

A Nurse-Centered Socio-Technical Readiness Framework for Artificial Intelligence in Clinical Practice

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Abstract

Background: Artificial intelligence (AI) is moving from experimental promise into the everyday infrastructure of clinical work through predictive analytics, clinical decision support, remote monitoring, documentation automation, robotics, and increasingly generative AI. Nurses are central to this transition because they translate data-rich systems into bedside decisions, relational care, safety surveillance, patient advocacy, and ethical accountability. Yet the literature shows that nurses' AI preparedness remains uneven, with readiness shaped not only by literacy and training but also by workflow fit, explainability, professional autonomy, equity, and governance. **Aim:** This article develops a nurse-centered socio-technical framework for AI readiness in clinical practice and clarifies why preparing nurses for AI requires more than digital skills acquisition. **Design:** Critical integrative review and conceptual framework development. **Evidence base:** The synthesis integrates recent empirical nursing studies, systematic and qualitative reviews, nursing position statements, health AI reporting standards, and global AI governance guidance. Priority was given to peer-reviewed sources published from 2018 to 2026, supplemented by foundational theories of technology acceptance, socio-technical systems, nursing ethics, and human factors. **Synthesis:** Six interdependent readiness domains were identified: technical, educational, ethical/legal, professional, organizational, and equity/governance readiness. These domains explain why AI adoption may fail even when systems are technically sophisticated and why nurse participation in design, implementation, oversight, and evaluation is indispensable. **Conclusion:** AI readiness in nursing is best understood as a socio-technical capability distributed across persons, technologies, institutions, regulations, and moral relationships. AI should augment, not displace, the nurse's clinical judgment, relational presence, and professional responsibility. **Impact:** The proposed framework offers nurse educators, clinical leaders, health system executives, AI developers, regulators, and researchers a practical structure for designing, evaluating, and governing AI-enabled nursing practice without weakening the human core of care.

Keywords: Artificial intelligence; nursing; AI readiness; digital health; clinical decision support; socio-technical systems; nursing ethics; technology acceptance; patient safety; AI governance.

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1. Introduction

Artificial intelligence (AI) is no longer peripheral to health care. Predictive models, clinical decision support systems, speech recognition, natural language processing, remote monitoring platforms, robotics, and generative AI tools now increasingly shape how health organizations see patients, allocate attention, document care, and define risk. Nursing is deeply implicated in this transformation because nurses occupy the most continuous and relational position in the clinical system. They are often the first to notice deterioration, the professionals who translate protocols into embodied care, and the patient advocates who mediate between institutional logic and individual need. For this reason, AI in nursing is not merely a technological development. It is a professional, epistemic, ethical, organizational, and political development.

The global stakes are considerable. The State of the World's Nursing 2025 estimated the global nursing workforce at 29.8 million in 2023 while also identifying an unevenly distributed shortage of 5.8 million nurses, largely concentrated in low- and lower-middle-income countries (World Health Organization [WHO] & International Council of Nurses [ICN], 2025). In such a context, AI is often presented as a solution to strained workforces, documentation burden, surveillance gaps, and uneven access to expertise. That promise deserves serious attention. However, the temptation to frame AI as a substitute for under-resourced nursing labor must be resisted. A tool that increases surveillance without increasing staffing, produces recommendations without explaining its reasoning, or shifts responsibility to nurses without giving them authority is not an innovation in care. It is a redistribution of risk.

Recent evidence shows both openness and unease among nurses. A qualitative study of 48 registered nurses in Saudi Arabia found that perceived benefits to patient care, organizational support, and comprehensive training were important facilitators of AI adoption, while technical challenges, privacy

concerns, and fear of job displacement were prominent barriers (Ramadan et al., 2024). A cross-sectional study of 329 newly qualified nurses in China found moderate AI readiness, with perceived ease of use, prior AI training, and awareness of AI in nursing practice significantly associated with readiness (Yang et al., 2026). A systematic review of 37 studies on nurses' and nursing students' attitudes, literacy, readiness, and adoption intentions concluded that prior AI training and computer skills were linked to more favorable readiness and intentions, while anxiety weakened readiness (El Arab et al., 2025). These findings suggest that nurses are not simply resistant to AI. Rather, they are critically negotiating whether AI is usable, trustworthy, ethically defensible, and compatible with professional nursing values.

This article argues that AI preparedness in nursing has been too often reduced to training. Training is essential, but it is insufficient. A nurse can be well trained and still be placed in an unsafe AI environment if the model is opaque, data are biased, alerts are poorly calibrated, workflows are impractical, liability is unclear, policies are absent, or nurses are excluded from system design. Conversely, even an imperfect system can become safer when embedded in a reflective, accountable, participatory, and well-supported work system. The decisive question is therefore not simply whether nurses are prepared for AI. The deeper question is whether health systems are prepared to implement AI in ways that respect, strengthen, and protect nursing practice.

The purpose of this critical integrative review is to develop a nurse-centered socio-technical readiness framework for AI in clinical practice. The article synthesizes current evidence and guidance across nursing research, technology acceptance, human factors, ethics, and AI governance. It makes three contributions. First, it clarifies the conceptual limits of treating AI readiness as individual willingness or skill. Second, it organizes the challenges of AI adoption into six interdependent readiness domains. Third, it offers practical implications for educators,

clinical leaders, health organizations, developers, regulators, and researchers.

1. Design and synthesis approach

This article uses a critical integrative review and conceptual framework development approach. Integrative reviewing is appropriate when a field includes heterogeneous empirical, theoretical, professional, and policy literature and when the aim is to generate a more comprehensive understanding of a complex health-care phenomenon rather than estimate a pooled effect size (Whittemore & Knafl, 2005). Critical interpretive synthesis is also useful when the task is not merely to summarize existing studies but to interrogate assumptions, construct higher-order concepts, and produce a theoretically useful account of a complex field (Dixon-Woods et al., 2006).

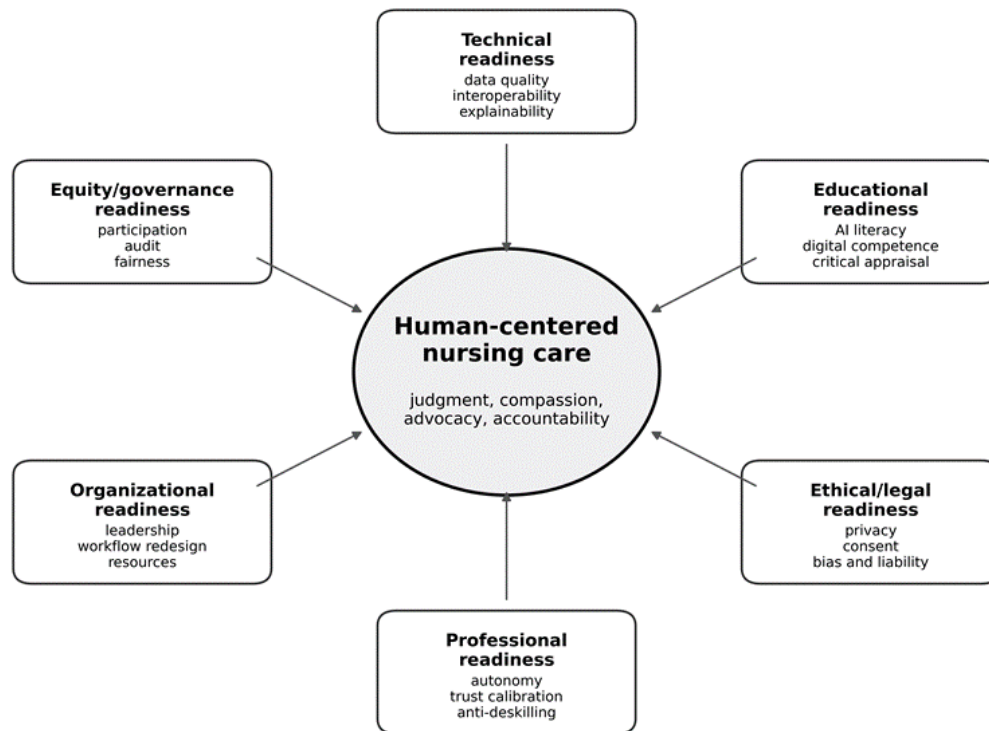
The source material was an author-provided professional manuscript on challenges nurses face in using AI in clinical practice. That manuscript offered a preliminary thematic architecture around technical, ethical/legal, educational, professional-cultural, and organizational/systemic challenges. The present article substantially reconceptualizes that material into a journal-style scholarly manuscript by integrating recent empirical studies, systematic and qualitative reviews, nursing and health AI position statements, clinical AI reporting standards, and governance guidance. The goal is not to present a formal systematic review, and no claim is made that all eligible studies have been exhaustively identified, screened, or appraised. Instead, the article offers a rigorous conceptual synthesis grounded in

high-relevance evidence and designed to support future empirical testing.

Sources were prioritized using four criteria: relevance to nurses or nursing education, direct engagement with AI adoption or readiness, methodological or governance authority, and recency where the field is rapidly changing. Evidence included nursing-specific empirical studies and reviews (El Arab et al., 2025; Joo et al., 2025; Labrague et al., 2023; Ramadan et al., 2024; Wei et al., 2025; Yang et al., 2026), professional nursing guidance (American Nurses Association [ANA], 2022; American Academy of Nursing, 2026; ICN, 2023), health AI governance documents (National Academy of Medicine [NAM], 2025; National Institute of Standards and Technology [NIST], 2023; WHO, 2021, 2023, 2024), and foundational theory on technology acceptance and socio-technical systems (Davis, 1989; Holden et al., 2013; Holden & Karsh, 2010; Venkatesh et al., 2003).

The synthesis proceeded through conceptual clustering. Claims in the preliminary manuscript were compared against the literature and reorganized into domains that explain readiness as a property of configured clinical systems. A domain was retained when it met three tests: it appeared repeatedly in nursing or AI governance literature, it had practical implications for clinical safety or professional practice, and it could not be reduced to another domain without losing explanatory force. This process generated the Nurse AI Readiness and Governance Framework presented in Figure 1.

Nurse-centered socio-technical AI readiness and governance framework



Readiness emerges from alignment among people, technologies, work systems, ethics, and governance, not from training alone.

Figure 1. Nurse-centered socio-technical AI readiness and governance framework.

Note. Figure developed by the authors from a synthesis of socio-technical systems theory, SEIPS 2.0, technology acceptance theory, nursing ethics, and health AI governance literature (ANA, 2022; Davis, 1989; Holden et al., 2013; NIST, 2023; Venkatesh et al., 2003; WHO, 2021, 2023, 2024).

2. Conceptual foundation: AI readiness as distributed professional capability

The dominant language of “readiness” can be misleading if it implies that the nurse alone is the problem to be fixed. In technology adoption research, readiness is often associated with willingness, perceived usefulness, perceived ease of use, social influence, and facilitating conditions (Davis, 1989; Venkatesh et al., 2003). These concepts remain useful. Yang et al. (2026), for example, found that perceived ease of use and prior AI training were significant predictors of AI readiness among newly qualified nurses. Yet in clinical nursing, the object of readiness is not a neutral consumer technology. AI is introduced into morally dense environments where patients are vulnerable, time is compressed,

consequences are serious, and accountability is distributed but often unevenly borne by frontline clinicians.

For this reason, the individual acceptance model must be nested within a socio-technical account of work. Human factors frameworks such as SEIPS 2.0 emphasize that care quality and safety emerge from interactions among persons, tasks, tools and technologies, organizations, environments, and external conditions (Holden et al., 2013). Applied to AI in nursing, this means that readiness cannot be located only in a nurse’s attitude or digital competence. It is also located in the quality of the data, the design of the interface, the explainability of the recommendation, the staffing context, the policy environment, the availability of technical support, the organizational culture, and the legal expectations surrounding clinical judgment.

A philosophical difficulty also arises. Nursing knowledge is not reducible to algorithmic inference. Nurses reason through signs, histories, embodied assessment, dialogue, family context, institutional constraints, and moral obligation. AI may extend pattern recognition, but it does not possess practical wisdom, compassion, responsibility, or presence. The nurse's judgment is not merely a slower version of computation; it is a situated moral practice. Therefore, the proper question is not whether AI can "think" better than nurses in selected tasks. The proper question is how AI can be configured so that computational inference strengthens rather than displaces nursing judgment.

This distinction matters because unsafe AI adoption often occurs when organizations confuse information with wisdom. A prediction score may indicate elevated risk, but it does not decide what should be done for this patient, in this bed, with this family, under these resource constraints, at this hour, with these values at stake. The prepared nurse is not the nurse who obeys AI quickly. The prepared nurse is the nurse who can interpret AI critically, integrate it with clinical assessment, explain its limits, document defensible reasoning, and advocate when algorithmic outputs conflict with patient-centered care.

3. Findings: Six domains of nurse AI readiness

4.1. Technical readiness: From functional tools to trustworthy tools

Technical readiness concerns the reliability, interoperability, usability, explainability, and local validity of AI systems. Nursing-facing AI tools frequently depend on electronic health record data, monitoring devices, structured documentation, sensor inputs, and historical patterns of care. If those data are incomplete, biased, delayed, poorly coded, or poorly integrated across systems, the resulting recommendation can be clinically misleading. Reviews of AI in nursing identify technical constraints, interoperability problems, and limited nursing-specific tool development as recurring

barriers (Wei et al., 2025). These problems are not abstract. A sepsis alert that misses a relevant laboratory result because systems are not connected, or a fall-risk model that performs poorly for underrepresented patients, can create a false sense of safety.

Explainability is a central technical and ethical issue. Nurses are asked to act on AI outputs in contexts where they may need to justify decisions to patients, families, physicians, managers, and regulators. A black-box recommendation may be statistically strong at population level but clinically difficult to trust at the bedside. WHO (2021, 2023) and NIST (2023) both emphasize transparency, explainability or interpretability, and risk management as conditions of trustworthy AI. For nursing, explainability must be practical rather than ornamental. The nurse does not need a mathematical proof of the model architecture during a shift. The nurse needs clinically intelligible information about why the alert was triggered, which variables drove the risk estimate, what the known limitations are, and what action pathway is recommended.

Usability is equally decisive. A system that requires nurses to leave the electronic health record, open a separate dashboard, interpret unfamiliar scores, and document manually is not an efficiency gain. It is a workarounds generator. Health technology acceptance research has repeatedly shown that perceived ease of use influences adoption (Davis, 1989; Holden & Karsh, 2010). In nursing, ease of use must be interpreted as workflow fit under real clinical load. An AI tool that functions well in a demonstration may fail during night shift, understaffing, emergencies, or high-acuity turnover if it has not been designed with nurses' work as it is actually performed.

4.2. Educational readiness: From button training to epistemic competence

Educational readiness is often discussed as AI literacy, but the term requires refinement. Basic literacy includes understanding what AI is, how predictive models use data, what algorithmic bias

means, and why AI outputs are probabilistic rather than authoritative. However, nursing AI literacy must also include epistemic competence: the ability to judge what kind of knowledge an AI output represents, how much confidence it deserves, what it cannot see, and how it should be integrated with clinical assessment.

Evidence supports the educational dimension of readiness. Labrague et al. (2023) found that student nurses' readiness to adopt AI was associated with attitudes, perceived usefulness, social influence, knowledge, and perceived barriers. El Arab et al. (2025) found that prior AI training and stronger computer skills correlated with more favorable attitudes and adoption intentions across nursing students and practicing nurses. Yang et al. (2026) found that prior AI training and awareness of AI in nursing practice were associated with readiness among newly qualified nurses. These findings support curriculum reform, but they also caution against superficial training. A 30-minute orientation on where to click cannot equip nurses to recognize model drift, automation bias, inequitable performance, or liability implications.

Nursing education should therefore move beyond tool-specific instruction to case-based reasoning with AI. Students and practicing nurses should examine scenarios in which AI is helpful, misleading, silent, overactive, or ethically troubling. Simulation can ask learners to compare an AI-generated risk score with patient assessment, family testimony, and contextual information. Such exercises preserve clinical reasoning while teaching trust calibration. De Gagne (2023) argues that AI is becoming part of nursing education's past, present, and future; the deeper implication is that AI must be taught as an object of professional judgment, not merely as a digital convenience.

4.3. Ethical and legal readiness: From compliance to moral accountability

Ethical and legal readiness includes privacy, consent, confidentiality, bias, accountability, liability, and the moral boundaries of delegation. The ANA position

statement on the ethical use of AI in nursing emphasizes that AI should support and enhance, not impede, the core values and ethical obligations of nursing (ANA, 2022). This principle is crucial because technological efficiency can quietly redefine what counts as good care. A model may optimize throughput while weakening relational presence; it may reduce documentation time while introducing surveillance; it may identify risk while making responsibility ambiguous.

Bias is among the most serious ethical challenges. Health AI systems trained on historical data can reproduce inequities embedded in past practice, including unequal access, incomplete documentation, differences in diagnostic intensity, and underrepresentation of marginalized groups. Gianfrancesco et al. (2018) showed how electronic health record data can encode biases that affect machine learning outputs. A qualitative systematic review by Joo et al. (2025) found that nurses identified AI-driven health inequity as a profound ethical concern. For nursing, bias is not only a statistical problem. It is a justice problem because nurses are professionally committed to equitable, individualized, and non-discriminatory care.

Legal uncertainty can also inhibit appropriate use. If an AI alert is ignored and harm occurs, nurses may fear being blamed. If an AI recommendation is followed and harm occurs, nurses may also fear being blamed. This double bind can produce defensive practice, overreliance, or avoidance. WHO (2023, 2024) highlights the need for regulation, safety, transparency, liability frameworks, and stakeholder dialogue in health AI. Clinical organizations should translate these principles into local policies that clarify whether AI outputs are advisory, how overrides are documented, who monitors performance, and how adverse events involving AI are reviewed without unfairly individualizing system failure.

4.4. Professional readiness: From threatened autonomy to disciplined augmentation

Professional readiness concerns the meaning of nursing work in AI-enabled environments. Nurses' concerns about job displacement, deskilling, moral distress, and diminished autonomy should not be dismissed as irrational fear. They are responses to real organizational possibilities. If AI is implemented primarily as a labor-saving device, it may intensify workloads or justify staffing reductions. If it is implemented as a command system, it may weaken professional judgment. If it is implemented without nurse governance, it may turn nurses into data-input workers for systems they did not design and cannot contest.

The better model is disciplined augmentation. AI should take over some forms of computational burden while leaving, and ideally strengthening, the nurse's role as clinical interpreter, moral agent, advocate, educator, and coordinator. The American Academy of Nursing (2026) similarly frames responsible AI as supporting rather than supplanting human wisdom and nursing clinical judgment. El-Bassal et al. (2025) found that AI readiness and professionalism were significant predictors of nurses' self-efficacy, suggesting that readiness is psychologically and professionally mediated. Nurses become more confident not by abandoning professional values but by seeing AI integrated in ways that respect those values.

Trust calibration is the professional skill at the center of augmentation. Under-trust can lead nurses to ignore useful warnings; over-trust can lead to automation bias and deskilling. The prepared nurse is therefore neither technophobic nor submissive. The prepared nurse asks: What is the model seeing? What is it missing? Is this patient represented in the model's training context? Is the recommendation consistent with the assessment? What alternative explanation exists? What does the patient value? This kind of disciplined skepticism is not resistance to innovation. It is nursing professionalism applied to algorithmic care.

4.5. Organizational readiness: From implementation project to learning system

Organizational readiness includes leadership commitment, infrastructure, staffing, protected training time, policy, workflow redesign, procurement standards, audit capacity, and mechanisms for feedback. Ramadan et al. (2024) found that organizational support and comprehensive training were prominent facilitators of AI adoption. This aligns with UTAUT, where facilitating conditions shape technology use (Venkatesh et al., 2003). In nursing, facilitating conditions are not merely technical support. They include staffing conditions that allow nurses to attend training, time to interpret alerts, clear escalation pathways, and governance structures that listen to frontline experience.

Many AI failures are implementation failures rather than algorithm failures. A predictive model may be accurate, but if no workflow exists to act on its output, the model becomes irrelevant. A documentation tool may be efficient, but if it creates inaccurate summaries or increases review burden, it may shift work rather than reduce it. A robotics system may save transport time, but if it disrupts unit routines or lacks maintenance support, it may add friction. Clinical AI should therefore be implemented through iterative learning cycles: pilot, observe, solicit nurse feedback, measure unintended consequences, refine workflow, evaluate equity, and scale only when local value and safety are demonstrated.

Procurement is a neglected organizational issue. Health systems often acquire AI tools through administrative or technical channels, while nurses are consulted late or not at all. This is unsafe. Nurses should help define requirements, evaluate usability, participate in vendor selection, test prototypes, and review performance after deployment. Interdisciplinary collaboration between nursing and engineering is already recognized as an important direction for health care innovation, with nurses serving as requirement analysts, designers, testers, and evaluators (Zhou et al., 2021). In AI procurement, these roles should become standard governance expectations.

4.6. Equity and governance readiness: From local adoption to accountable AI ecosystems

Equity and governance readiness recognizes that AI adoption is shaped by power, resources, regulation, vendor markets, and global inequalities. AI may widen disparities if well-funded institutions gain sophisticated tools while under-resourced settings are left with outdated infrastructure, poor data quality, or unvalidated systems. The global nursing shortage is already unequally distributed (WHO & ICN, 2025). If AI is implemented primarily where data and capital are abundant, it may concentrate advantages rather than democratize care.

Governance must therefore address both model performance and social distribution. WHO (2021) identifies principles of protecting autonomy, promoting human well-being and safety, ensuring transparency, fostering responsibility, ensuring inclusiveness and equity, and promoting responsive and sustainable AI. NIST (2023) organizes trustworthy AI risk management around governance, mapping, measuring, and managing risks. NAM (2025) calls for aligned action so that AI in health and medicine is accurate, safe, reliable, ethical, and oriented toward better health for all. For nursing, these principles become concrete when nurses are included in oversight committees, bias audits include nursing-sensitive outcomes, adverse-event review considers algorithmic contribution, and patients are informed when AI meaningfully shapes care.

Governance is also needed for generative AI. Large multimodal models can produce fluent but inaccurate outputs, fabricate sources, summarize patient records imperfectly, and introduce privacy risks if used carelessly. WHO (2024) warns that large multimodal models in health require governance across design, provision, deployment, liability, and international oversight. In nursing contexts, generative AI should not be used as an invisible substitute for assessment, education, documentation, or discharge communication without verification. Its outputs should be treated as drafts or suggestions subject to

professional review, not as autonomous clinical statements.

Table 1. Evidence-informed domains of nurse AI readiness.

Readiness domain	Core question	Typical failure mode	Minimum safeguards
Technical	Is the AI tool reliable, usable, explainable, locally valid, and integrated into workflow?	Opaque, fragmented, inaccurate, or burdensome systems that nurses bypass or distrust.	Human-centered design, interoperability, local validation, alert calibration, downtime plans, explainable outputs.
Educational	Can nurses critically interpret AI outputs and integrate them with clinical reasoning?	Training limited to button-clicking, leading to avoidance, misuse, or overreliance.	AI literacy, simulation, case-based training, continuing education, AI champions, competency assessment.
Ethical/legal	Are privacy, consent, bias, accountability, and liability addressed before deployment?	Responsibility is shifted to nurses without clear authority, transparency, or legal protection.	Policies for consent, privacy, documentation, overrides, audit, adverse-event review, and liability escalation.
Professional	Does AI preserve nursing judgment, advocacy, relational care, and autonomy?	Deskilling, automation bias, moral distress, or reduction of nurses to passive algorithm followers.	Trust calibration, protected override rights, professionalism-centered training, involvement in governance.
Organizational	Does the institution provide leadership, infrastructure, staffing, workflow redesign, and feedback loops?	AI is added to existing work without time, support, policy, or process change.	Executive sponsorship, protected learning time, nurse informatics support, iterative pilots, workflow redesign.
Equity/governance	Are fairness, inclusion, transparency, sustainability, and patient interests governed across the AI lifecycle?	AI amplifies inequities or is deployed without meaningful accountability.	Nurse co-design, bias monitoring, participatory governance, procurement standards, patient communication, external reporting standards.

Note. Domains synthesized from empirical nursing studies, systematic reviews, socio-technical theory, and health AI governance guidance (El Arab et al., 2025; Holden et al., 2013; Joo et al., 2025; Ramadan et al., 2024; Wei et al., 2025; WHO, 2021, 2023, 2024; Yang et al., 2026).

4. Analytical propositions for AI-enabled nursing practice

A framework becomes useful only if it yields propositions that can be examined, debated, and translated into action. Six propositions follow from the synthesis.

First, nurse AI readiness is a property of configured systems, not merely individual nurses. Individual education matters, but readiness will remain fragile when tools are opaque, workflows are poorly designed, and organizations fail to support implementation. This proposition reframes adoption problems: when nurses do not use AI, the first question should not be “Why are nurses resistant?” but “What is the system asking nurses to trust, do, and risk?”

Second, AI adoption is ethically legitimate only when accountability and authority are aligned. Nurses should not carry responsibility for AI-influenced decisions without authority to question, override, document, escalate, and improve the system. A policy that expects compliance without protected clinical judgment is professionally unsafe.

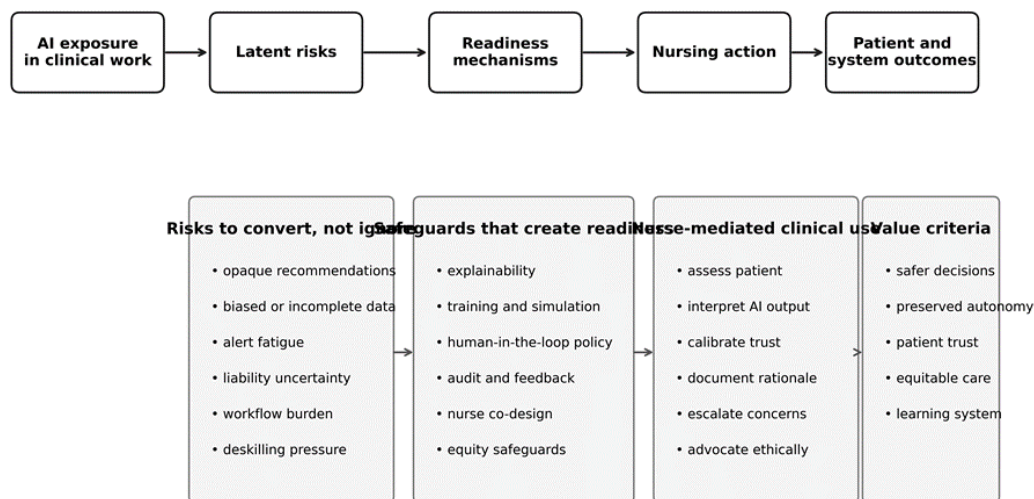
Third, explainability must be operational, not symbolic. It is insufficient for vendors to claim that models are explainable in technical documentation. Nurses need interpretable outputs at the point of care. Useful explanations should identify major drivers of

the recommendation, relevant uncertainty, known limitations, and appropriate action pathways.

Fourth, trust must be calibrated through practice, feedback, and audit. AI implementation should not aim for maximum trust. It should aim for warranted trust. Nurses need experience with cases where AI is accurate, cases where it is wrong, and cases where it is incomplete. Organizations should share performance data and near-miss learning to support this calibration.

Fifth, human-centered care is not the residual work left after automation. It is the evaluative standard by which AI's value should be judged. An AI system that improves documentation metrics while reducing patient understanding, relational care, or equity should not be considered successful.

Sixth, nurses should be treated as co-designers and governors of AI, not merely end-users. Their proximity to patients gives them access to contextual knowledge that developers, executives, and regulators may lack. Excluding nurses from AI design and oversight is therefore not just disrespectful. It weakens safety and validity.



The ethical unit of analysis is not the algorithm alone, but the configured relation among nurse, patient, tool, organization, and policy.

Figure 2. Risk-to-readiness pathway for AI-enabled nursing practice.

Note. Figure developed by the authors to show how AI-related risks are converted into clinical value through safeguards, nurse-mediated action, and outcome evaluation. The pathway is informed by human factors, technology acceptance, nursing ethics, and health AI governance literature (ANA, 2022; Holden et al., 2013; NIST, 2023; WHO, 2021, 2023, 2024).

Table 2. Practical operationalization of the Nurse AI Readiness and Governance Framework.

Stakeholder	Immediate actions	Medium-term actions	Indicators of progress
Nurse educators	Introduce AI literacy, bias, privacy, and trust calibration into undergraduate and graduate curricula.	Develop simulation cases requiring nurses to compare AI outputs with patient assessment and ethical reasoning.	AI competency mapping, student confidence measures, simulation performance, curriculum accreditation evidence.
Clinical leaders	Provide protected training time and clarify that AI is advisory unless policy states otherwise.	Build unit-based AI champions and feedback forums for alert quality, workflow fit, and unintended consequences.	Training completion, AI-related incident reporting, alert response quality, nurse-reported usability.
Health-system executives	Require nurse representation in procurement, implementation, and AI oversight committees.	Implement governance for validation, monitoring, equity audit, cybersecurity, and decommissioning.	Procurement checklists, model performance dashboards, equity audits, documented workflow redesign.
AI developers and vendors	Design with nurses from early discovery through testing, not after product completion.	Provide interpretable outputs, usability evidence, local customization, and post-deployment performance reports.	Usability test results with nurses, explanation quality, false alert rates, update transparency.
Regulators and professional bodies	Clarify ethical expectations for AI use in nursing practice and education.	Develop standards for accountability, documentation, informed consent, and human oversight.	Position statements, regulatory guidance, accreditation criteria, safe-harbor policies.
Researchers	Move beyond intention surveys toward intervention, implementation, equity, and outcome studies.	Test the proposed framework across settings, specialties, and resource levels.	Longitudinal studies, mixed-methods evaluations, nurse-sensitive patient outcomes, validated readiness measures.

Note. The actions listed are intended for adaptation to local clinical governance, nursing education, and health-system AI oversight processes.

5. Discussion

The central finding of this synthesis is that nurses' preparedness for AI is not a narrow educational deficiency. It is a distributed professional capability shaped by technology, work systems, moral norms, legal arrangements, institutional investments, and governance. This interpretation explains why AI adoption can stall even when nurses are interested, and why training alone cannot resolve distrust. Nurses may rightly hesitate when they are asked to rely on systems that they cannot interrogate, that add work, that may reproduce inequities, or that expose them to liability without clear protection.

This framework also sharpens the debate about whether AI threatens or strengthens nursing. The answer depends on configuration. AI threatens nursing when it is used to deskill clinicians, intensify surveillance, cut staffing, replace judgment with compliance, or treat patients as risk scores. AI can strengthen nursing when it reduces unnecessary documentation, improves early warning, supports

prioritization, assists education, expands access to information, and gives nurses more time and evidence for relational care. The same class of technology can therefore be emancipatory or exploitative depending on governance.

The evidence points toward cautious optimism. Recent studies do not show nurses uniformly rejecting AI. They show nurses asking for training, support, usability, ethical clarity, and involvement (El Arab et al., 2025; Ramadan et al., 2024; Yang et al., 2026). Joo et al. (2025) similarly found that frontline nurses recognize both the challenges of AI adoption and their intrinsic capacity to provide human-centered care. The task for nursing leadership is therefore not to persuade nurses to accept AI uncritically. It is to build conditions under which acceptance is warranted.

The framework has implications for how readiness should be measured. Many current studies use readiness or acceptance scales that focus on attitudes, knowledge, perceived usefulness, and perceived ease

of use. These measures are valuable but incomplete. A nurse could score high on AI readiness while working in an organization with poor governance. Conversely, a nurse could express low readiness because the available tool is genuinely unsafe or badly implemented. Future measures should therefore distinguish individual readiness from organizational readiness, technological readiness, ethical/legal readiness, and governance readiness.

The framework also aligns nursing with broader health AI standards. Reporting guidelines such as CONSORT-AI, SPIRIT-AI, DECIDE-AI, and TRIPOD+AI emphasize transparency in AI evaluation, protocols, early clinical studies, and prediction models (Collins et al., 2024; Liu et al., 2020; Rivera et al., 2020; Vasey et al., 2022). However, these guidelines will not automatically protect nursing practice unless nursing-sensitive outcomes, workflow effects, alert burden, relational care, equity, and professional accountability are included in implementation and evaluation. Nursing should therefore not wait passively for AI standards to trickle down. It should actively shape what counts as evidence of AI value.

Table 3. AI reporting and governance resources relevant to nursing-led implementation and evaluation.

Resource	Primary focus	Relevance to nursing AI readiness
WHO ethics and governance guidance	Ethical principles, human rights, equity, transparency, responsibility, sustainability.	Provides moral and policy criteria for judging whether AI supports patient-centered and equitable nursing care.
WHO regulatory considerations for AI for health	Safety, effectiveness, transparency, quality, data governance, stakeholder dialogue.	Supports institutional policies on validation, monitoring, consent, liability, and post-deployment oversight.
NIST AI Risk Management Framework	Govern, map, measure, and manage AI risks across the lifecycle.	Offers a practical language for procurement, risk assessment, audit, and continuous improvement.
CONSORT-AI and SPIRIT-AI	Reporting of AI clinical trials and trial protocols.	Useful when AI tools are prospectively evaluated in clinical settings affecting

		nursing workflows or outcomes.
DECIDE-AI	Early-stage live clinical evaluation of AI decision-support systems.	Highly relevant to pilot testing nursing-facing AI tools before larger-scale deployment.
TRIPOD+AI	Reporting prediction models using regression or machine learning.	Relevant to AI risk scores, early warning tools, deterioration prediction, falls, pressure injury, and readmission models.
ANA and AAN AI position statements	Ethical use of AI in nursing and health care.	Affirms that AI should support, not replace, nursing judgment, compassion, accountability, and human wisdom.

Note. These resources do not replace nursing-specific governance but can strengthen transparency, evaluation quality, and accountability for AI-enabled practice.

6. Implications for nursing education

Nursing curricula should treat AI as part of clinical reasoning, ethics, informatics, leadership, and research rather than confining it to a single technology lecture. Undergraduate students need foundational AI literacy, including probabilistic thinking, data quality, bias, privacy, and human oversight. Graduate students need deeper competence in governance, evaluation, implementation science, and interprofessional collaboration. Nurse educators should resist both hype and fear. Students need to understand what AI can do well, what it does poorly, and what only ethically accountable human professionals can do.

Competency development should be progressive. Early learning can focus on concepts and vocabulary. Intermediate learning can involve simulation with clinical decision support outputs. Advanced learning can include critique of model evaluation studies, bias audits, workflow redesign, and policy analysis. Assessment should not only test whether students can define AI terms. It should test whether they can use AI outputs responsibly in ambiguous clinical scenarios.

7. Implications for clinical practice and leadership

Clinical leaders should begin AI implementation with nursing work analysis. What task is the tool expected to improve? What nursing judgment does the tool inform? What documentation is required? What happens if the recommendation is wrong? How will nurses report concerns? Who reviews performance? If these questions are not answered before deployment, nurses will be forced to create informal workarounds.

Organizations should also develop policies that protect appropriate nurse discretion. AI outputs should be advisory unless clearly validated and incorporated into formal protocols with appropriate safeguards. Nurses should be able to override AI recommendations when clinical assessment supports an alternative decision, provided the rationale is documented. The point is not to create a loophole for ignoring AI. It is to protect accountable judgment in the presence of uncertainty.

8. Implications for developers and vendors

AI developers should treat nurses as expert users from the first stages of problem definition. Too many health technologies are designed around administrative, physician, or engineering assumptions and then handed to nurses late in the process. Nursing work is temporally dense, interruption-prone, relational, embodied, and ethically charged. Interfaces should minimize cognitive burden, explain recommendations in clinically meaningful language, support documentation, and preserve workflow continuity.

Vendors should also provide evidence that matters to nursing. Accuracy metrics alone are insufficient. Evaluation should include alert burden, false positive and false negative consequences, documentation time, usability under realistic workload, equity across patient groups, impact on nurse-patient communication, and adverse-event monitoring. These

data should be available to health systems and nursing governance bodies before and after implementation.

9. Implications for policy and regulation

Policy should clarify accountability in AI-influenced nursing care. Professional bodies and regulators need guidance on documentation, consent, liability, appropriate delegation, and minimum training expectations. Because AI systems change over time through updates, retraining, or changing clinical contexts, regulation should address lifecycle monitoring rather than one-time approval. Hospitals should be required to know which AI systems are active, what data they use, how they were validated, who is responsible for monitoring, and how nurses and patients can raise concerns.

Equity should be treated as a central regulatory and organizational concern. AI tools should be evaluated for performance across relevant demographic and clinical subgroups. Low-resource settings should not become testing grounds for unvalidated systems nor be excluded from beneficial technologies because of infrastructure inequality. Nursing organizations can play an important advocacy role by insisting that AI policy protect both patient safety and the nursing workforce.

10. Recommendations for Future Research

The next phase of research should move beyond descriptive attitude surveys. Such surveys remain useful, but the field now needs longitudinal, mixed-methods, implementation, and intervention studies. Future research should test whether AI education improves not only self-reported confidence but also performance in simulated and real clinical decisions. Studies should examine whether nurse co-design improves usability, reduces alert fatigue, and increases adoption. Evaluation should include nurse-sensitive outcomes such as missed nursing care, documentation burden, communication quality,

moral distress, professional autonomy, and retention, alongside patient safety outcomes.

Research is also needed in low- and middle-income countries and under-resourced clinical environments. Much AI evidence is generated in settings with mature electronic health records and substantial technical infrastructure. Nursing practice globally is more diverse. The promise and risks of AI differ across rural hospitals, community care, public health nursing, long-term care, home care, conflict-affected settings, and regions with severe workforce shortages. A global nursing AI agenda must therefore examine not only whether AI works, but where, for whom, at whose cost, under whose authority, and with what consequences.

11. Limitations

This article is a critical integrative conceptual review, not a formal systematic review or scoping review. It does not provide exhaustive database searching, duplicate screening, formal quality appraisal, or a PRISMA flow diagram. The framework should therefore be understood as a theoretically grounded synthesis requiring empirical testing, refinement, and contextual adaptation. Because the field is evolving rapidly, new evidence, especially on generative AI and large multimodal models, may alter specific recommendations. Nevertheless, the framework's core claim is likely to remain stable: safe AI-enabled nursing requires alignment among technical systems, education, ethics, professional judgment, organizational support, and governance.

12. Conclusion

Nursing stands at a critical threshold in the clinical use of artificial intelligence. The question is not whether AI will enter nursing practice. It already has. The question is whether nurses will be prepared as passive users of tools designed elsewhere, or as knowledgeable, ethical, and authoritative participants in shaping AI-enabled care. This article has argued that genuine readiness cannot be reduced to digital literacy. It is a socio-technical capability distributed

across technologies, nurses, organizations, policies, and moral relationships.

AI can help nursing when it reduces avoidable burden, strengthens vigilance, supports timely decisions, and creates space for human-centered care. It can harm nursing when it obscures accountability, reproduces inequity, intensifies work, weakens judgment, or treats care as a data-processing problem. The difference depends on governance. The Nurse AI Readiness and Governance Framework offers a structure for making that governance concrete. It calls for technical reliability, educational depth, ethical clarity, professional autonomy, organizational support, and equity-centered oversight.

The future nurse will not be defined by opposition to technology. Nor should the future nurse be defined by submission to it. The future nurse must be able to work with intelligent systems while remaining more than their operator. Nursing's enduring contribution is not only to act quickly on data, but to interpret suffering, protect dignity, notice the particular, advocate for the vulnerable, and make responsible judgments under uncertainty. AI should be welcomed only insofar as it strengthens that vocation.

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