Review

TOWARD THE RESPONSIBLE INTEGRATION OF ARTIFICIAL INTELLIGENCE INTO NURSING PRACTICE: A STRUCTURED NARRATIVE REVIEW OF CLINICAL DECISION-MAKING, SAFETY, AND IMPLEMENTATION GOVERNANCE

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ABSTRACT

Background: Artificial intelligence can support risk prediction, early recognition of deterioration, documentation, and clinical care decisions. However, its introduction into nursing practice raises issues concerning safety, data quality, autonomy, accountability, and governance. Aim was to critically examine the implications of artificial intelligence for nursing practice, with particular reference to clinical decision-making and judgement, patient safety, implementation governance, and leadership.

Methods: A structured narrative review was conducted through a systematic search of peer-reviewed publications in English or Italian indexed in PubMed/MEDLINE and CINAHL Ultimate and published from 1 January 2010 to 1 October 2026. Study selection and full-text assessment were performed independently by two reviewers. Primary studies, reviews, and conceptual, ethical, or governance contributions developed using an explicit method were included. Data were appraised using design-specific tools and integrated through narrative synthesis.

Results: Of 121 records identified, 102 remained after deduplication and 44 publications were included: 12 primary studies, 27 reviews, and five conceptual, ethical, or governance contributions. Artificial intelligence was used to synthesise information, identify patterns, predict risks, generate alerts, and support documentation. Potential benefits depended on data quality, validation, workflow integration, and the capacity to respond to outputs. Concerns included automation bias, false alerts, decontextualised outputs, opacity, deskilling, ambiguous accountability, and disparities. Evidence was stronger for professional perceptions and implementation conditions than for reductions in adverse events or improvements in clinical outcomes. Human oversight emerged as a cross-cutting dimension.

Conclusions: Artificial intelligence can expand nurses' informational and predictive capabilities, but it does not replace professional judgement. Responsible integration requires human oversight, nursing leadership throughout the technology lifecycle, monitoring of unintended effects, and assessment of safety, equity, and care outcomes.

Keywords: *Artificial intelligence, nursing, clinical decision-making, patient safety, leadership, clinical governance.*

INTRODUCTION

Artificial intelligence (AI) is assuming an increasingly important role in health systems through applications

capable of processing clinical data, recognising patterns, generating predictions, and supporting decision-making and organisational processes. These applications include machine learning, deep learning, natural language processing, predictive models, clinical decision support systems, and, more recently, large language models and generative AI tools. Their routine use nevertheless remains contingent on data quality and interoperability, professional competencies, the regulatory framework, and organisations' ability to govern the entire technology lifecycle (1,2).

The WHO recognises the potential of AI for diagnosis, treatment, research, and public health, but makes its use conditional on respect for autonomy, safety, transparency, accountability, inclusiveness, and equity (1). The OECD also emphasises the need for information infrastructures, interoperability, professional competencies, clear rules, and continuous monitoring (2). In the European context, Regulation (EU) 2024/1689 adopts a risk-proportionate approach and gives particular importance to human oversight of high-risk systems, including the ability to recognise their limitations and to critically interpret, disregard, or modify their outputs (3).

The nursing profession is directly involved in this transformation. Nurses generate and interpret clinical care data, monitor changes in people's conditions, and make decisions in complex and uncertain situations. According to the International Council of Nurses, digital technologies can contribute to accessible, efficient, and safe care when they are integrated into ethical, equitable, sustainable, person-centred systems supported by appropriate competencies and nursing participation in the transformation of care processes (4).

Such participation cannot be limited to the role of end users. The Nursing and Artificial Intelligence Leadership Collaborative identifies understanding the relationship between nursing data and AI, involving nurses throughout the technology lifecycle, and developing applications aligned with the needs of people and services as professional priorities (5). Insufficient involvement may foster the introduction of systems that are poorly aligned with care workflows and unable to adequately represent the complexity of nursing practice (5).

Available reviews describe AI applications in risk identification, health-status assessment, patient classification, care planning, and health documentation. A systematic review of 11 studies highlighted its potential for care assessment and delivery, while also emphasising the need to ensure algorithm validity, transparency, bias control, and clear attribution of clinical accountability (6).

The effects of AI depend not only on model performance but also on data quality, integration into information systems, tool usability, and output comprehensibility. Overestimating algorithmic reliability can improperly influence decisions and promote automation bias (7). Human oversight therefore requires the ability to verify and contextualise outputs, compare them with clinical assessment, and reject or modify them when necessary. AI can support information processing, but it is not equivalent to clinical judgement, which integrates data, longitudinal observations, knowledge of the person, and characteristics of the care context (5,1).

Since existing reviews have mainly addressed individual applications, specific technologies, or circumscribed aspects of clinical decision-making, an integrated interpretation of the relationships among professional judgement, safety, and organisational conditions for responsible implementation is still needed (6). This structured narrative review therefore examines the implications of AI for nursing practice through three interconnected domains: clinical decision-making and judgement; patient safety; and leadership, implementation, and governance. Data quality, nursing documentation, and ethical, legal, and equity issues are treated as cross-cutting dimensions. The aim is to describe the available evidence, identify convergences, concerns, and gaps, and clarify the conditions under which AI can support nursing judgement without compromising autonomy, professional accountability, equity, and the centrality of the caring relationship.

METHODS

REVIEW DESIGN

A structured narrative review based on a systematic literature search and thematic narrative synthesis was conducted. The analysis was initially organised according to three domains defined a priori: clinical decision-making and judgement; patient safety; and implementation governance and leadership. Within each domain, convergences, divergences, conditions of applicability, risks, and gaps were identified. During cross-domain comparison of the findings, human oversight emerged as a recurring dimension connecting the three domains and was therefore considered in the interpretive synthesis and Discussion, without being treated as a fourth predefined domain.

Given the heterogeneity of the field, three categories of publications were included: primary empirical studies; literature reviews; and conceptual, ethical, or governance contributions developed using an explicit method. The three categories were kept separate during extraction, critical appraisal, and the first stage of synthesis to avoid treating empirical evidence, secondary syntheses, and conceptual proposals as equivalent.

The methodological quality and reporting transparency of the manuscript were checked against the applicable items of the Scale for the Assessment of Narrative Review Articles (8); reporting of the literature search and selection process took account of PRISMA-S (9) and PRISMA 2020 (10), respectively.

A structured narrative review design was selected because of the heterogeneity of eligible sources and the interpretive

purpose of the synthesis, which sought to integrate empirical studies, reviews, and conceptual contributions without producing a pooled estimate of effectiveness. Systematic procedures for searching, selection, and appraisal were used to increase transparency and reproducibility, without framing the work as a systematic review of effects.

INFORMATION SOURCES AND SEARCH STRATEGY

The literature search was conducted on 1 October 2026 in PubMed/MEDLINE and CINAHL Ultimate. Search strategies combined five conceptual components relating to artificial intelligence; nursing; clinical decision-making or nursing clinical judgement; patient safety; and leadership, implementation, or governance. Synonyms within each component were combined using OR, whereas the five components were combined using AND. Publications in English or Italian published from 1 January 2010 to the date of the search were considered.

The coexistence of all five blocks was chosen to identify publications directly relevant to the intersection of AI use, nursing practice, decision-making, safety, and organisational conditions, consistent with the focused nature of the review.

The PubMed/MEDLINE search identified 57 records and the CINAHL Ultimate search identified 64, for a total of 121 records before deduplication. Results were exported in NBIB and RIS formats, respectively, retaining available abstracts and metadata. Original exports were archived separately and left unchanged to ensure traceability of the review process. Full search strategies and corresponding results are reported in the supplementary material.

ELIGIBILITY CRITERIA

Peer-reviewed publications in English or Italian were eligible if they substantially addressed the intersection of AI, nursing, clinical decision-making, patient safety, and at least one dimension among leadership, implementation, and governance. Relevance was considered substantial when it emerged from the aims, methods, findings, or main synthesis, rather than from merely introductory or concluding references.

Eligible technologies were those explicitly described as AI, machine learning, deep learning, natural language processing, predictive models, intelligent decision support systems, or generative AI, in any care, organisational, or managerial setting. Continuing education and professional development were eligible when directed at practising nurses and directly linked to clinical practice, safety, and AI implementation.

Primary quantitative, qualitative, or mixed-methods studies; development, validation, implementation, or evaluation studies; narrative, systematic, scoping, umbrella, and integrative reviews, with or without meta-analysis; and concept analyses with an explicit method were included. Reviews and conceptual analyses were treated as secondary or conceptual evidence, avoiding double counting of primary studies.

Protocols, editorials, commentaries, discussion and position papers, viewpoints, perspectives, and other contributions lacking empirical data, a recognisable synthesis process, or an explicit conceptual-analysis method were excluded. Publications with marginal nursing relevance or in which the required analytical dimensions could not be distinguished were also excluded.

PUBLICATION SELECTION AND CRITICAL APPRAISAL

Search results were imported into Rayyan. Of 38 potential duplicates identified by the platform, 19 were confirmed through manual verification and removed, leaving 102 unique records. Two reviewers independently screened titles and abstracts using predefined criteria, achieving 100% agreement. The 54 reports selected were retrieved and assessed in full text; 44 publications were included and 10 were excluded with a predefined primary reason.

Critical appraisal was performed independently by the two reviewers, and any disagreements were resolved by consensus. JBI checklists (11) were used for relevant primary studies, SANRA (8) for narrative reviews, and specific tools for systematic and scoping reviews. Conceptual contributions were assessed for clarity of purpose, methodological transparency, internal coherence, grounding in sources, and applicability. Appraisal was not used as an exclusion criterion but to weight interpretation of the sources.

DATA EXTRACTION AND NARRATIVE SYNTHESIS

Data were extracted using a structured form piloted on publications representative of the included types. Bibliographic, methodological, and contextual information; AI characteristics and functions; nurses' roles; findings; and implications for clinical decision-making, safety, leadership, implementation, and governance were collected. For reviews and conceptual contributions, method-specific characteristics and analysed content were also recorded.

A thematic narrative synthesis informed by the principles of Popay et al. (12) was conducted. Primary studies, literature syntheses, and conceptual analyses were initially examined separately and subsequently integrated by analysing convergences and divergences across technologies, settings, and publication types. Data, documentation, ethics, law, and equity were treated as cross-cutting dimensions. Overlap between reviews and primary studies was mapped to avoid double counting evidence. Interpretation considered methodological quality, consistency, relevance, and any discordant findings.

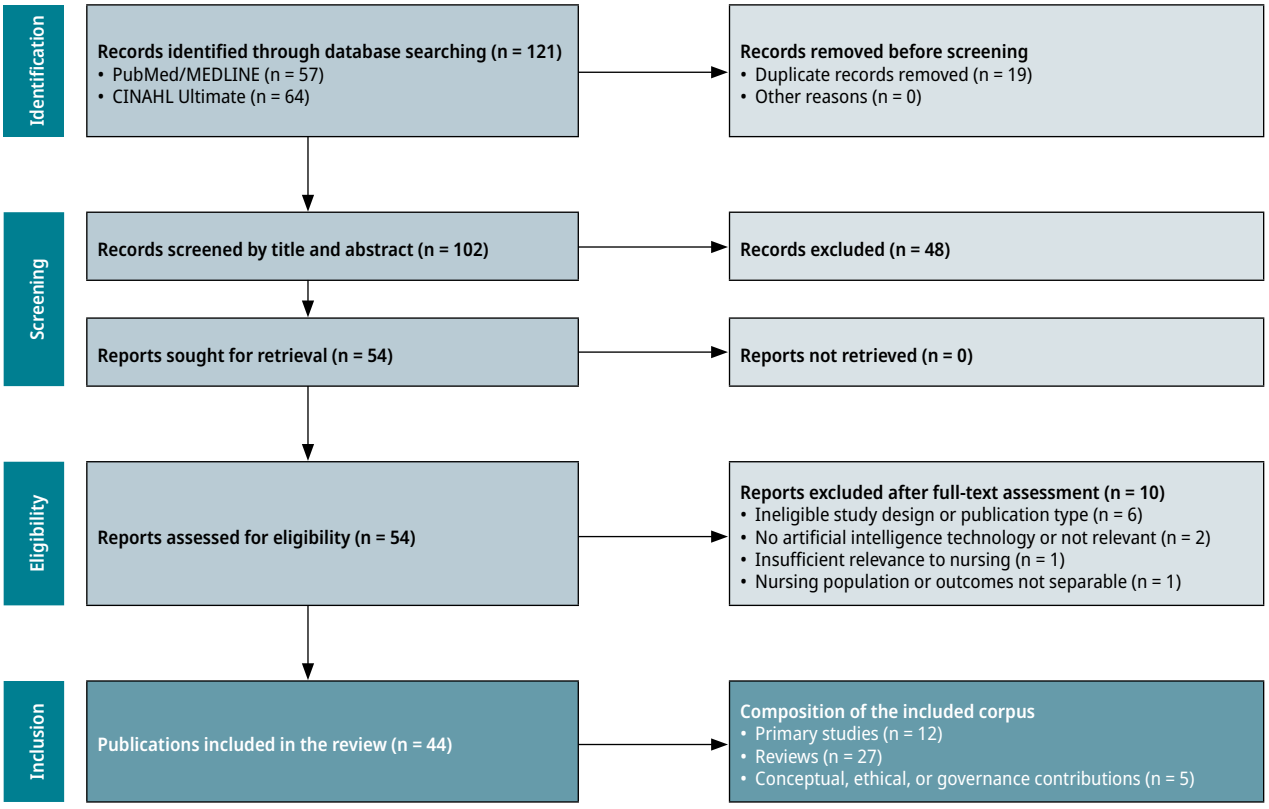

Figure 1. Flow diagram of the publication selection process, adapted from the PRISMA 2020 model.

RESULTS

SEARCH AND SELECTION RESULTS

The literature searches identified 121 records overall. At the end of the selection process, 44 publications met the eligibility criteria and were included in the narrative synthesis: 12 primary studies, 27 reviews, and five conceptual, ethical, or governance contributions. The selection process is shown in Figure 1.

CHARACTERISTICS OF INCLUDED PUBLICATIONS

The 44 included publications comprised 12 primary studies, 27 literature reviews, and five conceptual, ethical, or governance contributions developed using an explicit method. The primary studies included eight qualitative studies, three cross-sectional studies, and one retrospective observational study of real-world use of an early warning system integrated into electronic documentation. The reviews comprised eight scoping reviews, eight systematic or integrative reviews, eight narrative or structured narrative reviews, and three umbrella reviews. The remaining five contributions proposed governance frameworks, AI literacy models, or ethical-normative analyses developed using an explicit method.

The corpus showed marked heterogeneity in technologies and functions. Applications included predictive models, early warning systems, clinical decision support tools, automated monitoring, electronic documentation processing, large language models, and generative systems. Settings included intensive care, oncology, mental health, perioperative care, fall and pressure-injury prevention, medication management, family and community care, and general clinical settings.

Primary studies predominantly focused on professional perceptions, attitudes, trust, acceptability, and readiness. Only a limited part of the corpus examined actual AI use in real clinical workflows. Reviews broadened the field to predictive, organisational, and care applications, whereas conceptual contributions mainly provided models for governance, accountability, equity, AI literacy, and sociotechnical safety. A summary of each publication is provided in Supplementary Table S1.

METHODOLOGICAL QUALITY

Methodological quality was heterogeneous. Qualitative studies provided relevant information on professional experiences and

adoption conditions but were often limited by small samples, single settings, self-reported data, and incomplete reporting of reflexivity or saturation. Cross-sectional studies described attitudes and associations between variables but did not permit causal inference. The observational study based on information-system logs provided data on real-world technology use but did not allow any variation in clinical outcomes to be attributed directly to use of the system.

Among reviews, greater interpretive weight was assigned to syntheses with reproducible search strategies, explicit eligibility criteria, independent selection, and appraisal of included studies. Scoping reviews were particularly informative for mapping technologies and gaps but did not always include formal quality assessment. Narrative reviews contributed clinical, professional, and ethical contextualisation, although their source selection was less reproducible. Conceptual contributions offered useful structures for interpreting governance and accountability but generally lacked empirical validation.

Overall, the corpus more robustly supported conclusions on professional perceptions, implementation conditions, organisational risks, and governance requirements. Evidence was less robust regarding clinical effectiveness, reduction of adverse events, and improvement in care outcomes.

CLINICAL DECISION-MAKING AND JUDGEMENT

AI was predominantly described as supporting, rather than autonomously replacing nursing judgement. The most recurrent functions included information synthesis, pattern identification, risk prediction and stratification, deterioration recognition, prioritisation, and support for situational awareness. Applications mainly concerned the initial stages of clinical reasoning, whereas selection of the care response and subsequent reflection on the decision were less represented (13,14,15,16).

In real-world settings, early warning systems could facilitate information sharing and make changes in risk visible, but available data mainly documented patterns of use and workflow integration without demonstrating improved decisions or clinical outcomes (17). Language models and generative tools were considered useful for retrieving and synthesising information, identifying omissions, and producing preliminary content, but not as autonomous decision makers, particularly in emergencies, medication management, and high-risk scenarios (18,19).

Nurses showed greater willingness to use systems capable of integrating information and signalling risk conditions, whereas acceptability decreased when the algorithm replaced contextual assessment or was insufficiently transparent. The final decision remained the professional's responsibility and required integration of the output with direct observation, experience, clinical intuition, and the characteristics of the person receiving care (20,18,21).

Usefulness and reliance depended on data quality, output comprehensibility, workflow compatibility, local validation, and the ability to challenge the recommendation. In one cross-sectional study, greater reliance on decision support systems was associated with lower decision regret, and the relationship was strengthened by trust; however, the design did not allow causality to be established or more appropriate decisions or better clinical outcomes to be inferred (22).

Concerns included inaccurate or decontextualised outputs, opacity, automation bias, overreliance, and possible loss of skills. Overall, evidence more strongly supported AI's contribution to organising information, predicting risk, and strengthening clinical vigilance than a demonstrated improvement in decision appropriateness. Data on long-term effects on clinical reasoning, maintenance of competencies, and management of disagreement between professional judgement and algorithmic output remained limited (23,24,15,25).

PATIENT SAFETY

Safety-related applications concerned early recognition of deterioration, continuous monitoring, and timely intervention (26,14,15,27,25). Areas included fall prediction (28), pressure-injury prevention (29,19), infection risk and deterioration in critical care (30,31), medication safety (32,33), and early warning systems (17,27,34).

Potential benefits depended on local validation, data quality, appropriate thresholds, workflow integration, and the ability to translate alerts into timely interventions (20,35,36). Post-implementation monitoring, performance and bias audits, escalation procedures, and the ability to override outputs emerged as conditions for safe use (23,37,36). Risks included false positives and negatives, alert fatigue, automation bias, disparities, and false reassurance, particularly when absence of an alert was interpreted as absence of risk or the output was not compared with nursing assessment (32,23,34,16).

Publications described the mechanisms through which AI might contribute to safety more clearly than a demonstrated reduction in adverse events. Some intervention studies reported more timely escalation, better protocol adherence, and reduced readmissions in specific settings, but quality, interventions, outcomes, and follow-up were heterogeneous (15). Reviews confirmed the predominance of development or validation studies, with few real-world implementations and limited prospective outcome evaluation (24,28,27,31). Causal evidence on mortality, medication errors, complications, and other nursing-sensitive outcomes therefore remained limited (26,14,38,25).

IMPLEMENTATION GOVERNANCE AND LEADERSHIP

AI adoption depended on workflow compatibility, data

quality and interoperability, organisational support, and rules governing use, documentation, and accountability. Acceptance was higher when technology was useful, understandable, and consistent with practice, and lower in the presence of poor transparency, inadequate institutional readiness, or a perceived threat to professional autonomy (20,22,18,21).

Publications indicated the need to involve nurses in defining needs, selecting and designing tools, local validation, implementation, and monitoring. Such involvement made it possible to assess care relevance, compatibility with cognitive and operational processes, and effects on workload. Differences in use across sites, units, shifts, and professional groups confirmed the need to adapt implementation to context and monitor it over time (13,39,24,29,17).

Nursing leadership was assigned responsibility for participating in technology decisions, defining appropriate uses, protecting autonomy and equity, promoting competencies, and establishing procedures for incident reporting, output review, and escalation. Nursing representation in design and validation and collaboration among clinical professionals, managers, informaticians, and experts in ethics, law, and data security were also recommended (23,40,26,41).

Governance was represented as a process extending across the entire technology lifecycle, including local validation, staged introduction, transparency, data protection, allocation of accountability, override procedures, bias audits, and error monitoring (20,32,23,39,25). Major barriers were inadequate training, insufficient infrastructures, poor interoperability, costs, variable data quality, uncertain legal accountability, top-down implementation, and lack of stable feedback mechanisms. The corpus converged on the principles of responsible governance but offered limited evidence on comparative effectiveness, costs, sustainability, and long-term organisational effects of the proposed models (25,41,16,21).

CROSS-CUTTING INTEGRATION OF FINDINGS

Although organised into three domains, the findings showed strong interdependence among clinical decision-making, safety, and governance. The effects of AI depended not only on technical performance but also on how outputs were interpreted, integrated into workflows, and linked to professional and organisational accountability.

Human oversight emerged as a cross-cutting dimension. Clinically, it included verifying and contextualising outputs; for safety, recognising errors, biases, and conditions not represented in the data; and organisationally, ensuring decision-making authority, traceability, and escalation procedures.

Real-world experiences showed that system availability did not guarantee uniform use. Use, trust, and override of recommendations varied according to context, professional role, workload, and workflow compatibility (17,34). Human oversight, however, was more often recommended in frameworks and syntheses than empirically evaluated in practice.

Nursing documentation also emerged with a dual cross-cutting function: as a data source for predictive and alert systems and as a process potentially supported by AI through synthesis, automation, and identification of omissions. Publications nevertheless emphasised the need to preserve completeness, contextualisation, and professional verification of documentary outputs. In systems used in practice, traceability of algorithmic output, the decision taken, and any override was relevant to making human oversight verifiable and supporting audit and organisational learning (15,17,18,23,34,37).

Convergences, divergences, conditions, risks, gaps, and implications relating to the three domains are summarised in Supplementary Table S2. Since the same publications could contribute to multiple domains and reviews could overlap in their primary studies, recurrence of a theme did not correspond to the number of independent sources of evidence.

DISCUSSION

SUMMARY AND INTERPRETATION OF THE MAIN FINDINGS

This review shows that the value of AI in nursing practice depends not only on algorithm performance but on the conditions under which outputs are interpreted, integrated into workflows, and translated into care actions. Evidence mainly supports AI's contribution to organising information, predicting risk, and strengthening clinical vigilance, while it remains less robust regarding improved decision appropriateness and patient outcomes.

Clinical decision-making, safety, and governance are therefore interdependent. Human oversight is the principal connecting element across the three domains, but it becomes effective only when professionals have the competencies, information, time, authority, and procedures needed to verify, contextualise, and, where necessary, reject an output. The mere formal presence of a professional in the process does not guarantee meaningful control.

FROM ALGORITHMIC PERFORMANCE TO NURSING CLINICAL JUDGEMENT

The prevalence of applications directed at information synthesis, pattern recognition, and risk prediction indicates that AI is currently more mature in supporting the initial phases of clinical reasoning than in selecting, adapting, and evaluating the care response (13,15). This asymmetry matters because algorithmic risk classification is not equivalent to clinical judgement.

A model may estimate the probability of deterioration, a

fall, pressure injury, or medication-related complication, but translating a prediction into a decision requires consideration of the overall clinical picture, competing priorities, the person's preferences, available resources, and the consequences of intervention. Predictive capacity is therefore a potentially useful component of judgement, not its equivalent. Studies conducted in real-world practice likewise mainly describe use patterns and workflow integration without automatically demonstrating improved decisions or clinical outcomes (17).

Nurses' greater willingness to use systems that organise information, reduce repetitive activities, or provide preliminary alerts, together with their caution toward opaque outputs or outputs conflicting with clinical assessment, suggests that trust is not a stable attitude toward technology. Rather, it appears to be a calibration process influenced by use experience, transparency, local validation, and the ability to verify recommendations against the condition of the person receiving care (20,18,21).

The goal of implementation should therefore not be to maximise adherence to algorithmic recommendations, but to foster calibrated trust: enough to use relevant information without reducing critical appraisal or encouraging automation bias. A reasoned override should not automatically be interpreted as resistance to technology. When grounded in contextual assessment, it may represent responsible professional judgement. To generate organisational learning, however, disagreement must be documentable and analysed through procedures capable of distinguishing system limitations from professional error (20,23,39).

PATIENT SAFETY: POTENTIAL, EVIDENCE, AND EMERGING RISKS

The distinction between algorithmic performance and clinical safety is central. Sensitivity, specificity, accuracy, and discriminative ability describe model behaviour but do not independently demonstrate that introducing the model leads to more appropriate decisions or fewer adverse events. Effects also depend on who receives the alert, its timeliness, available information, resources that can be activated, and management of disagreement between algorithmic output and clinical assessment.

A system may therefore perform satisfactorily during development or validation without producing equivalent benefits in practice, especially when its integration into nursing workflows has not been prospectively evaluated (14,28,27,15,31,13). The predominance of development and validation studies over outcome evaluations makes it premature to equate the ability to predict risk with the ability to prevent its consequences.

The identified risks, including false positives and negatives, alert fatigue, bias, false reassurance, and overreliance, further show that technology can both reduce and introduce hazards (32,27,25,23,34). In high-intensity care settings and high-risk decisions, outputs must therefore be compared with the nurse's direct assessment and contextual knowledge (27,34).

Language models and generative AI tools introduce additional concerns. The formal plausibility of inaccurate, incomplete, or decontextualised content can make errors less immediately recognisable. Outputs should therefore be considered preliminary and verified before clinical or documentary use. Permitted uses, data protection, and the intensity of human review should be proportionate to the probability and severity of potential harm (42,18,19).

Ultimately, AI safety emerges as a property of the sociotechnical system in which the technology is introduced, rather than of the algorithm in isolation. Evaluation should include the interface, workflow integration, data quality, user competencies, workload, communication, escalation, and post-implementation monitoring. In addition to predictive performance, adverse events, omissions of care, response times, cognitive workload, frequency and appropriateness of overrides, subgroup differences, and unintended effects on nursing practice should be considered.

IMPLEMENTATION GOVERNANCE AND THE ROLE OF NURSING LEADERSHIP

AI implementation is a process of clinical and organisational transformation, not merely a technical stage following development. Even systems with satisfactory performance may produce limited benefits if they are incompatible with workflows, burdensome to verify, or introduced without adequate infrastructures, competencies, and support.

Recommendations across the corpus can be grouped into five interconnected areas: organisational readiness; nursing participation; leadership and accountability; AI literacy; and surveillance across the technology lifecycle. These areas represent an interpretive synthesis of the review, not an already validated governance model.

Organisational readiness includes interoperability, data quality and accessibility, technical support, available resources, and integration into care processes. Adoption therefore depends not only on the availability of technology but on the organisation's ability to use it without compromising continuity, sustainability, and safety of care (18,25,21).

Nursing participation should begin with defining the care need and continue through technology selection, design, local validation, and evaluation. Nurses can help identify relevant data, assess compatibility with practice, and recognise unintended consequences for work and the caring relationship. Involvement limited to the post-implementation phase reduces the possibility of correcting design assumptions that are incompatible with care processes (39,24,26,29).

Nursing leadership connects clinical practice, technology development, and organisational accountability. It includes representation in technology decisions, definition of

appropriate uses, promotion of competencies, and assessment of effects on quality, equity, workload, and professional autonomy. It is not synonymous with simply promoting adoption, but includes the authority to request changes, restrict use, or propose suspension of systems that do not ensure adequate conditions of safety and appropriateness (23,40,41).

Governance must extend across the entire technology lifecycle through performance monitoring, bias audits, incident analysis, and collection of professional feedback. Convergence on principles is stronger than the available evidence on the comparative effectiveness of organisational models, costs, sustainability, and long-term effects (20,32,17,41).

HUMAN OVERSIGHT AS AN ORGANISATIONAL FUNCTION

Human oversight becomes meaningful when nurses are aware that AI is being used, understand its purpose and limitations, can compare its output with clinical assessment, and have the authority to confirm, modify, or reject it (20,18,34).

The recommendations in the corpus can be synthesised into five operational dimensions:

- visibility, meaning that the contribution of AI is recognisable;
- comprehensibility, referring to the availability of information on purpose, limitations, and uncertainty;
- competence, required to interpret and contextualise the output;
- authority, as the actual ability to confirm, modify, or reject the recommendation;
- traceability, through documentation of the output, the decision made, and any disagreement.

These dimensions represent an interpretive synthesis of the review and not an empirically validated model.

Oversight should be considered an organisational function, not merely an individual responsibility. It requires systems designed to make AI's contribution verifiable, sufficient time to assess outputs, explicit responsibilities, and non-punitive pathways for reporting errors and disagreements. Without these conditions, invoking the human-in-the-loop may place final accountability on the nurse without granting effective control over the algorithmic process (23,43,39).

A reasoned override of an algorithmic recommendation may also contribute to organisational learning by revealing model limitations or clinical conditions not adequately represented. Samy et al. (34), however, show that such disagreements may remain undocumented when recording tools are burdensome or poorly aligned with clinical work, creating a traceability gap.

Documentation is therefore an operational component of oversight, not merely a subsequent record of a decision. Making the AI output, nursing assessment, decision made, and any disagreement traceable permits reconstruction of the process, attribution of accountability, and use of overrides for audit and organisational learning. Conversely, because some predictive systems directly use data and patterns from nursing documentation, incompleteness, semantic variability, and poor interoperability may affect both algorithmic inputs and the interpretation of outputs (15,17,28,34,37).

The level of oversight should be proportionate to risk. Reversible and easily verifiable activities may require fewer intensive controls than deterioration alerts, medication recommendations, or care prioritisation. High-risk applications require local validation, defined accountability, formal procedures for managing disagreements, and continuous monitoring. Human oversight should not compensate for poorly validated systems but should be a verifiable component of risk governance (37,36).

IMPLICATIONS FOR PRACTICE, LEADERSHIP, AND RESEARCH

In clinical practice, AI should be used as situated support for professional judgement. Outputs must be interpreted in light of direct assessment, clinical evolution, and the characteristics of the person receiving care. High-risk processes must ensure professional verification and documentation of any disagreement. Generative tools should be limited to tasks consistent with the available level of validation, and their content should be considered preliminary until verified clinically or documentarily (18,19,42).

For nursing leadership, the priority is to translate governance principles into operational structures. This requires participation in decision-making bodies, criteria for pre-implementation technology assessment, role-specific training, and procedures for monitoring safety, equity, workload, and documentation quality. Decisions to update, restrict, or retire a system should also be based on evidence collected during its use, not only on performance claimed before implementation (40,37,41,36).

Research should reduce the gap between algorithm development and care practice through prospective, multicentre, pragmatic studies conducted in real workflows. Future evaluations should consider decision appropriateness, nursing-sensitive outcomes, cognitive workload, maintenance of competencies, subgroup differences, effects on the caring relationship, and consequences of disagreement between professional judgement and algorithmic output (13,17,15).

Comparability across studies could also be improved through a shared outcome set defined by formal consensus procedures. Such a set could include model performance, adverse events, omissions of care, decision appropriateness and timeliness, workload, usability, calibrated reliance, equity, and organisational sustainability.

STRENGTHS AND LIMITATIONS OF THE REVIEW

Strengths of the review include the structured literature search, independent selection by two reviewers, and separate analysis of primary studies, reviews, and conceptual contributions. This approach enabled integration of empirical evidence and organisational perspectives while weighting them according to design and methodological quality.

The review nevertheless has limitations. Restriction of the search to two databases and publications in English and Italian may have missed studies indexed only in computing or engineering sources. Heterogeneity of designs, technologies, and outcomes precluded quantitative synthesis. The large number of reviews also creates possible overlap among primary studies, while the predominance of perceptual, cross-sectional, or pre-implementation studies limits conclusions on clinical effectiveness. Finally, exclusion of studies conducted exclusively with students means that the findings cannot be extended to pre-registration nursing education.

CONCLUSIONS

Artificial intelligence can expand nurses' ability to organise information, recognise risk conditions, and support timely responses, but the evidence does not yet consistently demonstrate improved decisions, safety, or clinical outcomes. Responsible integration requires contextual validation, effective human oversight, and nursing leadership involvement throughout the technology lifecycle.

Prospective studies conducted in real care settings are needed to evaluate effects on decisions, nursing-sensitive outcomes, equity, competencies, and work organisation.

AUTHOR CONTRIBUTIONS

All authors contributed to the conception and design of the review. PG developed the search strategy. PG and AS independently conducted publication selection, data extraction, and critical appraisal of the sources. PG prepared the first draft of the manuscript. All authors contributed to interpretation of the findings, critical revision of the text, and approval of the final version.

CONFLICTS OF INTEREST

The authors declare that they have no financial, professional, or personal conflicts of interest relevant to the content of this manuscript.

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DATA AVAILABILITY

The data used in this review derive from publications available through their respective bibliographic sources. The search strategies, extraction grid, characteristics of included publications, and cross-cutting synthesis of the analytical domains are reported in the supplementary materials. Additional materials relating to the selection process, extraction, and critical appraisal of the sources are available from the corresponding author upon reasonable request.

USE OF ARTIFICIAL INTELLIGENCE TOOLS IN MANUSCRIPT PREPARATION

During preparation of the manuscript, generative artificial intelligence tools were used exclusively to support language editing, text organisation, and improvements in clarity. Decisions concerning methodology, publication eligibility, data extraction and interpretation, critical appraisal of sources, and conclusions were made by the authors. All content generated or reworked using these tools was critically verified by the authors, who retain full responsibility for the manuscript.

SUPPLEMENTARY MATERIAL

Supplementary Table S1. Summary characteristics of the included publications

Supplementary Table S2. Cross-cutting synthesis of the analytical domains

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Supplementary Table S1. Summary characteristics of the included publications

Author, year; Country	Design; sample or no. of studies	AI technology/function	Domain(s)	Main finding	Methodological quality / interpretive weight
[S1] Alves et al., 2026; Portugal	Scoping review; n=11 studies	Predictive models, decision-support systems, and other AI technologies relevant to clinical judgement	Implementation governance and leadership; secondary: Human oversight; Patient safety; Clinical decision-making and judgement	Current research prioritises computational pattern recognition while neglecting the reflective phases essential to the development of expertise.	Moderate-to-good quality. High weight for theoretical mapping of clinical judgement and identification of gaps; moderate for safety and implementation implications.
[S2] Martinez-Ortigosa et al., 2023; Spain	Systematic review; n=21	Machine learning, natural language processing, neural networks/predictive algorithms, alert and support systems, chatbots/conversational agents, physical robots, and virtual simulation	Patient safety; secondary: Implementation governance and leadership; Clinical decision-making and judgement	Applications concerned early diagnosis/ clinical decisions, monitoring and workflow optimisation, and nursing education. AI is promising as support for clinicians, managers, and supervisors, but does not replace clinical assessment and requires careful implementation.	Moderate quality. Generally adequate systematic structure and reporting, but heterogeneity, limited synthesis of appraisal findings, and no certainty assessment reduce confidence in the conclusions.
[S3] Mikkonen et al., 2025; Finland/ Singapore	Systematic review of intervention studies with narrative synthesis; n=8	D2S2 discharge tool, deterioration algorithm, NeoCue neonatal resuscitation tool, seizure algorithm, APREDEL-ICU delirium tool, ML-CDSS for pressure injuries, ML/ontology documentation interface, and clinical decision support	Clinical decision-making and judgement; secondary: Patient safety; Implementation governance and leadership; Human oversight	Three categories emerged: specialised and general support tools, predictive technologies, and usability/workflow efficiency. Benefits were promising but not robust.	Moderate quality; low or very low certainty of evidence. High weight for identifying intervention studies and implementation characteristics; low-to-moderate for effectiveness estimates and generalisability.
[S4] Shah et al., 2025; India	Narrative review	Healthcare AI, LLMs, robotics, predictive systems, EHRs, virtual nursing assistants, telenursing, chatbots, and simulation; technologies were not systematically classified	Patient safety; secondary: Implementation governance and leadership; Human oversight; Clinical decision-making and judgement	AI offers potential benefits but requires robust governance to mitigate discrimination, opacity, privacy erosion, and other harms. Nurses need AI literacy and the ability to recognise bias.	Low quality as a review; mainly contextual and conceptual utility. Low-to-moderate interpretive weight. Suitable for mapping ethical themes and nursing implications, not for estimating effects, frequencies, or certainty of evidence.
[S5] Lee et al., 2025; United States	Multisite retrospective observational analysis of EHR logs linked to a pragmatic cluster randomised controlled trial; n=393 unique users and 2,572 detailed-view openings	CONCERN Early Warning System, which analyses patterns in nursing documentation to predict clinical deterioration and support situational awareness	Patient safety; secondary: Implementation governance and leadership; Clinical decision-making and judgement; Human oversight	CONCERN use varied by professional role, site, shift, unit, and patient characteristics. Views were opened mainly by nurses, during day shifts, and in acute-care units. Findings support workflow integration and context-sensitive implementation.	Moderate quality; moderate risk of bias and no causal inference. High weight for real-world use, workflow, and implementation governance; moderate for decisions and oversight; low for causal effectiveness and safety outcomes.

Author, year; Country	Design; sample or no. of studies	AI technology/function	Domain(s)	Main finding	Methodological quality / interpretive weight
[S6] Li et al., 2026; China	Qualitative study; n=17	Large language models: Doubao, DeepSeek, ChatGPT, Gemini, Qwen, and ERNIE Bot; support for documentation, routine tasks, knowledge access and synthesis, education, research, and management	Implementation governance and leadership; secondary: Clinical decision-making and judgement; Patient safety; Human oversight	Intention to use LLMs was positive but conditional. Perceived usefulness, ease of use, and organisational support favoured acceptance, whereas risks, accountability, and professional boundaries required caution. LLMs were considered most appropriate for standardised, low-risk tasks and could not replace clinical judgement, accountability, or human communication.	Overall good quality, with limited transferability and possible selection bias. Moderate-to-high weight for perceptions and adoption conditions; not suitable for inferring clinical effectiveness or LLM safety.
[S7] Soddu et al., 2025; Italy; international panel	Descriptive cross-sectional study; n=60 responses assessed by five experts	ChatGPT-4o generative LLM; specialist information and possible decision/educational support for neonatal pressure-injury prevention, assessment, and management	Clinical decision-making and judgement; secondary: Patient safety; Human oversight	More than 90% of responses received relatively high ratings for accuracy, completeness, and safety, although performance varied by topic and was weaker for medical-device management and technological innovation. Expert verification and human oversight remain necessary before clinical use.	Moderate quality: transparent procedure and useful evaluative findings, but risk of measurement bias and limited generalisability. Moderate weight for informational performance and perceived safety.
[S8] Abu Assab et al., 2026; Jordan	Interpretive descriptive qualitative study using reflexive thematic analysis; n=22	AI/CDSS for screening, risk flagging, imaging, alerts, prescribing, dosing, interactions, monitoring, and information organisation	Implementation governance and leadership; secondary: Clinical decision-making and judgement; Patient safety; Human oversight	Attitudes were cautious but constructive. Trust depended on accuracy, transparency, local validation, institutional support, and clearly defined accountability. AI was accepted as support, not a substitute for professional judgement; safe and sustainable implementation required human oversight, training, data governance, and organisational readiness.	Good quality; low-to-moderate risk of bias for the qualitative question, but limited transferability and nursing relevance confined to a subgroup. Moderate-to-high weight for governance, trust, accountability, oversight, and readiness.
[S9] Yildirim et al., 2026; Türkiye	Qualitative study; n=22	AI defined as machine learning, deep learning, LLMs, and AI-enabled CDSS; ChatGPT, dose-calculation tools, and perceived smart alarms, monitors, and ventilators were also mentioned	Implementation governance and leadership; secondary: Clinical decision-making and judgement; Patient safety; Human oversight	AI knowledge was limited and fragmented, with mainly indirect exposure. Nurses recognised potential benefits for clinical decisions and care, but identified risks to autonomy, data security, device reliability, and accountability. Professional judgement and human presence were considered irreplaceable; structured training and institutional support were essential.	Overall good quality for exploring perceptions, with important limitations regarding actual AI exposure and transferability. Moderate-to-high weight for perceptions, barriers, education, governance, and oversight.
[S10] Awad et al., 2025; Egypt	Correlational cross-sectional study; n=250	AI-based clinical decision-support systems used in intensive care; specific product or algorithm not reported	Patient safety; secondary: Implementation governance and leadership; Clinical decision-making and judgement; Human oversight	Greater reliance on AI-CDSS was associated with lower decision regret and greater trust in AI. Trust was also associated with lower regret and strengthened the relationship between reliance and reduced decision regret.	Moderate quality. Good analytical coherence, but risks of selection bias, information bias, and residual confounding; limited generalisability. Moderate weight for associations among reliance, trust, and regret.

Author, year; Country	Design; sample or no. of studies	AI technology/function	Domain(s)	Main finding	Methodological quality / interpretive weight
[S11] Amin et al., 2026; Saudi Arabia/ United States/ Jordan/Egypt	Systematic review; n=6	AI-CDSS, predictive/early-warning monitoring, pervasive sensing with wearables, cameras and environmental sensors, deep learning, pump-data algorithms, and AI tools for monitoring, workflow, and decisions	Patient safety; secondary: Implementation governance and leadership; Clinical decision-making and judgement; Human oversight	Four themes were identified: autonomy, privacy, accountability, and equity. Responsible integration requires transparency, governance, training, and assessment of disparities; the empirical base was small and heterogeneous.	Good methodological quality, with a small, heterogeneous, mainly perceptual evidence base. High weight for mapping autonomy, privacy, accountability, and equity; moderate-to-low for clinical effects, harms, and patient outcomes.
[S12] Cant, Ryan, and Chugh, 2026; Australia	Umbrella review; n=16 reviews	Machine learning, predictive analytics, clinical decision support, monitoring, and assisted documentation	Clinical decision-making and judgement; secondary: Implementation governance and leadership; Patient safety; Human oversight	AI technologies are promising for nursing decision-making, but the evidence remains heterogeneous and has limited validation in routine clinical use.	Moderate-to-good quality; overall moderate risk of bias. High weight for mapping applications and decision domains; moderate for safety and implementation; low-to-moderate for causal clinical effectiveness.
[S13] Rony et al., 2025; Bangladesh/ Saudi Arabia/ Norway	Umbrella review; n=13	Machine learning, deep learning, NLP, robotic process automation, predictive analytics, AI-CDSS, EHR alerts, wearables, telehealth, wound imaging, and monitoring systems	Patient safety; secondary: Clinical decision-making and judgement; Implementation governance and leadership; Human oversight	AI offers opportunities for decision-making, monitoring, and workflow, but adoption requires training, data governance, responsible policies, infrastructure, and balance with human-centred care.	Moderate quality: sound overall structure, but important gaps in reporting appraisal, overlap, and certainty of evidence. Moderate-to-high weight for mapping applications and recurring concerns.
[S14] Hassanein et al., 2025; Saudi Arabia/ Egypt (author affiliations)	Integrative review; n=18	Machine learning and predictive algorithms, AI-assisted imaging, wearables and continuous monitoring, telemedicine, follow-up systems, mobile apps, workload classifiers, and home-care/nutritional models	Clinical decision-making and judgement; secondary: Implementation governance and leadership; Human oversight; Patient safety	AI may improve clinical outcomes, efficiency, and staff well-being, but sustainable and equitable implementation requires robust governance, AI literacy, interdisciplinary collaboration, and longitudinal studies in diverse settings.	Moderate quality. The review is structured and informative, but heterogeneity, risk of bias in the sources, and methodological inconsistencies limit certainty.
[S15] Park et al., 2025; South Korea	Scoping review; n=35	Machine learning, deep learning, CNNs, NLP, explainable AI, expert systems, LLMs, predictive analytics, and optimisation algorithms	Patient safety; secondary: Clinical decision-making and judgement; Human oversight; Implementation governance and leadership	Predictive analytics was the predominant domain. Documentation and resource allocation may reduce workload, but clinical implementation and causal impact remain poorly established.	Moderate quality. High weight for mapping applications and gaps; low-to-moderate for effectiveness, real-world safety, workflow, and nursing outcomes.
[S16] O'Connor et al., 2022; United Kingdom and Hong Kong	Scoping review; n=14 empirical studies	Supervised machine learning, including decision trees, support vector machines, artificial neural networks, Bayesian networks and other predictive models; NLP applied to nursing documentation	Clinical decision-making and judgement; secondary: Human oversight; Patient safety; Implementation governance and leadership	AI, particularly machine learning, shows potential for predicting fall risk, but the evidence is limited and mainly concerns development and validation. Experimental and implementation studies are needed to demonstrate clinical utility and care impact.	Moderate quality. Risks of publication and disciplinary bias and uncertainty about included-study quality; clinical effectiveness not demonstrated. Moderate weight for mapping technologies, nursing roles, gaps, and implementation conditions.

Author, year; Country	Design; sample or no. of studies	AI technology/function	Domain(s)	Main finding	Methodological quality / interpretive weight
[S17] Kirkland-Kyhn et al., 2025; United States and Türkiye	Descriptive qualitative study; n=202 nurses	Future patient-centred AI systems for pressure-injury risk prediction, automated monitoring, and early warning; no specific algorithm was implemented or tested	Clinical decision-making and judgement; secondary: Patient safety; Implementation governance and leadership; Human oversight	Nurses identified limitations in traditional risk-assessment tools and were receptive to AI for advanced stratification, real-time monitoring, automated documentation, early warning, and personalised interventions. Adoption nevertheless required reliable data, safety protection, training, and management of ethical concerns.	Moderate quality. Sufficient credibility for perceptions, needs, and adoption conditions; transferability and confirmability limited by reporting and lack of experience with an actual system.
[S18] Nasiri et al., 2026; Saudi Arabia	Systematic scoping review with narrative synthesis; number of studies not reported in the text	Deep learning for haematological images, predictive ML, EHR early-warning tools, therapeutic CDSS, NLP for documentation, chatbots/apps, and scheduling/ triage tools	Patient safety; secondary: Implementation governance and leadership; Human oversight; Clinical decision-making and judgement	Four domains emerged: diagnostics; monitoring and prediction; therapeutic/ workflow support; and engagement/ education. Nurses were described as translators, gatekeepers, first responders, and co-designers.	Moderate-to-low quality. Moderate weight for nursing roles, governance, and human oversight; low for clinical effectiveness, aggregated accuracy, and patient outcomes.
[S19] Zhou et al., 2026; China	Scoping review; n=24 studies: 17 from the primary search and seven from supplementary searching	Random Forest, XGBoost, SHAP, nomograms, automated clustering and ML representations of intracranial-pressure waveforms, and early-warning systems using static factors and dynamic monitoring	Clinical decision-making and judgement; secondary: Patient safety; Implementation governance and leadership; Human oversight	Integration of precision nursing management and AI may support a shift from reactive response to proactive prevention, but clinical conclusions require caution: none of the included AI models had been prospectively implemented at the bedside or evaluated in routine care.	Moderate-to-low quality. High uncertainty regarding the weight of individual sources, possible publication/selection bias, and risk of overinterpreting retrospective performance as clinical utility.
[S20] Alruwaili, Paul-Chima, and Nneoma, 2026; Saudi Arabia and Uganda	Structured narrative review with conceptual framework; n=75 studies	CPOE, EHR-CDSS, adaptive systems, machine learning, NLP, alerts, predictive models, and adverse-drug-event surveillance	Clinical decision-making and judgement; secondary: Human oversight; Implementation governance and leadership; Patient safety	Medication safety requires an integrated sociotechnical approach. The CSIL framework links data, AI analysis, interface/cognition, action/outcome, and feedback relating to learning, governance, and equity.	Moderate-to-good quality; moderate risk of bias, particularly thematic selection and interpretation. High weight for mapping safety, human factors, and governance; moderate-to-high for nursing implications; moderate for effectiveness.
[S21] Alqaraleh et al., 2025; Jordan, Saudi Arabia, and China	Mixed-methods systematic review with major methodological concerns; n=12 sources	CDSS, CPOE, BCMA, smart infusion pumps, automated dispensing, predictive analytics, text mining, reinforcement learning, and pharmacovigilance	Clinical decision-making and judgement; secondary: Implementation governance and leadership; Human oversight; Patient safety	The conclusions favoured AI, but claims of effectiveness were weakened by methodological and bibliographic inconsistencies.	Very low overall quality; critical risk of bias in selection, classification, extraction, and synthesis. Assign minimal weight. Suitable only for describing perceived themes, tools, and barriers.
[S22] Samy et al., 2026; Saudi Arabia	Interpretive Description qualitative study; n=23	AI-assisted early warning system integrated into the EHR; probabilistic estimation of general deterioration risk with visual and audible alerts	Patient safety; secondary: Clinical decision-making and judgement; Implementation governance and leadership; Human oversight	AI-EWS outputs were considered useful but insufficient and had to be interpreted alongside clinical assessment and contextual knowledge. Trust and overrides were calibrated through experience; undocumented overrides exposed a governance gap. The system reorganised but did not replace nursing judgement and autonomy.	Moderate-to-high quality. High weight for decision-making, trust calibration, override, autonomy, oversight, and governance; low for clinical effectiveness.

Author, year; Country	Design; sample or no. of studies	AI technology/function	Domain(s)	Main finding	Methodological quality / interpretive weight
[S23] Park et al., 2026; South Korea	Pre-implementation consensus qualitative study based on SEIPS 101; n=14	pMSBOS-TS, an ML-based CDSS recommending personalised maximum red-cell orders for thoracic surgery; preoperative support for blood-component ordering and planning	Patient safety; secondary: Clinical decision-making and judgement; Implementation governance and leadership; Human oversight	The system was viewed as potentially useful for reducing variability in blood-component planning if reliable and integrated into EHR workflows. Participants anticipated verification burden, difficulty in unexpected scenarios, and communication problems between clinical units and the blood bank. Governance, organisational culture, and local logistics were decisive for safe implementation.	Moderate-to-high quality. High weight for workflow, governance, readiness, and sociotechnical risks; low for effectiveness, actual safety, and post-deployment behaviour.
[S24] Wang et al., 2026; United States	Conceptual framework	AI tools for decision support, documentation, and clinical-organisational processes; a nursing governance framework for safe assessment, implementation, oversight, and scaling based on clinical utility, reliability, equity, transparency, privacy, and accountability	Clinical decision-making and judgement; secondary: Patient safety; Human oversight; Implementation governance and leadership	A system-level nursing AI governance framework.	Good conceptual quality and high practical utility; uncertainty about effectiveness until prospective validation. High interpretive weight for governance, implementation, and oversight.
[S25] Ibrahim et al., 2026; Egypt, Jordan, United Arab Emirates, and Saudi Arabia	Conceptual framework	Generative and predictive AI for education, clinical reasoning, documentation, and scientific communication; literacy and governance framework for critical use, output verification, risk management, transparency, safety, and equity	Clinical decision-making and judgement; secondary: Patient safety; Human oversight; Implementation governance and leadership	NAIL-G, the Nursing Artificial Intelligence Literacy and Governance framework, comprises five domains applicable to education, clinical practice, and scientific communication.	Moderate-to-good conceptual quality and internal coherence; moderate uncertainty about source comprehensiveness and high uncertainty about effectiveness/applicability until empirical validation.
[S26] Pereira et al., 2026; Portugal/ Brazil	Mixed-methods systematic review with convergent segregated synthesis; n=11	Supervised and unsupervised ML, BERT-NER, Random Forest, SVM, decision trees, explainable AI, ChatGPT, service robots, and models addressing medication errors, stress, and burnout	Clinical decision-making and judgement; secondary: Human oversight; Patient safety; Implementation governance and leadership	Possible improvements in workload, burnout, patient-centred care, autonomy, collaboration, and efficiency were conditional on responsible implementation.	Moderate-to-high quality. High weight for mapping the practice environment and implementation; moderate-to-low for causal effectiveness and patient outcomes.
[S27] Bose et al., 2026; India	Structured narrative review	Machine learning, deep learning, NLP, CDSS, predictive analytics, early-warning systems, reinforcement learning, dashboards, and intelligent monitoring	Clinical decision-making and judgement; secondary: Patient safety; Implementation governance and leadership; Human oversight	Sustainable adoption depends on explainable, context-sensitive systems, clinician involvement, AI literacy, and integration of computational precision with clinical judgement and empathy.	Moderate-to-low quality; moderate-to-high risk of selection and interpretation bias. Useful for mapping, thematic convergence, and professional implications; reduced weight for effectiveness claims and clinical outcomes.
[S28] Connor and Kagan, 2026; United States	Narrative review	AI, telehealth, virtual nursing, remote patient monitoring, medical-device integration, and toolkits/frameworks for technology assessment	Patient safety; secondary: Implementation governance and leadership; Clinical decision-making and judgement; Human oversight	Nurse leaders should move from passive recipients to advocates and architects of the digital ecosystem while ensuring presence, equity, and individualised care.	Moderate-to-low quality as a narrative review. Moderate weight for informatics competencies, leadership, governance, and human-centred implementation; low for effectiveness and patient outcomes.

Author, year; Country	Design; sample or no. of studies	AI technology/function	Domain(s)	Main finding	Methodological quality / interpretive weight
[S29] Schultz et al., 2026; United States	Scoping review; n=49	LLMs, ML, NLP, predictive analytics, AI-CDSS, wearables and sensors, remote monitoring, robotics, augmented reality, apps/web tools, clinical algorithms, and governance frameworks	Patient safety; secondary: Implementation governance and leadership; Clinical decision-making and judgement; Human oversight	Five themes emerged: patient safety; trust, acceptance, and integration; educational preparedness; clinical decision-making and diagnosis; and patient engagement, autonomy, and ethics. Cautious, participatory implementation is needed to sustain safety, quality, and trust.	Moderate-to-low quality: substantial reporting and charting, but a limited search, permissive criteria, and no appraisal reduce robustness. Moderate weight for mapping themes, applications, and gaps.
[S30] Uchmanowicz et al., 2026; International	Structured narrative review	ChatGPT and large language models	Clinical decision-making and judgement; secondary: Implementation governance and leadership; Patient safety; Human oversight	LLMs should be used as auxiliary tools, with mandatory governance and verification.	Moderate-to-low quality. Moderate weight for governance and oversight; low for effectiveness.
[S31] Ball Dunlap et al., 2026; United States	Structured normative ethical analysis	Machine learning, generative AI, NLP, and robotics; predictive analysis, decision support, documentation, information processing, physical assistance, and educational simulation, while clinical judgement and moral/relational responsibility remain with the nurse	Clinical decision-making and judgement; secondary: Human oversight; Patient safety; Implementation governance and leadership	The paper distinguishes technical tasks from the moral and humanistic core of nursing and positions the nurse as the moral arbiter of AI.	Moderate-to-good quality for normative analysis; moderate risk of source selection and dependence on expert judgement. High weight for ethics, governance, human oversight, and implications; moderate for clinical claims.
[S32] Honda et al., 2026; Japan	Conceptual framework	AI for risk prediction, decision support, communication, remote monitoring, and documentation; early identification of family needs, personalised education and referral, routine digital support, and family-outcome assessment	Clinical decision-making and judgement; secondary: Human oversight; Patient safety; Implementation governance and leadership	A policy framework for integrating AI into family nursing care.	Good conceptual quality; reasonable methodological transparency for a policy analysis, but risk of interpretive selection and unestablished empirical validity. High weight for policy domains, governance, equity, and oversight.
[S33] Uygun Ilikhan et al., 2026; Türkiye	Descriptive-comparative cross-sectional study; n=260	Clinical AI and AI-supported systems not further specified; support for diagnosis, treatment, medication management, workload, and decisions	Clinical decision-making and judgement; secondary: Patient safety; Implementation governance and leadership; Human oversight	Attitudes toward AI were generally positive but ambivalent, despite limited knowledge and practical experience. Most participants requested training and viewed AI as support rather than a replacement for human judgement. Privacy, data security, misdiagnosis, and legal accountability were the main concerns.	Moderate quality. Moderate-to-high weight for attitudes and readiness; low for outcomes.
[S34] Takeuchi et al., 2025; Japan	Policy-oriented structured narrative review; n=31	Machine learning, NLP, predictive models, documentation, and simulation	Implementation governance and leadership; secondary: Clinical decision-making and judgement; Human oversight; Patient safety	AI should integrate aspects of tacit knowledge without reducing them to codifiable data alone.	Moderate-to-low quality. Moderate weight for governance and tacit knowledge; low for outcomes.
[S35] Si and Kwon, 2026; South Korea	Scoping review; n=42	Chatbots, LLMs, digital therapeutics, and clinical decision-support systems	Implementation governance and leadership; secondary: Human oversight; Clinical decision-making and judgement; Patient safety	Potential benefits for access, symptom and risk management were conditional on governance and protection of the caring relationship.	Moderate quality. Moderate-to-high weight for mapping and implications; not suitable for effectiveness claims without verification of the review corpus.

Author, year; Country	Design; sample or no. of studies	AI technology/function	Domain(s)	Main finding	Methodological quality / interpretive weight
[S36] Odame et al., 2026; Ghana/ Germany/ United States	Umbrella review of systematic reviews; n=27	Machine learning, deep learning, artificial neural networks, NLP, chatbots, conversational agents, LLMs, wearable/mobile AI, and algorithmic decision-making systems	Implementation governance and leadership; secondary: Patient safety; Human oversight; Clinical decision-making and judgement	Four themes emerged: detection and risk stratification; digital access and engagement; ethical and structural vulnerabilities; and greater value in hybrid human-centred models. The Ethics of Care framework emphasised relationships, dignity, equity, and responsiveness.	Moderate-to-low quality. Moderate weight for convergence, governance, ethics of care, and human oversight; low for quantitative effectiveness, aggregate counts, and comparisons among technologies.
[S37] Simunic et al., 2026; Croatia	Structured narrative review; n=14	AI and machine learning; simulation, virtual reality, and microlearning as educational approaches linked to AI literacy	Clinical decision-making and judgement; secondary: Implementation governance and leadership; Patient safety; Human oversight	Integrating digital and AI competencies into nursing education is essential for quality and safety in oncology. Flexible, verified, interdisciplinary programmes should support critical thinking, continuous evaluation, and ethically responsible use.	Moderate-to-low quality. Moderate-to-low weight. Suitable for mapping competencies, barriers, and implementation recommendations.
[S38] Mohammed et al., 2025; Saudi Arabia/ Egypt/Japan	Systematic review with thematic synthesis; n=17	Artificial intelligence and machine learning applied to clinical decision-making, operational efficiency, and care tasks	Implementation governance and leadership; secondary: Human oversight; Clinical decision-making and judgement; Patient safety	Five themes emerged: clinical decision-making, ethical awareness, routine nursing tasks, algorithmic bias, and public engagement in regulation.	Provisional methodological quality: moderate/not fully determinable. Moderate weight for ethical-regulatory mapping; weight for strength of evidence and recommendations remains to be established.
[S39] Gong et al., 2026; China	Scoping review; n=72	Predictive analytics, computer vision, decision support and real-time monitoring, automated documentation, robotics, and remote monitoring; risk stratification, early complication detection, workflow and sterility surveillance, perioperative support, and postoperative follow-up	Clinical decision-making and judgement; secondary: Patient safety; Implementation governance and leadership; Human oversight	AI applications showed potential benefits for early detection of complications, workflow efficiency, and perioperative nursing decisions. Evidence was mainly pilot or observational with limited large-scale validation. Data governance, professional readiness, process integration, and nursing oversight were essential	PRISMA-ScR reporting and a complete search strategy. Limitations: no formal appraisal, marked heterogeneity, and several narrative claims not always supported by primary data.
[S40] Gleasman-DeSimone, 2025; United States	Narrative review	CDSS, predictive analytics, and AI-assisted documentation; support for assessment and clinical decisions, risk prediction, documentation streamlining, and patient education in advanced nursing practice	Clinical decision-making and judgement; secondary: Patient safety; Implementation governance and leadership; Human oversight	AI may support diagnostic accuracy, documentation, and patient education, but entails risks of bias, privacy breaches, and depersonalisation. Responsible integration, education, interdisciplinary collaboration, and preservation of clinical judgement and human relationships were essential	Explicit method but no formal appraisal; strong relevance to governance, ethics, privacy, and human oversight
[S41] El Arab et al., 2025; International	Integrative review; n=25	Machine learning, predictive models, LLMs, alert algorithms, wearable sensors, simulations, and AI-assisted imaging; decision support, early deterioration detection, monitoring, education, personalised follow-up, task automation, and workload prediction	Clinical decision-making and judgement; secondary: Patient safety; Implementation governance and leadership; Human oversight	AI showed potential benefits for education, early deterioration detection, decision support, follow-up, and reduction of repetitive activities. Concerns included cognitive workload, privacy, bias, overreliance, and impoverishment of the caring relationship. Education, ethical governance, infrastructure, and professional oversight were essential	PRISMA, MMAT, and ROBINS-I were used. Twenty-one of 25 studies had moderate risk of bias; heterogeneity was high, but nursing relevance was strong

Author, year; Country	Design; sample or no. of studies	AI technology/function	Domain(s)	Main finding	Methodological quality / interpretive weight
[S42] Ozbay et al., 2026; Türkiye	Descriptive phenomenological qualitative study; n=18	Unspecified AI technologies for monitoring, risk prediction, decision support, and personalisation of paediatric oncology care; no system or algorithm was directly implemented or evaluated	Clinical decision-making and judgement; secondary: Patient safety; Implementation governance and leadership; Human oversight	Nurses recognised potential benefits of AI in paediatric oncology but highlighted implementation and ethical concerns and the risk of weakening the human component of care. Education, specific competencies, nurse-AI collaboration, and continued professional oversight were essential for responsible adoption	COREQ, purposive sampling, saturation, double coding, k=0.88. Limitations: single centre and self-reported perceptions
[S43] Alruwaili and Paul-Chima, 2026; Saudi Arabia and Uganda	Conceptual framework with structured narrative synthesis	ML-based predictive and decision-support systems for maternal and child risk stratification, early identification of complications, intervention prioritisation, and nursing decision support in resource-limited settings	Human oversight; secondary: Patient safety; Clinical decision-making and judgement; Implementation governance and leadership	The framework positions equity, local validation, and the nurse-patient relationship as prerequisites for AI implementation. Nursing and community governance, co-design, digital inclusion, data transparency, competency development, and longitudinal monitoring are essential for safe and sustainable adoption in resource-limited settings	Moderate methodological quality for a conceptual framework; moderate-to-high risk of source selection, but good conceptual transparency. High weight for governance, equity, implementation, and oversight; moderate for theory building
[S44] Alanazi, 2026; Saudi Arabia	Descriptive phenomenological qualitative study	AI-enabled clinical decision support for triage, deterioration, sepsis, and escalation; focus on clinical judgement, escalation, professional accountability, identity, and ethical tension	Clinical decision-making and judgement; secondary: Patient safety; Implementation governance and leadership; Human oversight	AI systems were perceived as useful but burdensome: alerts had to be interpreted alongside clinical assessment and did not replace nursing judgement. AI intensified interpretive work, accountability in escalation decisions, and ethical tension when algorithmic recommendations conflicted with patient-centred assessment	Moderate quality. Moderate-to-high weight for experiences, accountability, human oversight, and governance; not suitable for estimating effectiveness or safety

Note

NR = not reported. Interpretive weight indicates the appropriate use of the contribution in the narrative synthesis and is not a common quantitative score across different study designs

S = sequential identifier of the included publication (S1-S44); it does not correspond to the manuscript reference numbering

Supplementary Table S2. Cross-domain synthesis of the analytical domains

Domain	n*	Converging evidence	Conditions/ divergences	Risks and concerns	Gaps	Implications
Clinical decision-making and judgement	44	Support for the collection, synthesis, and interpretation of information; prediction and prioritisation; early warning and support for situational awareness	Usefulness depends on data quality and completeness, output comprehensibility, workflow integration, and verification against the clinical picture	Automation bias, errors or hallucinations, overreliance, deskilling, and inappropriate transfer of accountability	Few studies measure actual decisions, appropriateness, comparative accuracy, or effects on clinical reasoning over time	Use AI as verifiable, contextualised support while preserving professional judgement and the ability to disregard the output
		Relevant publications				
		[S1] Alves et al., 2026; [S2] Martinez-Ortigosa et al., 2023; [S3] Mikkonen et al., 2025; [S4] Shah et al., 2025; [S5] Lee et al., 2025; [S6] Li et al., 2026; [S7] Soddu et al., 2025; [S8] Abu Assab et al., 2026; [S9] Yildirim et al., 2026; [S10] Awad et al., 2025; [S11] Amin et al., 2026; [S12] Cant, Ryan and Chugh, 2026; [S13] Rony et al., 2025; [S14] Hassanein et al., 2025; [S15] Park et al., 2025; [S16] O'Connor et al., 2022; [S17] Kirkland-Kyhn et al., 2025; [S18] Nasiri et al., 2026; [S19] Zhou et al., 2026; [S20] Alruwaili, Paul-Chima and Nneoma, 2026; [S21] Alqaraleh et al., 2025; [S22] Samy et al., 2026; [S23] Park et al., 2026; [S24] Wang et al., 2026; [S25] Ibrahim et al., 2026; [S26] Pereira et al., 2026; [S27] Bose et al., 2026; [S28] Connor & Kagan, 2026; [S29] Schultz et al., 2026; [S30] Uchmanowicz et al., 2026; [S31] Ball Dunlap et al., 2026; [S32] Honda et al., 2026; [S33] Uygun Ilikhan et al., 2026; [S34] Takeuchi et al., 2025; [S35] Si & Kwon, 2026; [S36] Odame et al., 2026; [S37] Simunic et al., 2026; [S38] Mohammed et al., 2025; [S39] Gong et al., 2026; [S40] Gleasman-DeSimone, 2025; [S41] El Arab et al., 2025; [S42] Ozbay et al., 2026; [S43] Alruwaili and Paul-Chima, 2026; [S44] Alanazi, 2026.				
Patient safety	44	Potential for early recognition of deterioration, continuous monitoring, risk identification, and reduction of omissions or delays	Benefits require local validation, data quality, appropriate thresholds, organisational response to alerts, and post-implementation monitoring	False positives and negatives, alert fatigue, data bias, opacity, inequity, and false reassurance	Limited causal evidence on adverse events, mortality, medication errors, and other nursing-sensitive outcomes	Assess both technical and sociotechnical safety, including errors, workload, unintended consequences, and equity
		Relevant publications				
		[S1] Alves et al., 2026; [S2] Martinez-Ortigosa et al., 2023; [S3] Mikkonen et al., 2025; [S4] Shah et al., 2025; [S5] Lee et al., 2025; [S6] Li et al., 2026; [S7] Soddu et al., 2025; [S8] Abu Assab et al., 2026; [S9] Yildirim et al., 2026; [S10] Awad et al., 2025; [S11] Amin et al., 2026; [S12] Cant, Ryan and Chugh, 2026; [S13] Rony et al., 2025; [S14] Hassanein et al., 2025; [S15] Park et al., 2025; [S16] O'Connor et al., 2022; [S17] Kirkland-Kyhn et al., 2025; [S18] Nasiri et al., 2026; [S19] Zhou et al., 2026; [S20] Alruwaili, Paul-Chima and Nneoma, 2026; [S21] Alqaraleh et al., 2025; [S22] Samy et al., 2026; [S23] Park et al., 2026; [S24] Wang et al., 2026; [S25] Ibrahim et al., 2026; [S26] Pereira et al., 2026; [S27] Bose et al., 2026; [S28] Connor & Kagan, 2026; [S29] Schultz et al., 2026; [S30] Uchmanowicz et al., 2026; [S31] Ball Dunlap et al., 2026; [S32] Honda et al., 2026; [S33] Uygun Ilikhan et al., 2026; [S34] Takeuchi et al., 2025; [S35] Si & Kwon, 2026; [S36] Odame et al., 2026; [S37] Simunic et al., 2026; [S38] Mohammed et al., 2025; [S39] Gong et al., 2026; [S40] Gleasman-DeSimone, 2025; [S41] El Arab et al., 2025; [S42] Ozbay et al., 2026; [S43] Alruwaili and Paul-Chima, 2026; [S44] Alanazi, 2026.				
Implementation governance and leadership	43	Training, AI literacy, nurse involvement, data governance, workflow integration, and clarity of accountability recur as conditions for adoption	Variable professional and organisational readiness; acceptance is conditional on usefulness, trust, resources, interoperability, and leadership support	Top-down implementation, ambiguous accountability, inadequate training, limited transparency, increased workload, and misalignment with practice	Few implementation models have been prospectively evaluated; data on costs, sustainability, equity, and long-term maintenance are limited	Assign nursing leadership a role in system selection, co-design, evaluation, training, and oversight
		Relevant publications				
		[S1] Alves et al., 2026; [S2] Martinez-Ortigosa et al., 2023; [S3] Mikkonen et al., 2025; [S4] Shah et al., 2025; [S5] Lee et al., 2025; [S6] Li et al., 2026; [S8] Abu Assab et al., 2026; [S9] Yildirim et al., 2026; [S10] Awad et al., 2025; [S11] Amin et al., 2026; [S12] Cant, Ryan and Chugh, 2026; [S13] Rony et al., 2025; [S14] Hassanein et al., 2025; [S15] Park et al., 2025; [S16] O'Connor et al., 2022; [S17] Kirkland-Kyhn et al., 2025; [S18] Nasiri et al., 2026; [S19] Zhou et al., 2026; [S20] Alruwaili, Paul-Chima and Nneoma, 2026; [S21] Alqaraleh et al., 2025; [S22] Samy et al., 2026; [S23] Park et al., 2026; [S24] Wang et al., 2026; [S25] Ibrahim et al., 2026; [S26] Pereira et al., 2026; [S27] Bose et al., 2026; [S28] Connor & Kagan, 2026; [S29] Schultz et al., 2026; [S30] Uchmanowicz et al., 2026; [S31] Ball Dunlap et al., 2026; [S32] Honda et al., 2026; [S33] Uygun Ilikhan et al., 2026; [S34] Takeuchi et al., 2025; [S35] Si & Kwon, 2026; [S36] Odame et al., 2026; [S37] Simunic et al., 2026; [S38] Mohammed et al., 2025; [S39] Gong et al., 2026; [S40] Gleasman-DeSimone, 2025; [S41] El Arab et al., 2025; [S42] Ozbay et al., 2026; [S43] Alruwaili and Paul-Chima, 2026; [S44] Alanazi, 2026.				

**A publication may contribute to more than one domain; therefore, the counts are not mutually exclusive. Relevance was determined based on the available centrality coding for each domain.*

Note. S = sequential identifier of the included publication (S1-S44); it does not correspond to the manuscript reference numbering.