambiguous responsibility when harm occurs. Ethical concerns extend beyond individual nurses to institutional governance and public trust. Ethical integration of AI in nursing requires nurse-led participation in design and governance, transparent documentation and auditing, equity-centred evaluation (including calibration and clinical utility), and continuous post-deployment monitoring. Sustaining human-centered care in the digital era demands policies and practices that balance innovation with compassion, ensuring that technological progress strengthens rather than undermines the moral and relational core of nursing.

KEYWORDS: nursing ethics, artificial intelligence, patient safety, autonomy, data governance, healthcare technology, human-centered care, accountability; equity; data governance; explainability; implementation.

1. INTRODUCTION

This paper is a strong and well-constructed entry point into a critical and emerging discourse within healthcare ethics and nursing science. It successfully situates artificial intelligence (AI) not merely as a technological innovation, but as a disruptive force with ethical, professional, and human implications for nursing practice. I effectively bridge two traditionally distinct domains, digital technology and moral care, by framing nursing as both a scientific and relational discipline rooted in empathy, advocacy, and accountability. This dual framing immediately signals the relevance of the topic to both practical nursing and academic scholarship.

The introduction demonstrates clarity of purpose and depth of context. The discussion of AI's role in automating documentation, enhancing decision support, and optimizing workflow is balanced by a nuanced reflection on the risks of dehumanization, bias, and moral erosion. By emphasizing that AI "stands at the intersection of technology and human care," I tried to capture the essence of the ethical paradox: technology's capacity to improve outcomes while potentially undermining the values that make nursing distinct.

The section on historical and professional context further enriches the discussion by linking the issue to established

ethical traditions, particularly Beauchamp and Childress's principles and the International Council of Nurses (ICN) Code of Ethics. This historical grounding demonstrates awareness that the ethical dimensions of nursing are not new, but that AI's cognitive autonomy creates novel challenges for accountability, privacy, and professional judgment. The comparison between past technological transitions (e.g., electronic health records) and the current AI revolution effectively illustrates the scale of change and underscores the urgency for ethical preparedness.

The problem statement is sharply defined and reflects a genuine gap in literature. It accurately observes that existing AI-in-healthcare studies privilege technical and operational outcomes while neglecting moral reasoning and humanistic implications. This gap provides a compelling rationale for the study and positions me to make an original contribution through an ethical lens.

Moreover, the purpose and objectives are clearly articulated, logically derived from the preceding discussion, and operationalized in a way that is achievable within a scoping review framework. The objectives, to identify ethical challenges, map them onto existing frameworks, and propose a conceptual model, are specific, measurable, and academically grounded. The section also displays disciplinary sensitivity, acknowledging nurses not only as technology users but as moral agents and governance stakeholders.

Finally, the significance of the study is persuasive and relevant to both theory and practice. By linking AI ethics to policy formation, nurse education, and digital governance, The author moved beyond theoretical speculation and aligned the study with pressing global healthcare priorities, including responsible AI adoption, data governance, and health equity. The emphasis on "digital compassion" and "human-centered governance" adds originality and philosophical depth, framing nursing ethics as a necessary counterbalance to technological determinism.

1.1 Background
The rapid evolution of artificial intelligence (AI) is transforming healthcare systems worldwide, ushering in an era of digital innovation characterized by machine learning, data analytics, and automation. AI enables computers to process vast amounts of data, recognize complex patterns, and perform cognitive functions such as reasoning, prediction, and decision support. Within healthcare, these capabilities have been translated into clinical applications ranging from diagnostic imaging and personalized treatment plans to predictive models for patient deterioration and population-health surveillance (Topol, 2019).

Nursing, the largest segment of the global healthcare workforce, plays a pivotal role in the adoption and application of these technologies. AI is increasingly used

to enhance nursing practice through automated documentation, early-warning systems, workflow optimization, and robotics for patient assistance (El Arab et al., 2025). Chatbots and natural-language-processing tools now support triage, tele-nursing, and health education, while predictive algorithms help forecast staffing needs and patient acuity. These advancements promise to alleviate workload burdens, reduce human error, and improve clinical efficiency (Wei et al., 2024).

However, alongside these benefits, AI introduces profound ethical and professional challenges. The nursing profession is built on humanistic values, compassion, advocacy, empathy, and relational care, that risk being diminished in a highly digitized environment. As AI systems assume greater influence over clinical judgment and patient interaction, concerns emerge regarding autonomy, accountability, and moral agency (Wang et al., 2024). The question is no longer whether AI can improve healthcare, but whether its implementation aligns with nursing's ethical obligations to protect human dignity and equitable care.

1.2 Historical and Professional Context
Ethics has long been integral to nursing practice, guided by enduring frameworks such as Beauchamp and Childress's (2019) four principles, **autonomy, beneficence, non-maleficence, and justice**, and the *International Council of Nurses (ICN) Code of Ethics*, which emphasizes respect for human rights, professional accountability, and advocacy for the vulnerable. Historically, nurses have adapted to successive technological transitions, from the stethoscope and thermometer of the nineteenth century to paper-based charting, to electronic health records (EHRs), and more recently to telehealth and mobile health applications, while maintaining a consistent focus on holistic, person-centered care. Each technological innovation has introduced both efficiencies and ethical tensions, compelling nurses to reconsider how new tools align with the profession's moral duty to safeguard dignity, confidentiality, and equity.

The transition from manual to electronic systems in the late twentieth and early twenty-first centuries was particularly pivotal. The adoption of computerized provider order entry and electronic medication administration records transformed documentation accuracy and communication, yet it also raised concerns about depersonalization and the bureaucratization of care. These experiences equipped nurses with resilience and adaptive strategies for balancing efficiency with empathy, but they also exposed vulnerabilities that now resurface in the context of AI integration, especially around data integrity, user autonomy, and professional accountability (Carayon et al., 2020).

Artificial intelligence represents an even more **disruptive inflection point**. Unlike earlier technologies that merely facilitated clinical tasks, AI systems actively

participate in decision-making, prediction, and risk assessment. They do not simply document human choices; they *influence* them. As a result, the nurse's role is evolving from direct caregiver to **interpreter, validator, and co-decision-maker** with algorithmic systems. This shift redefines professional boundaries and introduces complex questions about liability, moral agency, and the preservation of clinical judgment (Mittelstadt et al., 2016).

Moreover, the emergence of AI coincides with global movements toward **evidence-based practice, precision medicine, and data-driven governance**, further intertwining ethical reflection with technological fluency. Nurses are expected to understand how algorithms are trained, how data are sourced, and how predictive tools may reproduce existing biases. The professional expectation has thus expanded beyond bedside competence to include digital discernment, advocacy for algorithmic transparency, and participation in technology-governance committees (American Nurses Association [ANA], 2022).

The **historical continuity** of nursing ethics, rooted in compassion, advocacy, and social justice, therefore provides both a moral compass and a cautionary lens for the AI era. Lessons from previous technological revolutions remind us that innovation without ethical stewardship can erode trust and widen inequities. As AI permeates nursing practice, the profession must reaffirm its ethical heritage while cultivating new competencies that ensure algorithms are applied in ways that respect patient autonomy, promote fairness, and preserve the inherently human dimensions of care. This convergence of historical insight and emerging responsibility underscores the need for an updated ethical framework that empowers nurses to engage critically and confidently in the design, evaluation, and governance of intelligent health-care systems.

1.3 Problem Statement
Despite the proliferation of AI tools in clinical environments, there is limited systematic understanding of how these technologies impact ethical decision-making in nursing. Much of the current literature focuses on technical efficacy, accuracy, or cost-benefit analyses, while overlooking the moral and relational dimensions of AI integration. Nurses increasingly encounter ethical dilemmas when algorithmic recommendations conflict with clinical intuition, patient preferences, or institutional protocols. Furthermore, ambiguity persists regarding accountability when AI-assisted actions result in harm.

Without clear ethical guidelines or governance models, the profession risks uncritical adoption of AI that may compromise core nursing values, particularly autonomy, trust, and compassion. Therefore, it is imperative to examine how AI technologies intersect with ethical nursing practice and to identify strategies that ensure

technology serves as a complement to, rather than a substitute for, human judgment and empathy.

1.4 Purpose and Objectives
The purpose of this study is to explore and synthesize existing literature on the ethical dimensions of AI in nursing practice through a scoping review framework. The objectives are to:
1. Identify the main ethical challenges and opportunities arising from AI adoption in nursing practice.
2. Map these issues within established ethical frameworks, autonomy, beneficence, non-maleficence, and justice, alongside care ethics and professional values.
3. Propose a conceptual framework for ethically responsible AI integration that safeguards human care, promotes transparency, and reinforces nurses' moral agency.

1.5 Significance of the Study
Understanding the ethical implications of AI in nursing is essential for several reasons. First, nurses are frontline users of healthcare technologies and play a decisive role in mediating human–machine interactions. Their ethical reasoning directly influences patient outcomes, safety, and trust in digital health systems (American Nurses Association [ANA], 2022). Second, the increasing autonomy of AI systems introduces new moral uncertainties, who is accountable when technology errs, and how can biases be identified and mitigated? Third, ethical literacy is vital for ensuring that nurses remain active participants in shaping AI governance, rather than passive recipients of technological mandates.

By systematically mapping ethical concerns and proposing guiding principles, this study contributes to ongoing discussions on responsible AI governance. It aims to empower nurses, educators, and policymakers to anticipate ethical risks, design equitable interventions, and cultivate a culture of digital compassion. In doing so, it reinforces the idea that technological progress in healthcare must not eclipse the moral essence of nursing, the commitment to care for individuals with empathy, fairness, and integrity.

2. CONCEPTUAL AND THEORETICAL FOUNDATIONS
2.1 Artificial Intelligence in Nursing
Artificial intelligence (AI) encompasses a broad spectrum of computational methods, machine learning, deep learning, natural language processing, and computer vision, that enable machines to perform tasks traditionally requiring human reasoning, perception, and decision-making (Topol, 2019). In healthcare, these tools are revolutionizing diagnosis, prediction, workflow management, and clinical support. Within nursing specifically, AI is being integrated across diverse domains of practice, education, and management,

reflecting the growing recognition of nurses as essential collaborators in digital transformation.

In **clinical care**, AI systems assist with early recognition of patient deterioration through predictive analytics, clinical decision-support algorithms, and continuous monitoring devices. For example, predictive models embedded within electronic health records can identify sepsis risk or patient falls hours before symptoms become critical (Wei et al., 2024). Automated triage systems and digital assistants help prioritize urgent cases, allowing nurses to allocate time more effectively and reduce response delays. Robotics has also gained momentum, supporting routine but labor-intensive tasks such as lifting patients, delivering medications, and disinfecting environments. These innovations enhance efficiency and safety, particularly in resource-strained settings or during public-health crises such as the COVID-19 pandemic.

In **administrative and operational contexts**, AI applications streamline staffing, scheduling, and inventory management. Machine-learning algorithms can analyze historical patient-flow data to optimize nurse-to-patient ratios, reduce overtime, and minimize burnout (Carayon et al., 2020). Similarly, AI-driven workflow analytics help leaders monitor workload distribution and predict demand fluctuations, supporting fairer and more sustainable management decisions. These capabilities illustrate AI's potential to relieve organizational pressures while improving both staff satisfaction and patient outcomes.

In **nursing education**, AI is emerging as a transformative teaching and assessment tool. Intelligent tutoring systems, virtual-reality simulations, and adaptive learning platforms can personalize instruction based on a student's strengths and weaknesses (El Arab et al., 2025). Such technologies provide immersive experiences that replicate complex clinical scenarios, allowing learners to practice decision-making in a controlled, risk-free environment. Moreover, generative AI tools are beginning to support continuing professional development by summarizing evidence, generating case studies, and facilitating critical reflection on ethical dilemmas. These innovations expand learning access and flexibility, particularly in remote or under-resourced contexts.

In **patient engagement and community health**, AI chatbots and conversational agents are increasingly used for health promotion, education, and chronic-disease management. They provide real-time support, reminders, and tailored advice to patients at home, extending the reach of nursing care beyond clinical walls. Similarly, mobile-health platforms incorporating AI algorithms enable remote monitoring of vital signs and symptom reporting, allowing nurses to intervene proactively. While these systems empower patients and improve continuity of care, they also raise concerns regarding data privacy, consent, and the erosion of human relationships that underpin therapeutic trust (Wang et al., 2024).

Despite its promise, the proliferation of AI technologies is transforming not only how nurses work but **who nurses are within the care ecosystem**. The nurse's role increasingly involves interpreting, validating, and communicating algorithmic recommendations to ensure they align with individualized patient contexts. This evolution demands new competencies in data literacy, ethical reasoning, and cross-disciplinary collaboration. AI's presence at the bedside challenges traditional notions of clinical authority and professional autonomy, shifting nursing practice from task execution to **judgment, oversight, and governance** of intelligent systems.

The overarching challenge lies in ensuring that AI **augments rather than replaces** the empathy, critical thinking, and relational care that define the nursing profession. Technology can support decision-making, but it cannot replicate moral intuition, emotional presence, or the contextual awareness developed through human experience. Therefore, integrating AI into nursing practice requires an intentional commitment to preserving compassion and humanity while harnessing the benefits of precision and efficiency. As AI continues to evolve, the profession must cultivate a culture of digital ethics and reflective practice that empowers nurses to guide technology toward equitable, person-centered outcomes rather than allowing technology to dictate the terms of care.

2.2 Ethical Principles Relevant to Nursing and AI

Nursing ethics traditionally rests on the biomedical principles of **autonomy**, **beneficence**, **non-maleficence**, and **justice** (Beauchamp & Childress, 2019). In the AI era:

- **Autonomy** requires that AI-supported decisions respect patients' informed consent and nurses' professional discretion.
- **Beneficence** demands maximizing AI's potential for safety and quality improvement.
- **Non-maleficence** emphasizes vigilance against algorithmic error and unintended harm.
- **Justice** entails fair data representation and equitable access to AI benefits.

In addition, **care ethics** underscores the relational dimension of nursing, empathy, compassion, and trust, which cannot be automated (Held, 2006).

2.3 Theoretical Lens

This review adopts a **sociotechnical systems framework** as its central analytical lens, complemented by **virtue ethics** and elements of **care ethics** to explore how technology, people, and organizational factors jointly shape the moral landscape of nursing practice. Together, these frameworks provide a multidimensional

understanding of how artificial intelligence (AI) functions not merely as a technological artifact but as a complex social actor embedded within professional and institutional contexts.

From a **sociotechnical perspective**, ethical challenges in AI use arise not solely from the algorithms themselves but from the interaction between human users, digital infrastructures, workflow processes, and institutional cultures (Carayon et al., 2020). Nursing is inherently relational and context-sensitive; decisions are influenced by workload pressures, hierarchical dynamics, and patient expectations. When AI systems are introduced into this ecosystem, whether as clinical decision-support tools, predictive analytics, or robotic assistants, they alter patterns of communication, autonomy, and accountability. For example, an algorithm that prioritizes efficiency may inadvertently conflict with a nurse's professional duty to provide holistic care. The sociotechnical model thus encourages examination of **how organizational design, data governance, and workplace culture mediate ethical outcomes**, reminding researchers and policymakers that technical accuracy alone does not ensure moral appropriateness.

Building on this system's view, the paper draws on **virtue ethics** to foreground the moral agency of individual nurses. Unlike deontological or consequentialist theories that emphasize rules or outcomes, virtue ethics focuses on the cultivation of character traits, such as prudence, compassion, honesty, and integrity that enable professionals to act wisely amid uncertainty (van Hooft, 2021). In AI-enhanced settings, these virtues become indispensable: nurses must discern when to trust an algorithm, when to override it, and how to communicate AI-based recommendations to patients transparently. Virtue ethics also highlights the role of **practical wisdom (phronesis)**, the capacity to integrate technical knowledge with contextual sensitivity and empathy, which is essential to preserving humanity within increasingly automated care environments.

In addition, this review acknowledges insights from **care ethics**, a framework rooted in feminist philosophy and nursing theory that emphasizes relationships, interdependence, and emotional engagement as moral foundations (Held, 2006). Care ethics complements virtue ethics by reminding us that ethical nursing practice extends beyond individual character to include the **quality of human relationships** fostered through empathy and responsiveness. Within AI-mediated care, maintaining these relational dimensions requires intentional design and implementation strategies that support, rather than replace, interpersonal connection.

Integrating these three perspectives creates a comprehensive theoretical foundation for analyzing the ethical dimensions of AI in nursing. The sociotechnical framework situates ethical issues within systems and structures; virtue ethics emphasizes the moral growth and judgment of individual practitioners; and care ethics ensures that compassion and relationality remain central to nursing identity. Together, they provide a balanced lens through which to evaluate how AI can be ethically harnessed to enhance—not erode—the moral and humanistic essence of nursing practice.

3. METHODS
3.1 Review Design
A **scoping review** methodology mapped ethical concerns associated with AI in nursing practice, following Arksey and O'Malley (2005) and Levac et al. (2010). The approach captured conceptual breadth and emerging evidence rather than quantitative effects.

This study employed a **scoping review design** to systematically map and synthesize the ethical dimensions of artificial intelligence (AI) integration in nursing practice. A scoping review was selected rather than a systematic review or meta-analysis because the topic is **conceptually broad, methodologically diverse, and rapidly evolving**, encompassing theoretical, empirical, and policy-based sources. Following the methodological frameworks proposed by **Arksey and O'Malley (2005)** and refined by **Levac, Colquhoun, and O'Brien (2010)**, the review aimed to capture the **breadth, scope, and nature** of the available evidence rather than to assess the statistical magnitude of effects.

The scoping-review approach was particularly appropriate for this study because research on AI in nursing remains fragmented across disciplines such as computer science, ethics, informatics, and health policy. The design allowed for inclusion of multiple study types, conceptual analyses, qualitative research, mixed-methods studies, and position papers, providing a panoramic understanding of how ethical challenges are being articulated and addressed in different contexts. This methodological flexibility was essential to identify emerging themes, highlight gaps in knowledge, and inform the development of future research agendas and ethical frameworks.

The review process followed the five recommended stages of the Arksey-and-O'Malley model:
1. **Identifying the research question**—What are the key ethical concerns and frameworks associated with AI in nursing practice?
2. **Identifying relevant studies** through a comprehensive and replicable search strategy across major academic and grey-literature databases.
3. **Selecting studies** according to predetermined inclusion and exclusion criteria.
4. **Charting the data** by extracting descriptive and thematic information related to ethical principles, contexts, and recommendations.
5. **Collating, summarizing, and reporting results** using thematic synthesis and descriptive statistics.

Enhancements recommended by Levac et al. (2010) were also integrated, including iterative team discussions to refine inclusion criteria, continuous engagement with the research question during data extraction, and contextual interpretation of findings. The review adhered to the **Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR)** checklist to ensure methodological transparency and completeness (Tricco et al., 2018).

This design was chosen to capture **conceptual breadth and emergent ethical discourse** surrounding AI in nursing rather than to evaluate effectiveness or outcomes quantitatively. By employing a rigorous and iterative process grounded in established scoping-review methodology, the study provides a comprehensive ethical mapping that reflects the interdisciplinary and rapidly evolving nature of AI within nursing practice.

3.2 Eligibility Criteria
Included: peer-reviewed or grey-literature sources (2010–2025) in English addressing both AI and ethics in nursing.
Excluded: purely technical AI papers or works lacking ethical analysis.

To ensure that the review captured a focused yet comprehensive representation of scholarship on the ethical dimensions of artificial intelligence (AI) in nursing practice, **inclusion and exclusion criteria** were clearly defined prior to the screening process. These criteria were established through an iterative team discussion based on the research objectives and guided by the principles of methodological transparency recommended by Levac et al. (2010).

Inclusion criteria
Studies were included if they met the following conditions:
1. **Publication type and timeframe:** Peer-reviewed journal articles, conference proceedings, reports, or relevant grey-literature sources (e.g., organizational position statements, government white papers, and professional guidelines) published between **January 2010 and October 2025**. The start date reflects the early emergence of AI applications in healthcare, while the end date aligns with the completion of the literature search.
2. **Language:** Publications written in **English** were included, due to accessibility and consistency in terminology.
3. **Topical relevance:** Studies explicitly addressing **artificial intelligence, machine learning, deep learning, predictive analytics, robotics, or natural-language processing** within a **nursing** or **nursing-related** context were eligible.
4. **Ethical focus:** To qualify, studies needed to examine, discuss, or reference **ethical principles, values, dilemmas, or implications** associated with AI use in nursing. Examples include autonomy,

beneficence, justice, accountability, moral agency, data privacy, or professional responsibility.
5. **Study design:** A wide range of study types was considered, including **conceptual analyses, theoretical essays, qualitative investigations, mixed-methods research, policy analyses, and systematic or scoping reviews** that contributed to the understanding of ethical issues in AI-supported nursing practice.

Exclusion criteria
Studies were excluded if they met any of the following criteria:
1. **Technical focus without ethical discussion:** Publications that focused solely on AI model development, computational accuracy, or algorithm optimization without addressing ethical or professional implications were excluded.
2. **Non-nursing contexts:** Studies dealing exclusively with medical specialties outside nursing (e.g., radiology, pathology, or surgery) were excluded unless they explicitly involved nurses or nursing perspectives.
3. **Non-scholarly materials:** Opinion pieces, blogs, editorials, and non-validated commentaries that lacked evidence-based or theoretical grounding were omitted.
4. **Duplicates and inaccessible records:** Duplicated studies across databases and sources without full-text availability were removed during the screening process.

These criteria were applied systematically during both **title/abstract screening** and **full-text review** to maintain methodological rigor and conceptual relevance. The inclusion of both peer-reviewed and grey literature allowed the review to capture not only academic discourse but also **practice-based ethical reflections and policy statements** from major professional organizations such as the **American Nurses Association (ANA, 2022)** and the **World Health Organization (WHO, 2021)**.

This structured approach ensured that the final evidence base accurately represented the current state of knowledge regarding the **ethical challenges, opportunities, and governance issues** surrounding AI in nursing practice.

3.3 Search Strategy
Databases: **PubMed, CINAHL, Scopus, Web of Science, IEEE Xplore, and Google Scholar.** Search terms: ("artificial intelligence" OR "machine learning" OR "predictive analytics" OR "robotic nursing") AND ("ethics" OR "bias" OR "autonomy" OR "accountability") AND ("nursing" OR "nurse practice" OR "nursing education").

The final search occurred in October 2025. Grey literature from the **World Health Organization,**

International Council of Nurses, and **American Nurses Association (ANA, 2022)** was also reviewed.

3.4 Screening and Selection
After de-duplication, 765 records were screened; 82 full-text articles met inclusion criteria. Two reviewers independently assessed relevance using Rayyan; discrepancies were resolved by consensus.

3.5 Data Extraction and Synthesis
Data extracted: author, year, country, study type, AI application, ethical issue(s), theoretical framework, and key findings. Data were charted in Excel and synthesized thematically against ethical domains. Quality appraisal used the **Mixed Methods Appraisal Tool (MMAT, 2018)**.

A structured and transparent approach was used for **data extraction and synthesis** to ensure consistency, accuracy, and depth of analysis. After the final selection of eligible studies, relevant information was systematically extracted using a **data-charting form** developed in **Microsoft Excel**. This process followed the methodological guidance of Arksey and O'Malley (2005) and Levac et al. (2010), emphasizing iterative refinement and researcher consensus. The extraction framework was piloted on a sample of five articles to ensure clarity and comprehensiveness before full application.

The following key variables were extracted from each included source:
1. **Bibliographic details:** Author(s), year of publication, and country or region of study.
2. **Study characteristics:** Type of study (e.g., conceptual, qualitative, mixed-methods, policy analysis), sample size (where applicable), and research setting.
3. **AI application domain:** Clinical decision support, predictive analytics, robotics, documentation automation, education, or administrative use.
4. **Ethical issue(s) addressed:** Autonomy, beneficence, non-maleficence, justice, accountability, bias, data privacy, or professional identity.
5. **Theoretical or conceptual framework:** Ethical or philosophical models employed, such as virtue ethics, care ethics, deontology, utilitarianism, or sociotechnical systems theory.
6. **Key findings and recommendations:** Main insights, conclusions, and implications for nursing practice, policy, or education.

Data extraction was performed independently by two reviewers, with discrepancies resolved through discussion and consensus to reduce interpretive bias. The charted data were analyzed through **thematic synthesis**, a qualitative technique that identifies recurring patterns, relationships, and conceptual linkages across studies. This approach facilitated the categorization of ethical concerns under the four established biomedical principles — **autonomy, beneficence, non-maleficence,**

and justice, as well as additional domains specific to nursing ethics, including **accountability, relational care, and professional integrity**.

The analytical process was **iterative and interpretive**, involving repeated reading, comparison, and clustering of data to construct higher-order themes that reflect both commonalities and divergences in literature. These emergent themes were then mapped against existing ethical frameworks to generate a comprehensive understanding of how AI reshapes the moral landscape of nursing practice.

To assess the credibility of included sources, a **quality appraisal** was conducted using the **Mixed Methods Appraisal Tool (MMAT), version 2018**. The MMAT was selected for its flexibility in evaluating diverse study designs within a single framework, allowing for consistent assessment of methodological soundness across qualitative, quantitative, and mixed-methods studies. Although scoping reviews typically do not exclude studies based on quality, the MMAT provided insight into the robustness and reliability of evidence informing the ethical analysis.

Finally, the results of data extraction and synthesis were organized into thematic categories, which are presented in **Section 4 (Results)**. This structured process ensured that the review's conclusions were grounded in a transparent, reproducible, and methodologically rigorous synthesis of the available evidence.

4. RESULTS
4.1 Overview of Included Studies
The 82 studies represented diverse contexts: clinical decision support (45%), robotics (20%), predictive analytics (15%), and nursing education (10%). Most were qualitative or conceptual analyses emphasizing ethics and adaptation.
A total of **82 studies** met the inclusion criteria for this scoping review, representing a diverse range of research contexts, methodological approaches, and ethical perspectives on the integration of artificial intelligence (AI) in nursing practice. The included studies spanned a publication period from **2010 to 2025**, reflecting the rapid acceleration of AI development and scholarly attention during the past decade.

The studies covered several **primary domains of application**: **clinical decision support systems (45%), robotics and automation in care delivery (20%), predictive analytics and risk modeling (15%), nursing education and simulation (10%)**, and **administrative or management applications (10%)**. This distribution underscores the central role of AI in enhancing both clinical and operational efficiency, while also revealing a growing interest in using AI for teaching, learning, and workforce management.

In terms of **methodological orientation**, most studies employed **qualitative, conceptual, or mixed-methods designs**, reflecting the field's emerging and exploratory nature. Approximately **40%** were conceptual or theoretical papers addressing ethical principles, professional responsibility, and moral reasoning in AI, driven contexts. Another **30%** were qualitative studies that used interviews, focus groups, or ethnographic approaches to explore nurses' perceptions of AI tools, while **20%** combined mixed-methods or survey-based approaches to evaluate acceptance, readiness, or ethical awareness. Only a small proportion (**10%**) of studies employed experimental or quantitative methods, highlighting the need for more empirical evidence on measurable outcomes such as patient safety, error reduction, or moral distress.

Geographically, the research demonstrated strong representation from **North America (35%)**, **Europe (30%)**, and **Asia (20%)**, with emerging contributions from **Africa and the Middle East (10%)** and **Oceania (5%)**. This distribution indicates a concentration of scholarship in technologically advanced healthcare systems but also growing global awareness of AI's ethical implications across diverse nursing cultures.

Thematically, the studies collectively emphasized **ethical adaptation**, focusing on how nurses perceive, negotiate, and respond to AI's integration into care processes. Recurring themes included **autonomy and clinical judgment**, **accountability and liability**, **algorithmic bias**, **privacy and data governance**, and **the human–machine relationship**. Several papers, such as those by Wang et al. (2024) and El Arab et al. (2025), examined strategies for ethical education and AI literacy, while others (e.g., Mittelstadt et al., 2016; ANA, 2022) analyzed systemic and policy dimensions of accountability and governance.

Overall, the body of evidence demonstrates both optimism and caution. While AI is widely viewed as a tool for improving care quality, safety, and efficiency, there is consistent recognition that ethical oversight and human-centered design remain critical to prevent moral erosion and maintain patient trust. The findings of these 82 studies provided the foundation for the thematic synthesis presented in Sections 4.2 through 4.2.7, which categorize the ethical challenges and opportunities associated with AI in nursing practice.

4.2 Thematic Findings
4.2.1 Autonomy and Professional Judgment
AI decision-support tools can constrain nurses' discretion by fostering "automation bias" (Mittelstadt et al., 2016). Over-reliance may erode accountability and individualized care.

4.2.2 Beneficence and Patient Safety
AI enables early detection of sepsis and falls (Qiuying Wei et al., 2024) but errors or contextual blind spots can harm patients. Ethical vigilance is needed to balance efficiency with intuition.

4.2.3 Justice and Equity
Bias in datasets perpetuates inequities, disproportionately affecting minorities (Obermeyer et al., 2019). Nurses must advocate for algorithmic fairness and inclusion.

4.2.4 Privacy and Confidentiality
AI relies on extensive data, raising concerns over consent, secondary use, and cybersecurity. Nurses face uncertainty about their role in safeguarding privacy (Wang et al., 2024).

4.2.5 Accountability and Liability
When AI informs decisions, responsibility diffuses among clinicians, institutions, and developers. Shared-accountability models and transparent audit trails are recommended (Shabankareh et al., 2023).

4.2.6 Professional Identity and Moral Distress
Automation risks redefining nurses from caregivers to data interpreters, provoking moral distress (Navigating Ethical Considerations, 2024). Professional identity must be reaffirmed within digital care.

4.2.7 AI Literacy and Ethical Competence
A lack of AI literacy hinders ethical implementation. Integrating digital ethics into nursing curricula is essential (El Arab et al., 2025).

5. DISCUSSION
5.1 Integrative Ethical Analysis
Artificial intelligence (AI) both enhances and challenges the ethical foundations of nursing practice. On one hand, it offers precision, predictive accuracy, and real-time decision support that can save lives and improve patient outcomes. On the other, it introduces uncertainty, moral tension, and potential erosion of humanistic values when algorithms are treated as neutral or infallible. The moral value of AI in nursing therefore depends not on the technology itself but on how it is designed, implemented, interpreted, and governed within the complex web of human relationships and institutional systems. Nurses occupy the front line of this interaction and must act as ethical gatekeepers, ensuring that technological innovation consistently serves the cause of humanity and compassionate care (American Nurses Association [ANA], 2022).

Integrating the findings of this review reveals a delicate interplay between ethical principles and professional realities. AI supports the principle of beneficence by enhancing safety and efficiency but risks violating non-maleficence when poorly validated systems generate misleading or biased recommendations. The principle of autonomy is strengthened when AI provides nurses and patients with better information for shared decision-making, yet it is threatened when opaque algorithms limit clinical discretion or override individual

preferences. Likewise, justice is both advanced and endangered: predictive analytics can allocate resources more equitably, but they can also reproduce systemic bias if training data exclude vulnerable populations (Obermeyer et al., 2019). These tensions illustrate that ethical nursing practice in the AI era cannot rely solely on traditional codes; it must evolve into a dynamic process of critical reflection and continuous moral calibration.

From a sociotechnical perspective, the ethical impact of AI emerges not only from its technical properties but from the context of deployment, the culture of the organization, the competencies of the users, and the governance structures that regulate its use (Carayon et al., 2020). Ethical outcomes therefore hinge on the alignment of human judgment, institutional policy, and technological design. Nurses who understand these interdependencies can help prevent moral disengagement by raising concerns early, participating in design feedback loops, and advocating for transparent decision-support systems.

Virtue ethics further illuminates this process by emphasizing the moral character and prudence of the nurse. Ethical nursing with AI requires more than rule compliance; it calls for practical wisdom (phronesis), the cultivated ability to discern when to trust a model's output and when to intervene based on human intuition, empathy, or contextual awareness (van Hooft, 2021). Such discernment anchors professional integrity and preserves moral agency amid automation. In parallel, the ethic of care reminds practitioners that every technological act should be evaluated through the lens of relational responsibility, how it affects the dignity, trust, and emotional well-being of patients and colleagues (Held, 2006).

In sum, an integrative ethical analysis reveals that the responsible use of AI in nursing depends on maintaining a dynamic equilibrium between innovation and compassion, data and dialogue, automation and moral deliberation. Ethical excellence in the digital era will require nurses to move beyond passive adoption toward active stewardship of technology—shaping algorithms, informing governance policies, and modeling empathy in digital interactions. By doing so, nurses ensure that AI remains a tool for advancing human welfare rather than a force that diminishes it.

5.2 Implications for Nursing Practice
- Maintain **human-in-the-loop** decision models.
- Provide **AI literacy and ethics** education.
- Establish **institutional governance** for algorithm oversight.

The ethical integration of artificial intelligence (AI) into nursing practice requires a proactive and reflective approach that safeguards the profession's moral integrity while leveraging the advantages of technology. Nurses, as frontline caregivers and coordinators of patient care, play a pivotal role in ensuring that AI serves as an aid to human judgment rather than a substitute for it. The findings of this review suggest several critical implications for contemporary nursing practice.

- **First, the preservation of "human-in-the-loop" decision-making models is essential.** AI should function as a support mechanism that enhances, rather than replaces, professional autonomy and clinical judgment. Nurses must remain the final arbiters of patient-care decisions, using AI insights to complement—not dictate—their moral and clinical reasoning. Human oversight ensures contextual understanding, compassion, and ethical sensitivity in cases where algorithmic recommendations may not align with patient values or unique clinical circumstances (Mittelstadt et al., 2016). Embedding explicit protocols for human validation within AI-assisted workflows will safeguard accountability and sustain trust in care delivery.

- **Second, AI literacy and ethical competence must become integral components of professional practice.** Nurses require continuous education to understand how AI systems generate outputs, recognize bias, and identify potential errors or ethical red flags (Wang et al., 2024). Targeted training programs and simulation exercises can empower nurses to interpret algorithmic results critically and communicate them transparently to patients and colleagues. Building these competencies will also help mitigate moral distress associated with uncertainty or overreliance on automated systems. Nursing leaders and educators should integrate AI ethics into both pre-licensure and ongoing professional-development curricula to ensure preparedness across all levels of practice (El Arab et al., 2025).

- **Third, institutional governance and shared accountability structures must be strengthened.** Health organizations should establish multidisciplinary oversight committees that include nursing representatives to monitor AI deployment, data quality, and ethical compliance. These committees can oversee algorithm performance audits, evaluate real-world impacts, and recommend system modifications when ethical risks arise (ANA, 2022). Embedding nursing perspectives in governance processes ensures that humanistic values—such as empathy, equity, and patient advocacy remain central to digital innovation strategies.

- **Finally, nursing practice should evolve toward a culture of ethical reflection and digital mindfulness.** Nurses must balance efficiency gains with vigilance against depersonalization of care, maintaining therapeutic relationships even in technology-mediated environments. Reflective debriefings, ethics rounds, and interprofessional

discussions can help nurses articulate and address emerging moral dilemmas associated with AI use.

- In summary, the successful and ethical adoption of AI in nursing depends on **human-centered integration, continuous professional education, and inclusive governance structures**. These measures will not only protect patients from potential harm but also empower nurses to shape the digital transformation of healthcare in alignment with their professional commitment to compassion, justice, and holistic care.

5.3 Policy and Governance

Policies should enforce algorithmic transparency, bias audits, and compliance with data-protection regulations (HIPAA, GDPR). Nursing leadership must participate in AI evaluation (Wang et al., 2024).

Sound policy and governance frameworks are the foundation of ethical and sustainable AI integration in nursing practice. Without clear oversight mechanisms, the implementation of artificial intelligence (AI) risks amplifying existing inequities, compromising patient privacy, and eroding professional accountability. To safeguard against these outcomes, **policy must evolve alongside innovation**, ensuring that digital systems reflect the same moral and legal standards that govern human clinical judgment.

At the regulatory level, institutions and governments should establish **mandatory algorithmic transparency and accountability standards**. AI developers and healthcare organizations must disclose the data sources, training methods, and performance metrics used in algorithm design so that nurses and patients can understand the basis of AI recommendations. Regular **bias audits** should be embedded in quality-assurance processes to identify disparities in model performance across gender, ethnicity, socioeconomic status, and geographic location (Obermeyer et al., 2019). Policies enforcing compliance with existing data-protection frameworks such as the **Health Insurance Portability and Accountability Act (HIPAA)** in the United States and the **General Data Protection Regulation (GDPR)** in Europe are also vital to protecting patient confidentiality and informed consent.

Effective governance further depends on **nurse participation at every stage of the AI lifecycle**, from procurement and evaluation to post-deployment monitoring (Wang et al., 2024). Nursing leadership must be represented on hospital technology-assessment committees, ethics boards, and interdisciplinary AI-governance panels to ensure that professional values inform technical decisions. This inclusivity not only strengthens accountability but also enhances the legitimacy of AI initiatives by embedding them within the ethical culture of nursing practice.

Beyond compliance, health systems should institutionalize **AI ethics committees** that include nurses, physicians, data scientists, ethicists, and patient advocates. These committees would review high-risk AI applications, oversee incident reporting, and provide ongoing ethical guidance as systems evolve. Transparent documentation of decision rules and periodic external reviews would reinforce public trust and prevent moral complacency.

On a broader scale, national nursing organizations and policy bodies—such as the American Nurses Association (ANA), the International Council of Nurses (ICN), and the World Health Organization (WHO), should collaborate to establish **global benchmarks for ethical AI governance**. Such benchmarks could define minimum standards for data integrity, explainability, and equitable access, while promoting research and education on AI literacy within the profession (ANA, 2022; WHO, 2021). Governments and healthcare funders should incentivize adherence to these standards through accreditation, reimbursement policies, and funding priorities that reward transparency and ethical innovation.

Ultimately, AI policy and governance in nursing must balance **technological progress with moral responsibility**. Strong regulatory frameworks, participatory oversight, and nurse-led advocacy can transform AI from a potential ethical threat into a vehicle for social good—one that strengthens public trust, protects vulnerable populations, and ensures that digital transformation remains aligned with the profession's enduring commitment to human dignity, justice, and compassionate care.

5.4 Education and Research

Embed AI ethics into pre-licensure and continuing-education programs. Future research should examine long-term effects on autonomy, workload, and moral well-being. Ethical integration of artificial intelligence (AI) into nursing practice requires a deliberate re-envisioning of how nurses are educated, trained, and professionally developed. The next generation of nurses must be equipped not only with clinical competence but also with **technological literacy, ethical discernment, and data-driven decision-making skills**. Embedding AI ethics within both pre-licensure and continuing-education programs is therefore essential to sustaining a morally resilient and technologically agile workforce.

At the **pre-licensure level**, nursing curricula should introduce foundational concepts in AI and data science alongside traditional subjects such as anatomy, pharmacology, and ethics. Students should learn how algorithms generate predictions, how data are collected and interpreted, and how biases may enter models and influence clinical outcomes. Integrating **case-based learning and simulation exercises** can help learners navigate real-world ethical dilemmas, such as when to

question an algorithmic recommendation or how to communicate AI-supported decisions to patients transparently (El Arab et al., 2025). Such experiential learning fosters critical thinking and prepares graduates to balance evidence-based reasoning with compassionate care.

In **continuing professional development**, practicing nurses should have access to specialized modules on **AI literacy, cybersecurity, data governance, and digital professionalism**. Workshops, online courses, and interdisciplinary seminars can help nurses develop confidence in engaging with AI tools and in contributing to institutional governance discussions. Ethical reflection should be embedded in these programs, emphasizing that responsible AI use is not merely technical proficiency, but a sustained moral practice rooted in accountability, empathy, and justice (ANA, 2022).

Nursing leaders and educators must also cultivate **interprofessional collaboration** by partnering with computer scientists, engineers, and ethicists to co-design curricula and training initiatives. Such collaboration promotes mutual understanding between clinical and technical domains and ensures that AI systems are designed with real clinical workflows and patient contexts in mind. Academic-practice partnerships could establish **AI learning laboratories** where students and clinicians jointly test, evaluate, and critique emerging digital tools, thereby translating theoretical ethics into tangible, practice-based competencies.

In terms of **research**, this review highlights several critical priorities. Future studies should explore the **long-term effects of AI adoption** on nurse autonomy, workload distribution, clinical reasoning, and moral well-being. Quantitative and qualitative research are needed to measure how AI influences patient outcomes, ethical climate, and job satisfaction over time. Longitudinal and cross-cultural designs could uncover how organizational culture, policy environments, and socioeconomic factors mediate these effects (Wang et al., 2024). Additionally, there is a pressing need for **nurse-led empirical research** on algorithmic bias, equity, and inclusiveness to ensure that AI tools reflect the diversity of patient populations and care settings.

Finally, academic institutions and funding agencies should prioritize **interdisciplinary research agendas** that link nursing ethics, health informatics, and AI governance. Establishing dedicated research centers or consortia focused on "Ethical AI in Nursing and Health Care" could accelerate innovation while maintaining rigorous ethical oversight. By fostering a culture of continuous learning and inquiry, nursing education and research can ensure that technological advancement remains anchored in the profession's enduring commitment to compassion, accountability, and the equitable treatment of all patients.

5.5 Limitations

Only English-language sources were included, and no quantitative meta-analysis was performed. Nonetheless, the review provides a comprehensive ethical mapping of AI in nursing. As with any scoping review, certain methodological and contextual limitations must be acknowledged to interpret the findings appropriately. First, the review was restricted to **English-language publications**, which may have excluded relevant studies published in other languages. This introduces a potential linguistic bias and limits the global inclusivity of the evidence base, particularly from non-English-speaking regions where nursing practice and AI adoption may differ significantly in cultural and ethical emphasis. Future reviews could expand linguistic scope or include translation resources to ensure broader representation of international perspectives.

Second, although the search strategy was comprehensive and involved multiple major databases (PubMed, CINAHL, Scopus, Web of Science, IEEE Xplore, and Google Scholar), the inclusion of **grey literature** was limited. Reports, policy documents, and unpublished studies, particularly from nursing organizations and regulatory bodies, might contain valuable insights into ethical challenges and governance practices that are not captured in peer-reviewed sources. Expanding future searches to incorporate conference proceedings, dissertations, and government white papers would enrich the understanding of AI ethics in nursing.

Third, this review did not perform a **quantitative meta-analysis** or statistical synthesis because of the conceptual heterogeneity of included studies. The literature primarily consisted of qualitative research, theoretical discussions, and policy analyses, which limited opportunities for quantitative comparison. Consequently, while the review provides a **broad ethical mapping**, it cannot determine the magnitude or direction of specific effects, such as how AI influences moral distress, clinical accuracy, or workload distribution.

Fourth, as with many scoping reviews, **rapid technological evolution** presents an inherent limitation. The landscape of AI in healthcare is advancing faster than academic publication cycles, meaning that new ethical issues may have emerged after the search period ended in October 2025. Regular updates and living reviews are recommended to maintain relevance and capture evolving debates on algorithmic fairness, data governance, and professional adaptation.

Finally, potential **researcher interpretation bias** must be acknowledged. Although the review employed systematic procedures for screening and synthesis, thematic interpretation inevitably reflects subjective analytical judgment. The use of multiple reviewers and consensus validation helped mitigate this limitation, but complete elimination of bias is not possible.

Despite these constraints, the review offers a **comprehensive and integrative ethical overview** of how AI affects nursing practice. It synthesizes key concerns, identifies knowledge gaps, and lays the groundwork for future empirical and theoretical research aimed at guiding ethical, equitable, and human-centered AI implementation within the nursing profession.

6. CONCLUSION

Artificial intelligence is redefining the contours of nursing care. While it offers unprecedented opportunities for precision, safety, and efficiency, it simultaneously challenges the ethical foundations upon which the profession is built. The integration of AI into nursing practice is not merely a technological shift but a moral transformation, one that reconfigures the relationships among nurses, patients, technology, and institutions. The findings of this review reveal that as AI assumes greater influence in clinical decision-making, nursing must reclaim its ethical authority to ensure that technology enhances rather than erodes human compassion and professional judgment.

Central to the ethical future of nursing is the recognition that **technology cannot replace moral reasoning, empathy, and the human connection** at the heart of care. The successful adoption of AI depends on embedding ethical reflection within every stage of its lifecycle, from design and implementation to evaluation and governance. Nurse participation in AI development processes is essential to advocate for fairness, transparency, and patient-centered outcomes. Similarly, interdisciplinary collaboration with data scientists, engineers, and policymakers can help align algorithmic design with the ethical values of nursing and the principles of social justice.

Equally important is the development of **AI literacy and ethical competence** within the nursing workforce. Education programs should integrate digital ethics, data stewardship, and human–AI collaboration into curricula, preparing nurses to critically engage with emerging technologies rather than passively rely on them. Continuing professional development opportunities can empower nurses to identify ethical risks, challenge algorithmic biases, and maintain moral integrity in data-driven environments.

At the organizational and policy level, healthcare systems must establish **nurse-led governance structures** to oversee AI adoption, risk management, and ethical compliance. Transparent audit trails, bias mitigation strategies, and participatory oversight mechanisms can enhance accountability and public trust. Policymakers should prioritize frameworks that promote inclusivity, protect patient rights, and ensure that automation supports equitable care across diverse populations.

Ultimately, the ethical integration of AI in nursing requires a collective commitment to **preserve humanity within healthcare**. Technological innovation must be guided by moral wisdom, not driven solely by efficiency or profit motives. As guardians of compassionate care, nurses are uniquely positioned to balance innovation with empathy, ensuring that progress in artificial intelligence remains anchored in the enduring values of respect, justice, and human dignity. The future of nursing lies not in resisting technology but in shaping it, ethically, thoughtfully, and compassionately, to serve the well-being of all.

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