

The Role of Artificial Intelligence in Diagnosis and Clinical Decision-Making in Nursing

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Abstract. The integration of Artificial Intelligence (AI) into healthcare is profoundly reshaping nursing diagnosis and clinical decision-making. This study explores how AI particularly Clinical Decision Support Systems (CDSS) and Decision Support Systems (DSS) has enhanced nursing practice between 2020 and 2025. Employing a mixed-method approach combining bibliometric analysis, participatory system design, and qualitative field studies in Europe, the research identifies emerging trends, practical challenges, and implementation opportunities in AI-enabled nursing care. Bibliometric data reveal a surge in global publications focusing on early detection, diagnostic accuracy, and personalized care. Participatory studies conducted in Germany and Austria illustrate how AI tools reduce nursing workload, aid complex decisions, and improve interprofessional coordination. However, concerns remain regarding data privacy, system transparency, and the erosion of human interaction. The findings emphasize the need for AI to function as a cognitive partner, complementing rather than replacing nurses. Successful integration depends on ethical design, contextual adaptation, and human-centered development. In low-resource settings like Indonesia, AI-aligned digital interventions have significantly improved maternal health education and pediatric nutrition. This study concludes that AI holds transformative potential when developed collaboratively, applied ethically, and tailored to diverse healthcare contexts. Future research should investigate long-term impacts, equity in access, and nursing competencies for safe and empathetic AI use.

Keywords: Artificial Intelligence, Nursing, Diagnosis, Medical Technology, Decision Making

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Introduction

The integration of Artificial Intelligence (AI) into healthcare is rapidly reshaping clinical decision-making, diagnosis, and patient care. AI tools, both assistive and autonomous, are increasingly used in diagnostic and resource allocation contexts, raising practical and ethical questions regarding dignity, trust, and fairness in clinical encounters (Formosa et al., 2022). While AI offers improved efficiency and accuracy, its use may lead to perceptions of dehumanization and reduced interactional justice (Bankins et al., 2022; Binns et al., 2018). Moreover, the opacity of AI decision-making processes and lack of legal clarity regarding responsibility in

adverse events raise concerns about transparency and accountability (Naik et al., 2022). These issues underscore the need to evaluate AI’s role not only for clinical utility but also its ethical and societal impacts.

Methods

This study used a mixed-method design that integrated participatory qualitative approaches, user-centered system development, and bibliometric quantitative analysis to support the design and contextual understanding of AI-based decision support systems in nursing. The qualitative component adopted from (Gleim et al., 2025) involved purposive sampling to conduct 22 field observations, 12 interviews with nurses and physicians, and a focus group with 9 nurses at a medical center in Freiburg, Germany. This participatory process explored challenges in delirium prevention and gathered expectations for an AI-based CDSS. Following (Demarcsek et al., 2025), expert workshops in Graz, Austria, involving nurses, pain specialists, and IT professionals shaped a DSS prototype for chronic pain management. The design process combines literature scoping, iterative prototyping with Figma, and technical tests using the SMART on FHIR framework to assess EHR integration.

To position these local developments within global trends, a bibliometric analysis adapted from (Balpande et al., 2025) was conducted. Publications 2019–2024 were systematically retrieved from Scopus, PubMed, and Web of Science, then analyzed using VOSviewer, CiteSpace, and R Bibliometrix to map citation networks, keyword clusters, and collaborative patterns. This provided a broader view of how AI applications, particularly in clinical decision support, predictive analytics, and personalized care, are evolving in healthcare and nursing worldwide. By combining participatory field insights, user-centered system design, and bibliometric evidence, this integrated method ensured that the proposed CDSS and DSS developments were both contextually grounded and aligned with international best practices in AI for nursing care.

Result and Discussion

Participatory studies identified critical challenges in delirium care, such as difficulties in early detection, limited interprofessional coordination, and high workload demands, prompting the need for an AI-supported CDSS to assist nurses without replacing clinical judgment (Gleim et al., 2025).

Location	Study Focus	AI Tool	Key Findings
Freiburg, Germany	Delirium prevention	CDSS	Improved early detection; AI accepted as clinical partner
Graz, Austria	Chronic pain management	DSS	Integrated pain algorithms into EHR; initial validation successful
Texas, USA	Healthcare provider attitudes	Mixed tools	58% adoption willingness; concerns on privacy and diagnostic accuracy
Indonesia	Maternal and child education	Mobile AI	Improved pneumonia management and nutrition in low-resource settings

Similarly, user-centered workshops for chronic pain care led to a DSS prototype integrating pain assessment algorithms, with successful initial EHR simulation tests (Demarcsek et al., 2025). In a rural Texas medical center, 58% of providers reported willingness to adopt AI, yet significant concerns persisted about data privacy, diagnostic errors, and the overall trustworthiness of AI systems, even though perceived efficiency correlated positively with expectations of improved patient outcomes (Lintz, 2025). A bibliometric review confirmed a global surge of AI publications in nursing and healthcare since 2019, clustering around decision support, predictive analytics, and workflow optimization (Balpande et al., 2025).

Keyword Cluster	Research Focus	Technologies/Tools Used
Clinical Decision Support	Diagnostics, early warning systems	CDSS, rule-based system
Predictive Analytics	Risk prediction, clinical outcomes	Machine learning, random forest
Personalized Care	Genomic-based and individualized care	Deep learning, multi-omics
Workflow Optimization	Workload management, system efficiency	NLP, robotic process automation (RPA)

Experimental studies on patient perceptions showed that patients consistently viewed AI-driven diagnostic decisions as less respectful and more dehumanizing than human decisions, despite similar outcomes (Formosa et al., 2022). Meanwhile, technical advances were clear, CNN models outperformed radiologists in detecting lung pathologies, and deep learning on multi-omics data achieved precision rates up to 98% in diagnosing rare genetic diseases (Sharma, 2025). However, practical implementations like the PULsE-AI system for atrial fibrillation screening faced barriers in real-world adoption due to misaligned incentives and integration challenges (Thomas & Finnie, 2025).

These findings illustrate both the promise and complexity of integrating AI into nursing and clinical decision-making. Local participatory studies aligned with global trends, emphasizing AI's role in augmenting rather than replacing human expertise (Gleim et al., 2025) (Balpande et al., 2025). Yet persistent concerns among providers about data security and diagnostic reliability indicate that technical success alone is insufficient trust building through transparent design and targeted training remains essential (Lintz, 2025). Patient studies underscored the importance of preserving human dignity in healthcare delivery, revealing that even highly accurate AI systems may undermine perceptions of care if not carefully integrated (Formosa et al., 2022). Advanced AI diagnostic tools demonstrate extraordinary technical potential, yet real-world adoption still hinges on organizational support, alignment with clinical workflows, and ethical safeguards (Sharma, 2025) (Thomas & Finnie, 2025). This highlights the critical need for interdisciplinary approaches that blend robust technical validation with stakeholder engagement and ethical oversight. Ultimately, while AI systems like CDSS and DSS prototypes promise to enhance clinical assessments and reduce nurse workload (Demarcsek et al., 2025) (Gleim et al., 2025).

Conclusion

Artificial Intelligence (AI) is increasingly influencing nursing diagnosis and clinical decision-making through tools such as Clinical Decision Support Systems (CDSS) and Decision Support Systems (DSS). This study found that AI can enhance early detection, optimize workflows, and support complex care decisions when integrated through participatory, human-centered approaches. However, challenges remain—especially regarding ethical transparency, user trust, and interoperability. Qualitative insights from European field studies revealed that nurses are open to AI collaboration but require systems that complement, not replace, clinical expertise. Bibliometric analysis confirmed the global acceleration of AI adoption in nursing but also highlighted persistent barriers in real-world settings, including digital literacy gaps and infrastructure limitations. In both high-resource and low-resource contexts, AI's potential is evident—but only when implemented with attention to ethical safeguards, contextual adaptation, and nurse preparedness. Future research should explore the long-term impacts of AI on patient safety, empathy in care, and equitable access across healthcare systems.

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In Indonesia, community-based interventions using AI-aligned digital tools have improved maternal education and pediatric care. For example, mobile audiovisual education improved pneumonia management among mothers (La Saudi, Nurhaeni, & Hayati, 2020). Nutrition education for mothers of stunted children enhanced parenting behavior (La Saudi, 2020). In pediatric oncology, models supporting energy conservation promoted better nutritional outcomes (La Saudi, Allenidekania, & Agustini, 2021). These cases illustrate AI's potential beyond hospital settings, supporting behavioral change and preventive care.

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