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Artificial Intelligence in Nursing Education: A Narrative Review of Current Applications, Pedagogical Benefits, Challenges, and Future Directions

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Abstract: ***AI is changing the way nursing students learn, practise clinical reasoning and build competencies before they care for real-world patients. This review synthesises present uses of AI in nursing education, such as intelligent tutoring systems, virtual patient simulations, adaptive learning platforms, natural language processing tools, and clinical decision support training. It further discusses pedagogical benefits, barriers for implementation, ethical considerations, and faculty readiness issues of this integration. Finally, it highlights emerging trends and future directions for curriculum development, faculty development, and research to support the responsible and effective integration of AI into nursing education. As AI becomes increasingly embedded in healthcare practice, preparing nursing graduates to use these technologies critically, ethically, and safely will be essential for delivering high-quality, patient-centred care. The article concludes with a discussion of future directions for curriculum design and research.***

Keywords: Integration, Artificial Intelligence (AI), Nursing, Education, Simulation

1. Introduction

As AI tools become more prevalent in healthcare, nursing programs face increased pressure to produce graduates who are both clinically competent and digitally savvy, allowing them to work alongside advanced systems (Chaturvedi et al., 2025; El Arab et al., 2025). The rise of computerized care plans and machine-learning diagnostics shows a shift in what it means to be prepared for nursing in a digital age (Gilart et al., 2025). At the same time, AI is also becoming a teaching tool, creating new opportunities for simulating clinical scenarios, personalizing learning, and providing instant feedback that human instructors could not match (Dağcı et al., 2024). Large language models and intelligent tutoring programs can serve both as the clinical software being studied and as training tools. This presents a unique challenge in modern classrooms. Since AI is both subject matter and teaching aid, integrating it into nursing education is a complex area of study (Chen et al., 2025).

1.1 Applications of AI in Nursing Education

The integration of artificial intelligence (AI) into nursing education is rapidly transforming how future nurses gain knowledge, develop clinical skills, and prepare for complex healthcare environments. By leveraging AI technologies, educators can move beyond traditional methods to provide more interactive, personalized, and competency-based training. The key applications of AI in Nursing are as follows:

1.2 Intelligent Virtual Patients and Simulation

Intelligent Virtual Patients and Simulation AI is used in virtual patient platforms to create realistic clinical experience. Using this method students can take medical histories, conduct assessments, and make decisions affecting simulated patients' outcomes (Yang et al., 2025). Traditional virtual patient systems rely on fixed scripts, which restrict communication ability. Newer generative AI systems aim to improve this by allowing more open-ended dialogues (Yu et al., 2025). A study on nursing students using generative AI in virtual reality found that the authenticity of simulations relates more to whether the scenario activates the same cognitive processes and behaviors required in real practice, rather than just visual fidelity (Wilson et al., 2026). Researchers label this shift as focusing on functional task alignment and psychological authenticity rather than just physical realism. A comparison between AI-enhanced virtual reality and traditional simulated patient encounters revealed that AI-VR offers advantages in scalability, consistency, and cost-effectiveness not usually found in actor-based simulations. However, its educational effectiveness relative to simulated patients remains uncertain and requires further research (Chang & Kim, 2025).

Another study examining nursing students' experiences with AI-driven virtual patients during simulated placements indicated that this approach boosted students' confidence, communication skills, clinical reasoning, and knowledge acquisition. Students particularly appreciated the self-paced and repeatable nature of the simulations (Gilart et al., 2025). A broader systematic review following PRISMA guidelines, which evaluated AI-based simulation technologies, including chat bots, avatars, and AI-supported debriefing, also found high student engagement (Sengul et al, 2025). However, it noted persistent limitations in addressing cultural and emotional nuances, underscoring the importance of ethical and pedagogical design choices for realizing AI's full potential.

1.3 Adaptive and Personalized Learning Systems

Adaptive learning platforms employ AI algorithms that test a student's current knowledge and modify content difficulty, speed, and remediation based on those results. This has been

used in nursing programs for pharmacology calculations, pathophysiology concepts, and NCLEX-style question banks (Anderson et al., 2021). The system identifies knowledge gaps and guides students to focused practice content. This personalisation can alleviate study inefficiency and can identify at-risk students earlier than traditional periodic testing (O'Connor et al, 2023).

1.4 Clinical Decision-Making and Reasoning Support

Teaching and assessing clinical judgment is challenging, and many studies have explored how well large language models can aid in this area. The NCSBN introduced the Next Generation NCLEX in 2023, using computer-adaptive testing based on the NCSBN's Clinical Judgement Measurement Model to evaluate candidates' decision-making abilities rather than rote memory. This has raised interest in whether AI tools can help students develop this specific skill. A review of the technical literature found that accuracy on NCLEX-style items improved significantly across model generations, going from about 75 percent with GPT-3.5 to nearly 89 percent with GPT-4. However, the same review pointed out that nearly a third of the empirical studies it analyzed lacked methodological rigor, along with inconsistent quality control and unaddressed equity concerns. GPT-4 also performed better than earlier models and other chatbots in a study on chatbot effectiveness for licensure-style multiple-choice questions from the United States and China, especially for English-language items. This suggests it could be useful as a multilingual study aid, though not as a substitute for clinical reasoning instruction (Wu Z et al., 2024). In another study comparing AI-generated to nurse educator-generated NCLEX-RN style questions, both groups received similar ratings for Item clarity, grammar, and difficulty level of questions. Clinical relevance and use of complex terminology was similar for all question pairs (Cox et al., 2023). As an emerging artificial intelligence technology, Chat GPT has great potential to revolutionize nursing education, nursing practice, and nursing research. However, researchers, institutions, and administrations still need to critically examine its accuracy, safety, and privacy, as well as academic misconduct and potential ethical issues that it may lead to before applying Chat GPT to practice (Zhou Y et al., 2024)

1.5 Documentation and Communication Training

AI-powered tools are increasingly being used to help students practise clinical documentation and handoff communication-two areas that are often under-represented in traditional curricula (Holderried et al., 2024). Generative language models can generate simulated realistic charting scenarios, critique a student's documentation for clarity and completeness, or generate practice handoff reports for students to critique (Rabani et al., 2025).

1.6 Administrative and Faculty-Support Applications

In addition to tools used by students, nursing faculty also leverage AI to automatically grade objective assessments, create practice questions, check for plagiarism, and analyze overall student performance to uncover gaps in the curriculum. These applications free up time for faculty to focus on more valuable teaching activities, but they also raise concerns about how to appropriately oversee AI-generated content (Alrazeeni et al., 2026).

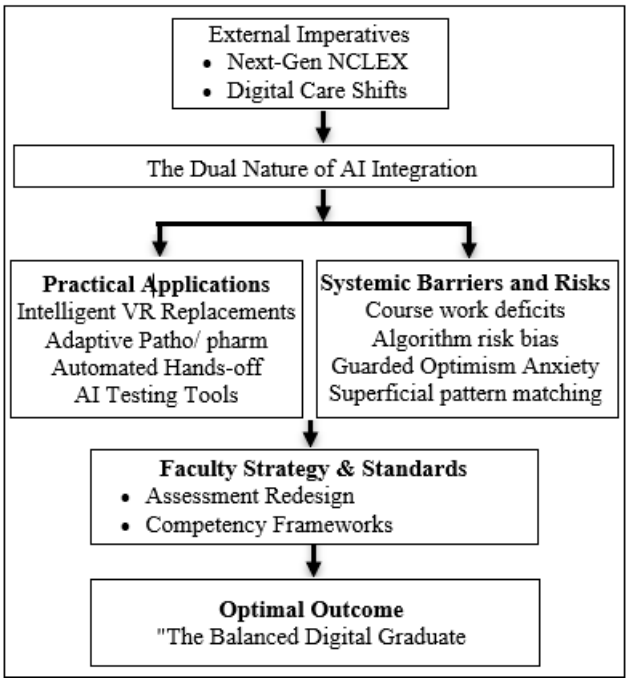

Figure 1: A conceptual framework showing systemic integration of artificial intelligence in nursing curriculum

Pedagogical Benefits

The literature outlines several common benefits linked to adopting AI. Students often gain access to unlimited, low-stakes practice that would be difficult to replicate with human standardized patients or limited clinical placement hours. AI systems can provide immediate, personalized feedback, encouraging the kind of focused practice needed for skill mastery Moreover, many of these tools allow educators to track learning analytics closely, which helps identify struggling students early and provide targeted support (Sriram et al., 2025).

2. Challenges and Barriers

However, integration can bring major obstacles too. A cross sectional study to assess knowledge, attitudes, practices, and perceived barriers toward AI among nursing and health sciences students. Students demonstrated substantial exposure to AI technologies but limited structured preparedness for their effective and ethical use. Positive attitudes toward AI suggested readiness for educational adoption; however, moderate knowledge and practice levels indicated the need for formal curriculum integration, faculty development, and competency-based training. Addressing ethical concerns and institutional barriers is essential to support responsible AI implementation in nursing and health sciences education (Alqaissi, 2026). A similar cross-sectional study of newly qualified nurses found that the AI readiness was only moderate and that prior AI training and general awareness of AI in practice were among the strongest predictors of the readiness, but limited computer skills and gaps in AI-specific knowledge persisted as common barriers even after entering practice (Yang et al., 2026).

The wider systematic review that synthesised evidence worldwide of the views of nursing students and practicing nurses towards AI found a pattern of "guarded optimism" with positive attitudes alongside high anxiety about AI in many student populations. Adoption was predominantly driven by self-efficacy, digital literacy instead of accessibility to technology. The review also identified a "preparedness-impact gap" among nurse leaders, and pointed out that role-specific factors, such as lower reported AI use among head nurses despite overall positive attitudes, complicate any assumption that readiness translates uniformly into use (El Arab et al., 2025).

There are also discipline issues. Therapeutic communication, empathy with competent clinical skills such as physical assessment, are critical to nursing and where AI-based simulation can supplement but not replace human interaction and hands-on practice (El Arab et al., 2025; O'Connor et al., 2023). Another concern with overreliance on feedback from artificial intelligence is the possibility that students will learn to match test-taking patterns rather than clinical reasoning, especially if assessment design does not keep pace with the tools (Elendu et al., 2024)

3. Ethical and Equity Considerations

The use of AI in nursing education raises a number of ethical questions that need to be attended with priority. Algorithmic bias is a major concern, as many AI tools are trained on data that may not sufficiently represent diverse patient populations, thereby potentially perpetuating inequalities in how students learn to identify symptoms or risk factors in different demographic groups (Rony, et al., 2024). Another issue is data privacy. Platforms are able to collect detailed data on student behaviour and performance (Arcia A., 2024) Equity of access is also a consideration, as students at well-resourced institutions may have significantly more exposure to advanced AI tools than their peers at other institutions, which could widen gaps in readiness entering the workforce (Al-Zahrani et al., 2024). Finally, there is a larger pedagogical question of academic integrity, especially with generative AI tools able to generate care plans, case study answers or reflective journal entries that students may submit as their own work, leading many programs to revise assessment design and academic integrity policies (Sengul et al., 2025).

Faculty Development and Curricular Integration

Faculty development seems to be critical to successful integration. Programs that have invested in structured training to allow faculty to experiment with AI tools, understand their limitations, and redesign assessments accordingly report smoother adoption (Amankwaa et al., 2025). It is increasingly recommended that curricular frameworks view AI literacy as a defined competency, rather than an incidental by product of using new software, much like the formal incorporation of informatics competencies into nursing curricula earlier (El-Banna et al., 2025)

4. Future Directions

Several directions will probably guide the next phase of AI integration in nursing education. Multimodal simulation, combining AI based virtual patients with haptic feedback devices, could fill the gap between virtual and physical skill practice (Xian et al., 2025). As AI becomes more prevalent in clinical practice, the need for introducing AI literacy including of diverse clinical AI tools functions, their limitations and critical evaluation of their outputs as a part of nursing curriculum is likely to become standard (Wei et al., 2025). More rigorous outcome-based research is also needed. Stronger comparative evidence is needed to determine which applications improve clinical competency and patient safety outcomes in a meaningful way, rather than simply providing novelty or engagement (O Connor, 2023).

5. Conclusion

The integration of AI into nursing education is advancing rapidly in the areas of simulation, adaptive learning, support for clinical reasoning, and administration, providing real pedagogical benefits and important challenges regarding faculty readiness, equity, and ethical use (Nugent et al., 2026). As clinical AI tools become more integrated into health care delivery, nursing programs have a mutual obligation, to train graduates who can use these tools critically and safely, while maintaining the human and judgment-based skills that are the core elements of nursing practice (Wei et al., 2025). The ongoing investment in faculty development, rigorous research on evaluation, and careful curricular design will determine if this integration ultimately strengthens, or only modernises the surface of, nursing education (Fernandez & Audétat, 2019).

6. Recommendations

Based on the current findings, future research work on AI integration in nursing curriculum can also focus on the following points:

- Clinical judgement models in nursing licensure examinations and their relationship to AI-based reasoning assessment tools
- Studies comparing virtual patient simulation and standardised patient encounters
- Bias in healthcare AI algorithms and implications for clinical training content
- A health professions education faculty development framework in AI literacy

Declaration

The authors used Google Gemini to improve the clarity, grammar, and readability of the manuscript during the drafting phase.

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