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RESEARCH ARTICLE

ARTIFICIAL INTELLIGENCE LEADERSHIP IN NURSING MANAGEMENT FOR NURSING ORGANISATIONS: A CONCEPT ANALYSIS

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ABSTRACT

BACKGROUND:

Artificial intelligence (AI) is increasingly embedded in nursing management through workforce modelling, quality surveillance, resource allocation and organisational decision support. However, artificial intelligence leadership in nursing management remains conceptually underdeveloped, particularly regarding governance, accountability and nursing-specific leadership responsibilities.

OBJECTIVE:

To analyse and define artificial intelligence leadership in nursing management and develop a conceptual framework for future empirical research, competency development and responsible AI implementation.

DESIGN:

A concept analysis using Walker and Avant's eight-step methodology, supported by a structured search to identify conceptually relevant interdisciplinary literature.

SETTING:

Peer-reviewed interdisciplinary literature and authoritative policy and professional guidance documents identified through PubMed, Google Scholar, Europe PMC, ProQuest Nursing & Allied Health Database and relevant authoritative sources, published between 2020 and 2025.

MAIN OUTCOME MEASURES:

Defining attributes, antecedents, consequences, model cases and empirical referents.

RESULTS:

Twenty-four substantive sources were retained for conceptual analysis; methodological and theoretical foundations were used separately to guide analysis and support theoretical positioning. Artificial intelligence leadership in nursing management was conceptualised as a governance-specialised extension of nursing leadership comprising five interrelated attributes: strategic AI direction-setting, managerial AI literacy, ethical and regulatory oversight, organisational change leadership and workforce capability development, and systematic integration into nursing management processes. Antecedents were organised as core or contextual conditions; consequences were differentiated into proximal and proposed distal consequences, the latter requiring empirical validation. Empirical referents were identified at individual, workforce and organisational levels.

CONCLUSIONS:
Artificial intelligence leadership in nursing management clarifies the leadership responsibilities required when AI informs nursing managerial decision-making, including algorithmic accountability, human oversight and preservation of professional nursing judgement. The concept provides a foundation for competency development, empirical validation and organisational governance across health and aged care settings, including Asia-Pacific contexts.

KEYWORDS
artificial intelligence; artificial intelligence leadership; nursing management; nursing leadership; concept analysis

INTRODUCTION

Artificial intelligence (AI) is increasingly used in health and aged care organisations for predictive workforce modelling, operational optimisation, quality surveillance and resource allocation [1]. In nursing management, these applications influence staffing, workload, patient safety, service equity and organisational performance, shifting leadership accountability towards the interpretation and oversight of AI-informed decisions.

In nursing and aged care, this shift is particularly important because continuity of care, workforce stability, patient advocacy, safety culture and ethical accountability are central to service delivery. AI applications such as workload forecasting, staffing optimisation and real-time quality monitoring may redistribute informational authority within managerial decision-making [2,3], raising questions about responsibility for AI-informed harm, human override, data validation and preservation of professional judgement.

Although scholarship on AI in nursing and health services is expanding, much of the literature focuses on readiness, professional adaptation, user perceptions and clinical ethics [4,5]. Less attention has been directed towards the leadership capability required to govern AI-informed managerial decisions responsibly. Existing perspectives including digital, informatics, technology and transformational leadership, as well as technology governance provide relevant foundations but do not consistently specify responsibilities for algorithmic accountability, critical interpretation of AI outputs and professional oversight. Digital leadership guides organisation-wide technology change [6,7]; informatics leadership focuses on the use and governance of health information and data in nursing practice [8]; AI leadership additionally requires scrutiny of algorithmic outputs, monitoring of bias and human accountability for AI-informed decisions.

Artificial intelligence leadership in nursing management is therefore conceptualised not as a wholly independent leadership theory or separate construct, but as a governance-specialised extension of nursing leadership. Its additional contribution lies in specifying responsibilities that become particularly salient when AI influences managerial authority and professional accountability, including critical interpretation of algorithmic outputs, human oversight, AI-related risk governance and preservation of professional nursing judgement. Its nursing relevance is evident in decisions affecting staffing adequacy, workload distribution, nursing-sensitive outcomes, workforce wellbeing and safe person-centred care. The concept builds on rather than replaces established leadership perspectives. Transformational, adaptive, complexity, systems and ethical leadership provide foundations for vision, change, uncertainty, interdependence and professional responsibility [9–13], while the focal concept integrates these perspectives with AI-specific accountability and governance responsibilities in nursing management.

Although derived from international and interdisciplinary literature, the framework is intended to be broadly applicable rather than region-specific. Its application may nevertheless be particularly relevant to Asia-Pacific health systems, where population ageing, nursing workforce shortages, uneven digital maturity, resource constraints and regulatory variation may shape AI adoption and governance. Using Walker and Avant's eight-step concept analysis methodology [14], this study aimed to clarify artificial intelligence leadership in nursing management, identify its defining attributes, antecedents,

consequences, model cases and empirical referents, and provide a foundation for competency development, empirical operationalisation and responsible AI governance.

METHODS

DESIGN

This theoretical study used Walker and Avant's eight-step concept analysis methodology [14] to clarify the defining attributes, antecedents, consequences, model cases and empirical referents of artificial intelligence leadership in nursing management. The study was conducted as a concept analysis rather than a systematic or scoping review; the structured literature search identified conceptually relevant sources to support the analytic steps rather than to synthesise evidence, estimate effects or formally appraise study quality. No risk-of-bias assessment, evidence grading or meta-synthesis was undertaken because the search served a concept-identification rather than evidence-synthesis purpose.

DATA SOURCES AND SEARCH STRATEGY

A structured literature search was conducted in PubMed, Google Scholar, Europe PMC and ProQuest Nursing & Allied Health Database. Search terms combined "artificial intelligence" with "nurse manager" or "nurse leader" and with leadership, management or governance, with syntax and limits adapted to each platform. English-language literature published from January 2020 to December 2025 was eligible for inclusion.

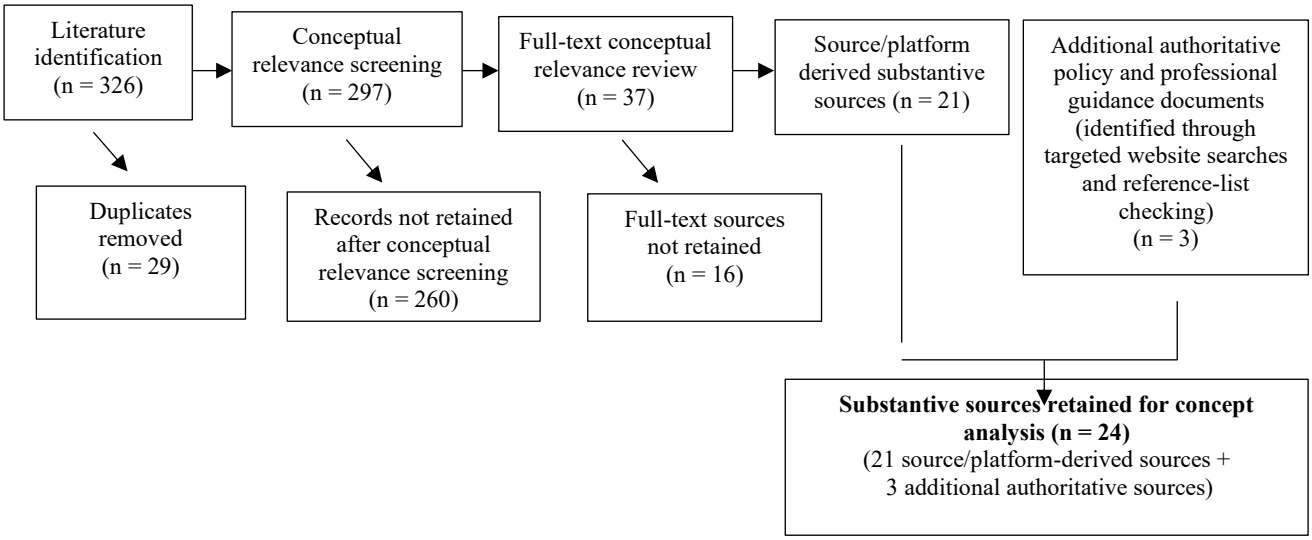
The structured searches across the four sources/platforms identified 326 records. After removal of 29 duplicates, 297 records were screened and 37 full texts were reviewed for conceptual relevance. Of these, 21 source/platform-derived sources were retained. Three additional authoritative policy and professional guidance documents were identified through targeted website searches and reference-list checking. Following assessment for conceptual relevance and contribution to the analysis, a total of 24 substantive sources were retained for concept analysis. Walker and Avant [14] and five established leadership sources [9–13] were used separately as methodological and theoretical foundations and were not included among the 24 substantive sources. Source/platform-specific search strategies, including the search strings as executed, fields and limits, search dates, and the number of records exported for screening, are reported in Supplementary Table S2.

Peer-reviewed conceptual papers, empirical studies and reviews, together with authoritative policy and professional guidance, were retained when they contributed to understanding AI-related leadership, governance or managerial responsibilities in nursing or health services. Sources focused solely on technical AI development, clinical applications without organisational leadership relevance, or non-authoritative material were excluded.

SCREENING AND CONCEPTUAL DATA EXTRACTION

One author conducted screening and conceptual data extraction using a structured matrix aligned with Walker and Avant's analytic steps. The matrix captured concept uses, leadership and governance responsibilities, nursing-specific considerations, candidate attributes, antecedents, consequences and empirical referents. An audit trail documented source-selection, extraction and category-development decisions to enhance analytic transparency and consistency.

FIGURE 1. LITERATURE IDENTIFICATION AND CONCEPTUAL RELEVANCE SCREENING FOR WALKER AND AVANT'S CONCEPT ANALYSIS, INCLUDING SOURCE/PLATFORM-DERIVED AND ADDITIONAL AUTHORITATIVE SOURCES.



ANALYTICAL PROCEDURE

The analysis followed Walker and Avant's eight steps: concept selection, determination of aims, identification of concept uses, determination of defining attributes, construction of a model case, identification of related, borderline and contrary cases, identification of antecedents and consequences, and definition of empirical referents [14].

Conceptual data were iteratively compared across sources. Candidate attributes were retained when they were recurrent, conceptually coherent and necessary to clarify the boundaries of artificial intelligence leadership in nursing management. Antecedents, consequences and empirical referents were subsequently organised to support conceptual clarity and future operationalisation. Leadership sources [9–13] were used for theoretical positioning rather than category generation.

ETHICAL CONSIDERATIONS

As this study involved analysis of published literature and did not include human participants or identifiable data, ethical approval was not required.

RESULTS

STEP 1: SELECTION OF THE CONCEPT

Artificial intelligence leadership in nursing management was selected because AI increasingly informs nursing workforce planning, quality governance, resource allocation and managerial decision-making, expanding nurse leaders' responsibilities for oversight, accountability and ethical stewardship. Related digital, technology and informatics leadership constructs share important features but do not consistently address algorithmic accountability, human oversight and preservation of professional nursing judgement. The focal concept was therefore positioned as a governance-specialised extension of nursing leadership, rather than a wholly independent leadership construct.

STEP 2: DETERMINATION OF THE AIM OF ANALYSIS

The aim of this analysis was to clarify and define artificial intelligence leadership in nursing management by identifying its defining attributes, clarifying its boundaries with related concepts, determining antecedents and consequences, and articulating empirical referents to inform future competency development, measurement and empirical testing.

STEP 3: IDENTIFICATION OF ALL USES OF THE CONCEPT

Interdisciplinary literature described AI-related leadership across several domains. In health service contexts, it was associated with staffing optimisation, predictive workforce modelling, service coordination, resource allocation and quality monitoring [8,15]. Related literature addressed technology implementation and organisational readiness [6,16], alongside ethical accountability, transparency, regulatory oversight and AI governance [17,18]. In nursing-specific literature, additional emphasis was placed on professional judgement, patient advocacy, workforce wellbeing, safety culture and ethical responsibility [19–21]. However, most sources focused on implementation, readiness or technological competence rather than the governance responsibilities of nurse leaders overseeing AI-informed managerial decisions.

STEP 4: DETERMINATION OF DEFINING ATTRIBUTES

Five defining attributes emerged through iterative comparison of conceptual data from the 24 substantive sources. Candidate attributes were retained when they were recurrent, conceptually coherent and contributed to clarifying the boundaries of artificial intelligence leadership in nursing management. Conceptual boundaries and distinguishing focus across the five attributes are summarised in Table 1. Source contributions are mapped in Supplementary Table S1.

Strategic AI direction-setting concerns why, where and for what purposes AI should be adopted in nursing management. It aligns AI initiatives with safe staffing, nursing-sensitive outcomes, workforce sustainability and professional accountability. Managerial AI literacy refers to the nurse leader's capability to understand, interpret and critically question AI outputs, including data quality, uncertainty, bias and potential risks, particularly when these outputs influence staffing, workload, care prioritisation and patient safety.

Ethical and regulatory oversight encompasses transparency, fairness, privacy, data governance, regulatory compliance and human oversight. Its nursing relevance lies in protecting patient advocacy, equitable care, workforce wellbeing and professional nursing judgement.

Organisational change leadership and workforce capability development involves preparing staff and organisations for responsible AI use, addressing resistance and developing workforce capability while preserving professional judgement and autonomy.

Systematic integration into nursing management processes involves embedding AI within governed functions such as staffing, quality surveillance, risk monitoring and resource allocation, linking AI-supported decisions with nursing governance, nursing-sensitive indicators and patient safety.

Collectively, these attributes position artificial intelligence leadership in nursing management as a governance-specialised extension of nursing leadership that integrates strategic direction, critical interpretation, ethical oversight, workforce capability development and systematic AI integration.

TABLE 1. CONCEPTUAL BOUNDARIES AMONG DEFINING ATTRIBUTES OF ARTIFICIAL INTELLIGENCE LEADERSHIP IN NURSING MANAGEMENT

Defining attribute	Distinct conceptual focus	Level of leadership responsibility
Strategic AI direction-setting	Defines the purpose and priorities for AI adoption in nursing management, aligned with safe staffing, workforce sustainability and nursing-sensitive outcomes.	Strategic / policy level
Managerial AI literacy	Enables nurse leaders to critically interpret and question AI outputs affecting staffing, workload and patient safety, including data quality, uncertainty, bias and risk.	Individual managerial capability
Ethical and regulatory oversight	Ensures transparency, fairness, privacy, regulatory compliance and human oversight so that AI-informed	Governance / accountability level

Defining attribute	Distinct conceptual focus	Level of leadership responsibility
	decisions remain explainable, contestable and consistent with professional nursing judgement.	
Organisational change leadership and workforce capability development	Prepares staff and organisational culture for responsible AI use while developing collective capability and preserving professional nursing judgement and autonomy.	Workforce / organisational change level
Systematic integration into nursing management processes	Embeds AI into governed nursing management functions, including staffing, quality surveillance, risk monitoring and resource allocation, linked with nursing governance, nursing-sensitive indicators and patient safety.	Operational / system-integration level

STEP 5: CONSTRUCTION OF A MODEL CASE

A chief nursing officer implements AI-driven predictive workforce analytics, integrated into routine staffing processes, to support strategic staffing and patient safety. The system recommends reducing registered nurse coverage because predicted patient volume is low; however, the nurse manager identifies high patient acuity and safety risks that are not adequately reflected in the model. The chief nursing officer overrides the recommendation, documents the rationale and refers the decision to a multidisciplinary AI governance committee. The committee reviews the model input and performance, and the findings inform staff education, future monitoring and model improvement.

This case demonstrates all five defining attributes: strategic AI direction-setting, managerial AI literacy, ethical and regulatory oversight, organisational change leadership and workforce capability development, and systematic integration into nursing management processes.

STEP 6: CONSTRUCTION OF ADDITIONAL CASES

Borderline case: A nurse manager uses AI scheduling software to optimise shifts but lacks strategic alignment, formal governance oversight, structured risk review and workforce capability development. AI use is present, but only some defining attributes are demonstrated.

Related case: A nurse executive leads digital transformation through electronic health records and reporting systems. Digital leadership is evident, but AI-specific governance, algorithmic accountability and human oversight of AI-informed recommendations are absent.

Contrary case: A nurse administrator rejects AI integration and relies solely on manual systems without strategic AI direction, managerial AI literacy, governance oversight or systematic AI integration. None of the defining attributes are present.

STEP 7: IDENTIFICATION OF ANTECEDENTS AND CONSEQUENCES

Antecedents were classified as core or contextual. Core antecedents comprised adequate digital and data infrastructure, minimum managerial AI literacy, governance and accountability mechanisms, and organisational authority to oversee AI-informed decisions. Contextual antecedents included executive support, financial resources, organisational learning culture, psychological safety, regulatory clarity, workforce readiness and interprofessional collaboration. Together, these conditions shape whether Artificial intelligence leadership in nursing management develops as a sustained governance capability rather than an isolated managerial practice.

Consequences were classified as proximal or proposed distal. Proximal consequences included clearer accountability, more critical interpretation of AI outputs, strengthened governance practices, improved workforce capability and more systematic integration of AI into nursing management. Proposed distal consequences may include patient safety, quality

of care, nurse retention, organisational resilience, legitimacy and public trust [22,23]. These distal consequences are theoretically anticipated rather than established causal effects and require empirical validation.

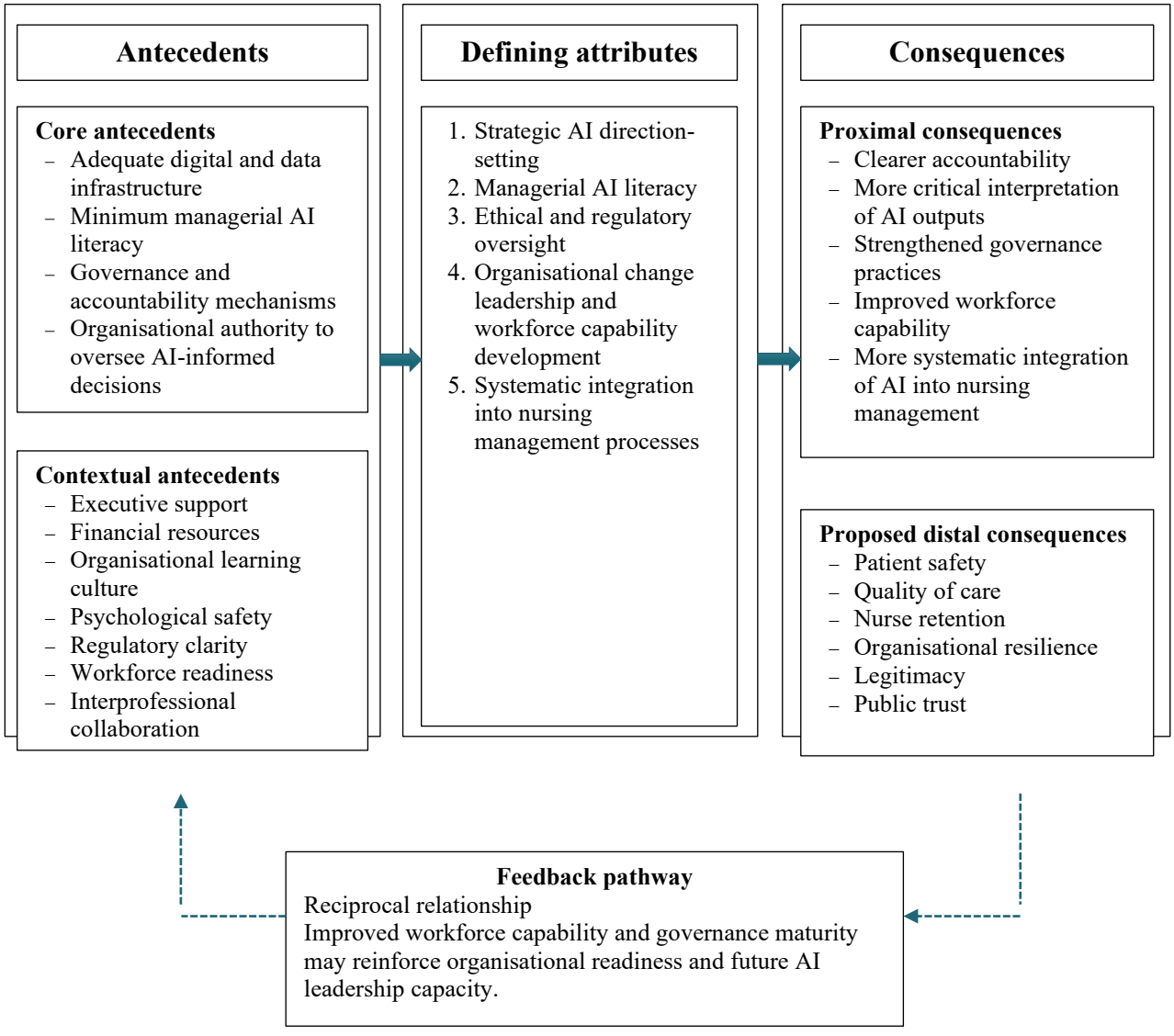
The relationship is dynamic rather than linear: improved workforce capability and governance maturity may reinforce organisational readiness and future AI leadership capacity.

STEP 8: DEFINITION OF EMPIRICAL REFERENTS

Empirical referents for the five defining attributes were organised by level of measurement. Individual-level referents included AI literacy and competency assessment scores, demonstrated ability to interpret algorithmic uncertainty and bias, and documented questioning or override of AI-generated recommendations with professional rationale. Workforce-level referents included AI-readiness scores, training participation rates, psychological-safety scores and mechanisms to prevent deskilling or automation-driven work intensification. Organisational-level referents included AI governance policies, ethics-review mechanisms, bias-monitoring reports, audit frequency, escalation protocols and routine integration of AI-supported evidence into nursing management and governance.

Individual referents reflect nurse-manager leadership capability, whereas workforce and organisational indicators represent the context in which that capability is enacted. Accordingly, a future artificial intelligence leadership competency scale for nurse managers should primarily assess individual-level competencies, with workforce and organisational indicators treated as contextual or complementary measures. A separate organisational AI leadership capability measure may be developed in future research.

FIGURE 2. CONCEPTUAL FRAMEWORK OF ARTIFICIAL INTELLIGENCE LEADERSHIP IN NURSING MANAGEMENT



DISCUSSION

PRINCIPAL FINDINGS

This concept analysis positions artificial intelligence leadership in nursing management as a governance-specialised extension of nursing leadership concerned with the responsibilities that arise when AI informs managerial decision-making. Its contribution lies in clarifying how nurse leaders can retain professional accountability while using AI in decisions affecting staffing, workload, nursing-sensitive outcomes and patient safety.

THEORETICAL POSITIONING OF AI LEADERSHIP

Artificial intelligence leadership in nursing management builds on rather than replaces established leadership perspectives. It shares with digital and informatics leadership a concern with technology-enabled transformation, and with transformational, adaptive, complexity, systems and ethical leadership a concern with vision, change, uncertainty, interdependence and accountability [9–13]. Digital leadership concerns organisation-wide technology-enabled change [6,7], whereas informatics leadership concerns the use and governance of health information and data in nursing practice [8]. Digital and informatics implementation is additionally influenced by usability, training, technical support and organisational support [24]. AI leadership places additional emphasis on critical interpretation of algorithmic outputs, human oversight, bias monitoring and accountability for AI-informed managerial decisions.

Beyond identifying AI-specific responsibilities, this analysis makes two theoretical contributions. First, while transformational leadership [9] provides a foundation for strategic direction and mobilisation, the joint human–algorithm decision process proposed here aligns more directly with adaptive and complexity leadership perspectives [10,11], which emphasise responding to novel challenges and enabling adaptation within complex organisational systems. In AI-informed nursing management, this contribution specifies a distinct decision-governance requirement: determining when algorithmic outputs should inform, be questioned or be overridden by professional nursing judgement. Second, drawing on systems thinking [12] and ethical leadership [13], the analysis links individual nurse-leader capability with organisational governance arrangements and specifies accountability for decisions produced through human–algorithm interaction. Together, these contributions clarify decision authority and accountability when algorithmic recommendations influence managerial judgement, positioning AI leadership in nursing management as a governance-specialised extension of established nursing leadership rather than a separate leadership theory. The proposed relationships among antecedents, defining attributes and consequences (Figure 2) remain conceptual propositions for future empirical testing rather than established causal relationships.

NURSING-SPECIFIC CONTRIBUTION

The five attributes are not exclusive to nursing. Their nursing specificity derives from the professional domain and accountability in which they are enacted, particularly in decisions concerning staffing, workload, nursing-sensitive outcomes, workforce capability, professional judgement and patient safety. Their significance lies in the nurse leader's responsibility to ensure that AI-informed decisions remain consistent with nursing governance, professional standards and safe person-centred care.

COMPARISON WITH EXISTING LITERATURE

Existing studies have primarily examined nurse leaders' AI preparedness, including the relationship between executive nurses' leadership self-efficacy and medical AI readiness [25], broader AI preparedness among hospital nurse leaders [15], and experiences with digital technologies [7], as well as relationships between transformational leadership, perceptions of AI use and innovative work behaviour [26]. The present analysis extends this literature by shifting attention from readiness and adoption towards the governance responsibilities associated with AI-informed nursing management.

RISKS AND GOVERNANCE RESPONSIBILITIES

AI-informed nursing management may introduce algorithmic bias, automation bias, deskilling and workforce resistance [5,27,28]. Responsible leadership therefore requires human oversight, transparent decision processes, mechanisms for questioning or overriding AI recommendations, workforce engagement and ongoing monitoring. Governance

responsibility extends beyond adoption to ensuring that AI-informed decisions remain accountable, context-sensitive and professionally defensible.

STRENGTHS AND LIMITATIONS

Strengths include the structured application of Walker and Avant's eight-step framework [14], use of a structured analytic matrix and maintenance of an audit trail. The governance-oriented framing also addresses an emerging area of nursing management relevant to AI ethics, regulation and health-system accountability [29,30]. Limitations include restriction to English-language sources, which may have excluded relevant Asia-Pacific scholarship, source selection based on conceptual relevance, and screening and conceptual data extraction by one author. In addition, Google Scholar results cannot be fully reproduced, and search limits differed across platforms (Supplementary Table S2). The resulting concept therefore requires empirical validation across diverse settings.

MEANING OF THE STUDY

At the individual level, the concept can inform nurse-manager competency development in AI literacy, critical interpretation and ethical judgement. At the organisational level, responsible implementation requires governance policies, accountability structures, ethics-review mechanisms, audit processes and workforce development. These requirements may warrant particular examination in Asia-Pacific health systems, where variation in workforce capacity, digital maturity and governance contexts may influence implementation.

UNANSWERED QUESTIONS AND FUTURE RESEARCH

Future research should develop and validate an artificial intelligence leadership competency scale for nurse managers focused on individual-level competencies, while organisational AI leadership capability should be examined separately using organisational-level indicators. Psychometric studies should assess content validity, construct validity, factor structure and measurement equivalence. Quantitative, qualitative and mixed-method studies should examine the proposed relationships and proposed distal consequences identified in this analysis. Longitudinal and cross-contextual studies are also needed to determine how organisational readiness, governance maturity and workforce capability shape these relationships across diverse settings, including the Asia-Pacific region.

CONCLUSION

This concept analysis conceptualises artificial intelligence leadership in nursing management as a governance-specialised extension of nursing leadership for contexts in which AI informs managerial decision-making. The concept comprises five interrelated attributes: strategic AI direction-setting, managerial AI literacy, ethical and regulatory oversight, organisational change leadership and workforce capability development, and systematic integration into nursing management processes. Together, these attributes clarify the leadership responsibilities required to govern AI-informed decisions while preserving professional nursing judgement and supporting safe person-centred care. The concept provides a foundation for competency development, empirical validation and responsible AI governance across diverse health and aged care settings, including Asia-Pacific contexts.

DECLARATIONS

Authorship

All authors listed in this manuscript have made substantial contributions to the conception, design, analysis, and interpretation of the work. All authors participated in drafting or critically revising the manuscript for important intellectual content and approved the final version of the manuscript for submission.

Authorship has been determined in accordance with the recommendations of the International Committee of Medical Journal Editors (ICMJE) guidelines. All authors agree to be accountable for all aspects of the work and approve the order of authorship as presented in the manuscript.

Author Contribution Statement (CRediT Taxonomy)

The authors' contributions to this manuscript follow the Contributor Roles Taxonomy (CRediT) to ensure transparency in scholarly authorship.

K O: Conceptualisation, Methodology, Formal analysis, Original draft writing,

N S: Conceptualisation, Data curation, Investigation, Visualisation, Review & editing writing, Supervision.

All authors have read and approved the final version of the manuscript and agree to be accountable for all aspects of the work.

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Declaration of Conflicting Interests

The author declares that there is no conflict of interest related to this research, authorship, and/or publication of this article.

Data Availability

Data will be made available on request.

DECLARATION OF GENERATIVE AI AND AI-ASSISTED TECHNOLOGIES IN THE WRITING PROCESS

During the preparation of this work, the authors used ChatGPT in order to improve language clarity. The authors reviewed and edited the content and take full responsibility for the final paper.

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SUPPLEMENTARY TABLE

SUPPLEMENTARY TABLE S1. SOURCE-TO-CONCEPT MAPPING OF THE 24 SUBSTANTIVE SOURCES INFORMING ARTIFICIAL INTELLIGENCE LEADERSHIP IN NURSING MANAGEMENT. THEORETICAL FOUNDATIONS (REFS. 9–13) AND THE METHODOLOGICAL FOUNDATION (REF. 14) ARE LISTED IN CITATION ORDER, IDENTIFIED IN THE ROLE COLUMN AND SHOWN IN ITALICS; THESE FOUNDATION SOURCES WERE NOT COUNTED AMONG THE 24 SUBSTANTIVE SOURCES.

Coding: A1 = Strategic AI direction-setting; A2 = Managerial AI literacy; A3 = Ethical and regulatory oversight; A4 = Organisational change leadership and workforce capability development; A5 = Systematic integration into nursing management processes. A check mark (✓) is used only where the source directly or clearly informs the conceptual domain; blank cells indicate that support was not sufficiently explicit.

Ref.	Source	Role	A 1	A 2	A 3	A 4	A 5	Antecedent(s) informed	Proposed consequence(s) informed	Empirical referent(s) / observable contribution
1	Gonzalez-Garcia et al. (2024)	Substantive		✓		✓	✓	Managerial AI capability; training; interdisciplinary collaboration; organisational readiness	Potentially improved decision support, resource management and operational efficiency	AI use in nurse-management functions; decision-support/resource-management indicators; training needs
2	Martinez-Ortigosa et al. (2023)	Substantive					✓	Implementation readiness; technological capability	Potential workflow optimisation and decision support in nursing practice	AI applications in patient monitoring, workflow optimisation and nursing decision support
3	O'Connor et al. (2023)	Substantive		✓	✓		✓	AI expertise; clinical interpretation capability; data quality and governance awareness	Potentially safer and more informed AI use	AI expertise/knowledge needs; clinical interpretation; bias, privacy and trust concerns; administration/management applications
4	Burford et al. (2025)	Substantive	✓	✓	✓	✓	✓	Leadership preparedness; education/training; organisational support; governance capacity	Potentially ethical, strategically guided and workforce-responsive AI integration	Nurse-leader roles; education/training needs; ethical, implementation and work-environment themes
5	Göktepe & Sarıköse (2025)	Substantive	✓			✓	✓	Organisational readiness; infrastructure; workforce planning capability; managerial support	Potential improvements in managerial processes, workforce planning and resource use	Nurse-manager experiences of AI-supported monitoring, bed-occupancy prediction and workforce-planning applications
6	Laukka et al. (2020)	Substantive		✓		✓	✓	Leader understanding of HIT; implementation support; organisational readiness	Potentially more effective technology implementation and organisational change	Healthcare-leader roles in HIT implementation; understanding/competence needs; implementation roles
7	Laukka et al. (2023)	Substantive		✓		✓		Digital competence; organisational support; implementation readiness	Workforce adaptation and more effective use of digital technologies	Nurse-leader digital capability; competence needs; stakeholder collaboration; implementation experiences

Ref.	Source	Role	A 1	A 2	A 3	A 4	A 5	Antecedent(s) informed	Proposed consequence(s) informed	Empirical referent(s) / observable contribution
8	Ronquillo et al. (2021)	Substantive	✓	✓	✓	✓	✓	AI/data knowledge; nursing involvement; interdisciplinary collaboration; leadership engagement	Potentially responsible and nursing-informed AI development and implementation	Consensus priorities for nursing participation across AI design, implementation, evaluation, education and governance
9	*Bass & Riggio (2006)*	*Theoretical foundation*	—	—	—	—	—	*Transformational leadership: vision, inspiration and change*	*Supports theoretical interpretation of strategic direction and workforce change*	*Not used to derive AI-specific categories*
10	*Heifetz et al. (2009)*	*Theoretical foundation*	—	—	—	—	—	*Adaptive leadership under uncertainty*	*Supports interpretation of adaptive leadership and change*	*Not used to derive AI-specific categories*
11	*Uhl-Bien et al. (2007)*	*Theoretical foundation*	—	—	—	—	—	*Complexity, emergence and interdependence*	*Supports interpretation of leadership in complex systems*	*Not used to derive AI-specific categories*
12	*Senge (1990)*	*Theoretical foundation*	—	—	—	—	—	*Systems thinking and organisational learning*	*Supports interpretation of feedback, integration and learning*	*Not used to derive AI-specific categories*
13	*Brown et al. (2005)*	*Theoretical foundation*	—	—	—	—	—	*Ethical leadership, role modelling and fairness*	*Supports interpretation of ethical accountability and responsible leadership*	*Not used to derive AI-specific categories*
14	*Walker & Avant (2019)*	*Methodological foundation*	—	—	—	—	—	*Eight-step concept-analysis methodology*	*Provides the methodological structure for concept clarification*	*Not used as substantive AI evidence*
15	Alnomasy et al. (2025)	Substantive		✓		✓		AI preparedness; education/training; professional readiness	Greater preparedness for AI integration among nurse leaders	SHAIP perception/preparedness scores; validated measurement of nurse-leader preparedness
16	Laukka, Hammarén & Kanste (2022)	Substantive		✓		✓		Nurse-leader AI familiarity; awareness of risks; organisational readiness	Potential support for development of AI-enabled services and workflows	Nurse-leader perceptions of AI effects on work, care/services and organisations; familiarity and risk awareness
17	Stokes & Palmer (2020)	Substantive			✓			Ethical awareness; preservation of caring values and human roles	Preservation of human caring and professional nursing judgement	Ethical appraisal of human-versus-AI task allocation
18	Reddy et al. (2020)	Substantive			✓		✓	Governance structures; regulatory/ethical readiness; organisational authority	More accountable and ethically governed AI application	Governance framework; oversight roles; transparency, bias, privacy, safety and liability controls
19	International Council of Nurses (2021)	Substantive			✓			Professional standards; ethical accountability; advocacy responsibilities	Preservation of professional judgement, patient rights and ethical nursing practice	Professional accountability, advocacy, privacy/confidentiality and ethical-decision standards
20	Ergin et al. (2022)	Substantive		✓		✓		Managerial AI awareness; education/training; readiness to guide staff	Potentially more informed adoption of AI and robotic nursing applications	Nurse-manager awareness/opinions and identified education/guidance needs

Ref.	Source	Role	A 1	A 2	A 3	A 4	A 5	Antecedent(s) informed	Proposed consequence(s) informed	Empirical referent(s) / observable contribution
21	Al Khatib & Ndiaye (2025)	Substantive				✓	✓	Nurse involvement and empowerment in AI implementation	Role change, process automation and decision support associated with AI integration	Nurse involvement in AI deployment; role-change themes; operational-use and implementation examples
22	Fisher & Rosella (2022)	Substantive	✓	✓	✓	✓	✓	Data governance; modern infrastructure; workforce skills; partnerships; equity/bias capability	Potentially more sustainable, transparent and equitable organisational AI use	AI strategy/governance priorities; infrastructure readiness; workforce skill gaps; transparency/reproducibility; equity/bias indicators
23	Morley et al. (2020)	Substantive			✓			Ethical-risk awareness; governance and regulatory attention	Ethically mindful AI deployment and protection of public trust	Epistemic, normative and traceability-related ethical-risk categories; accountability and fairness considerations
24	Corbett et al. (2025)	Substantive				✓	✓	Management support; training; IT support; usability; organisational readiness	Potentially improved EHR acceptance and integration into nursing practice and workflow	EHR acceptance; usability-related facilitators and barriers; documentation burden; management and IT support; training needs
25	Eminoğlu & Çelikkanat (2024)	Substantive		✓		✓		Leadership self-efficacy; AI readiness among executive nurses	Greater readiness of nurse leaders for AI integration	Executive nurses' leadership self-efficacy and medical AI readiness scores; observed relationship between leadership self-efficacy and AI readiness
26	Agaoglu et al. (2025)	Substantive				✓		Transformational leadership; employee happiness; perceptions of AI use	Innovative work behaviour (reported empirical association; not a direct causal consequence of AI leadership)	Transformational-leadership, AI-perception, employee-happiness and innovative-work-behaviour scale scores
27	Johnson et al. (2024)	Substantive		✓	✓	✓		Critical evaluation capability; education/training; legal-policy preparedness	Potentially safer AI-informed nursing decisions and preservation of professional responsibility	Patient-safety risk appraisal; education/training recommendations; legal and policy considerations
28	Bodur et al. (2025)	Substantive		✓	✓	✓		AI knowledge; workforce readiness; ethical reasoning; institutional preparedness	Professional adaptation while preserving human-centred nursing roles	Nurses' AI understanding; ethical/accountability concerns; de-skilling, dehumanisation and training needs
29	World Health Organization (2021)	Substantive			✓		✓	Ethical governance; accountability; human-rights safeguards; data stewardship	Trustworthy, accountable and human-centred AI use	Human oversight; transparency; accountability; privacy; fairness and governance mechanisms
30	World Health Organization (2023)	Substantive			✓		✓	Regulatory clarity; lifecycle governance; risk-management capacity	Safer and more accountable AI deployment	Regulatory compliance, documentation, performance monitoring, risk-benefit assessment and audit mechanisms

SUPPLEMENTARY TABLE S2. SOURCE/PLATFORM-SPECIFIC SEARCH STRATEGIES AND RECORDS EXPORTED FOR SCREENING

Source / platform	Database / collection searched	Search string as executed	Fields and limits	Date searched	Records exported for screening (n)
PubMed	PubMed	("artificial intelligence"[tiab] OR "Artificial Intelligence"[Mesh]) AND ("nurse manager"[tiab] OR "nurse leader"[tiab] OR "nursing management"[tiab] OR "nursing leadership"[tiab] OR (nurs*[tiab] AND (leadership[tiab] OR management[tiab] OR governance[tiab]))) AND ("2020/01/01"[dp] : "2025/12/31"[dp]) AND english[la]	Title/Abstract [tiab] and MeSH Terms [Mesh]; English language; publication date 1 Jan 2020–31 Dec 2025; no publication-type or full-text availability filters	10 Jan 2026	20
Google Scholar	Google Scholar	"artificial intelligence" ("nurse manager" OR "nurse leader") leadership management	General search; publication years 2020–2025; English-language records considered	15 Jan 2026	198
Europe PMC	Europe PMC	"artificial intelligence" AND ("nurse manager" OR "nurse leader") AND leadership AND management AND (HAS_FT:Y) AND (FIRST_PDATE:[2020 TO 2025]) AND ((SRC:MED OR SRC:PMC) NOT (PUB_TYPE:"Review"))	Full text available; first publication date 2020–2025; sources limited to MED or PMC; reviews excluded	13 Jan 2026	104
ProQuest	Nursing & Allied Health Database	TI,AB("artificial intelligence") AND TI,AB("nurse manager*" OR "nurse leader*") AND TI,AB(leadership OR management OR governance)	Title/Abstract (TI,AB); publication date 1 Jan 2025–31 Dec 2025	11 Jan 2026	4
Total					**326**

Note. Records from all sources/platforms were combined before removal of duplicates. Three additional authoritative policy and professional guidance documents from the World Health Organization and International Council of Nurses were identified through targeted website searches and reference-list checking and were not included in the source/platform record counts. Search syntax and limits differed across platforms according to the search procedures applied and are reported as executed. The overall eligibility period was 2020–2025; platform-specific search limits are shown in the table.