

Implications of Generative Artificial Intelligence on Ethics in Nursing Education: State of The Art Review.

Implicaciones de la Inteligencia Artificial Generativa en la Ética en la Educación en Enfermería: Revisión del Estado del Arte.

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Abstract: The rapid advancement of generative artificial intelligence (GAI) presents both opportunities and ethical challenges in nursing education. GAI has the potential to enhance teaching, learning, and clinical decision-making through personalized learning resources and simulation of healthcare scenarios. However, it also introduces multifaceted ethical dilemmas, which require careful consideration in its integration into nursing curricula. This study aims to critically examine the ethical implications of GAI adoption in nursing education, focusing on its impact on ethical principles, clinical reasoning, academic integrity, and pedagogical strategies. We synthesized peer-reviewed evidence published between January 2023 and August 2025 in a state-of-the-art review. Studies were selected from PubMed, Scopus, and Web of Science using specific search terms related to GAI, ethics, and nursing education. Data extraction was performed using a predefined template, capturing key variables such as ethical principles, methodological approaches, and recommended pedagogical safeguards. The integration of GAI in nursing education raises concerns regarding academic integrity, automation bias, AI "hallucinations," data privacy, and equity. However, it also offers opportunities for improving clinical reasoning, knowledge, and attitudes among students. The results underscore the need for clear governance frameworks, hybrid pedagogical approaches with "human-in-the-loop," and explicit guidelines for transparency, bias mitigation, and data protection. GAI can enhance learning in nursing education when used responsibly. Ethical risks, such as the degradation of ethical reasoning and issues of privacy and equity, require careful management. A hybrid design approach, coupled with ethical training and continuous evaluation of AI use, is essential to ensure GAI's benefits while safeguarding professional judgment and patient safety.

Keywords: Generative Artificial Intelligence, Chat GPT, Nursing Ethic, Nursing Ethics

Resumen: El rápido avance de la inteligencia artificial generativa (IAG) presenta tanto oportunidades como desafíos éticos en la educación en enfermería. La IAG tiene el potencial de mejorar la enseñanza, el aprendizaje y la toma de decisiones clínicas mediante recursos de aprendizaje personalizados y simulaciones de escenarios de atención médica. Sin embargo, también

introduce dilemas éticos multifacéticos, que requieren una consideración cuidadosa en su integración en los programas de enfermería. Este estudio tiene como objetivo examinar de manera crítica las implicaciones éticas de la adopción de la IAG en la educación en enfermería, centrándose en su impacto sobre los principios éticos, el razonamiento clínico, la integridad académica y las estrategias pedagógicas. Sintetizamos evidencia revisada por pares publicada entre enero de 2023 y agosto de 2025 en una revisión de estado del arte. Los estudios fueron seleccionados de PubMed, Scopus y Web of Science utilizando términos de búsqueda específicos relacionados con la IAG, la ética y la educación en enfermería. La extracción de datos se llevó a cabo utilizando una plantilla predefinida, capturando variables clave como los principios éticos, los enfoques metodológicos y las salvaguardias pedagógicas recomendadas. La integración de la IAG en la educación en enfermería genera preocupaciones sobre la integridad académica, el sesgo de automatización, las "alucinaciones" de la IAG, la privacidad de los datos y la equidad. Sin embargo, también ofrece oportunidades para mejorar el razonamiento clínico, el conocimiento y las actitudes entre los estudiantes. Los resultados subrayan la necesidad de marcos de gobernanza claros, enfoques pedagógicos híbridos con un "humano en el ciclo" y directrices explícitas para la transparencia, la mitigación de sesgos y la protección de los datos. La IAG puede mejorar el aprendizaje en la educación en enfermería cuando se utiliza de manera responsable. Los riesgos éticos, como la degradación del razonamiento ético y los problemas de privacidad y equidad, requieren una gestión cuidadosa. Un enfoque de diseño híbrido, junto con capacitación ética y una evaluación continua del uso de la IAG, es esencial para asegurar los beneficios de la IAG mientras se protege el juicio profesional y la seguridad del paciente.

Palabras clave: Inteligencia Artificial Generativa, Chat GPT, Ética en Enfermería, Ética de la Enfermería.

1. Introduction

The rapid advancement of generative artificial intelligence (GAI) has opened new frontiers in nursing education, offering innovative tools to enhance teaching, learning, and clinical decision-making. By producing human-like text, generating personalized learning resources, and simulating complex healthcare scenarios, GAI has the potential to enrich nursing students' academic experiences and prepare them for technologically driven healthcare environments. However, the integration of GAI into nursing curricula also presents multifaceted ethical challenges that demand careful consideration.

The literature highlights those ethical principles such as autonomy, nonmaleficence, beneficence, justice, and explicability should guide AI adoption in nursing education, ensuring that technology serves as a complement rather than a replacement for human judgment and empathy (1). Structured AI ethics education programs have demonstrated positive impacts on nursing students' ethical awareness, moral sensitivity, and attitudes toward the responsible use of GAI in healthcare contexts (2). Furthermore, the role of nurse educators is pivotal in developing strategies, establishing clear guidelines, and fostering critical thinking to ensure ethically sound integration (1, 3).

GAI literacy—defined as the ability to critically evaluate AI-generated content, understand its underlying mechanisms, and responsibly apply it in clinical settings—has emerged as a core competency for future nurses (4). While GAI tools can improve efficiency and conceptual clarity, they also raise concerns regarding the accuracy of generated information, the lack of emotional understanding, and privacy risks associated with sensitive healthcare data (5). In clinical practice, the adoption of AI technologies can enhance patient care delivery but simultaneously introduces ethical dilemmas related to informed consent, accountability, and the preservation of human-centered care (6).

Given the dual nature of opportunities and ethical risks, there is a growing need to investigate the implications of GAI adoption in nursing education from an ethical perspective. This leads to the

central research question: What are the implications of generative artificial intelligence on ethics in nursing education?

2. Methods

The reporting of information sources and search methods follows PRISMA-S (Preferred Reporting Items for Systematic reviews and Meta-Analyses literature search extension) (7). The completed PRISMA-S checklist is provided in Supplementary Table S1.

Eligibility Criteria

We considered peer-reviewed documents (January 2023–August 2025; English/Spanish) that (i) addressed generative AI or conversational AI (e.g., LLMs/ChatGPT or NLP-based chatbots) in an educational use or ethical analysis relevant to nursing; (ii) were situated in nursing education (e.g., undergraduate courses) or nurse-led educational interventions with patients; and (iii) comprised empirical studies (randomized, quasi-experimental, mixed-methods) or principle-based ethical analyses with an explicit framework. We excluded records outside nursing or without educational/ethical focus; purely technical AI performance papers; editorials/opinion without methodological basis; preprints/unpeer-reviewed literature; duplicates; and ‘classical’ AI without linguistic interaction or educational/ethical analysis.

Information Sources and Search Strategy

We searched in PubMed, Scopus, and Web of Science. The window spanned January 2023 to August 2025, with searches performed between August 12 and 14, 2025 (last update: August 14, 2025). No geographic limits were applied; records in English and Spanish were eligible. Full, exact strategies as run are provided in Supplementary Table S2. Reporting of information sources and search methods followed the PRISMA-S extension. The completed PRISMA-S checklist is available as Supplementary Table S1. Study selection and screening. All records retrieved from the databases were exported (RIS/CSV), consolidated in a shared spreadsheet by A.H.L.L., and deduplicated using Rayyan (8). QCRI’s duplicate detection plus manual verification. Deduplicated records were screened independently in Rayyan by eight investigators (A.H.L.L., J.A.C.O., A.M.S., P.C.A.M., G.P.Z.Z., S.C.P.A., T.P.V.S., and R.Y.V.M.). Disagreements at title/abstract were adjudicated by G.P.Z.Z. by discussion. The same group reviewed full texts, with any remaining discrepancies resolved by A.H.L.L. Screening occurred between August 12 and 14, 2025. We identified 5 records (databases = 3; registers = 5). Two duplicates were removed, leaving 3 records for title/abstract screening. Three reports were assessed at full text, and 3 studies were included in the review.

Supplementary Table S1. PRISMA-S Checklist

Section/topic	#	Checklist item	Locations
Information Sources And Methods			
Database name	1	Name each individual database searched, stating the platform for each.	1, 3-4, 7
Multi-database searching	2	If databases were searched simultaneously on a single platform, state the name of the platform, listing all of the databases searched.	NR
Study registries	3	List any study registries searched.	4
Online resources and browsing	4	Describe any online or print source purposefully searched or browsed (e.g., tables of contents, print conference proceedings, web sites), and how this was done.	NR
Citation searching	5	Indicate whether cited references or citing references were examined, and describe any methods used for locating cited/citing references (e.g., browsing reference lists, using a citation index, setting up email alerts for references citing included studies).	NR
Contacts	6	Indicate whether additional studies or data were sought by contacting authors, experts, manufacturers, or others.	NR
Other methods	7	Describe any additional information sources or search methods used.	NR
Search Strategies			
Full search strategies	8	Include the search strategies for each database and information source, copied and pasted exactly as run.	7
Limits and restrictions	9	Specify that no limits were used, or describe any limits or restrictions applied to a search (e.g., date or time period, language, study design) and provide justification for their use.	3-4
Search filters	10	Indicate whether published search filters were used (as originally designed or modified), and if so, cite the filter(s) used.	NR
Prior work	11	Indicate when search strategies from other literature reviews were adapted or reused for a substantive part or all of the search, citing the previous review(s).	NR
Updates	12	Report the methods used to update the search(es) (e.g., rerunning searches, email alerts).	3-4

Dates of searches	13	For each search strategy, provide the date when the last search occurred.	3-4
Peer Review			
Peer review	14	Describe any search peer review process.	NR
Managing Records			
Total Records	15	Document the total number of records identified from each database and other information sources.	4, 8
Deduplication	16	Describe the processes and any software used to deduplicate records from multiple database searches and other information sources.	4

NR= Not reported

Supplementary Table S2. Bibliographic search strategy.

Engine	Strategy	Results
PUBMED	#1= ("Generative Artificial Intelligence" OR "Artificial Intelligence, Generative" OR "Chat GPT" OR "Chat-GPT" OR "ChatGPT" OR "ChatGPTs" OR "Chatbot" OR "Chatbots")	2
	#2= ("Ethics, Nursing" OR "Ethic, Nursing" OR "Nursing Ethic" OR "Nursing Ethics")	
	#3 = #1 AND #2	
SCOPUS	#1= TITLE-ABS-KEY ("Generative Artificial Intelligence" OR "Artificial Intelligence, Generative" OR "Chat GPT" OR "Chat-GPT" OR "ChatGPT" OR "ChatGPTs" OR "Chatbot" OR "Chatbots")	1
	#2= TITLE-ABS-KEY ("Ethics, Nursing" OR "Ethic, Nursing" OR "Nursing Ethic" OR "Nursing Ethics")	
	#3 = #1 AND #2	
WEB OF SCIENCE	#1= ("Generative Artificial Intelligence" OR "Artificial Intelligence, Generative" OR "Chat GPT" OR "Chat-GPT" OR "ChatGPT" OR "ChatGPTs" OR "Chatbot" OR "Chatbots")	2
	#2= ("Ethics, Nursing" OR "Ethic, Nursing" OR "Nursing Ethic" OR "Nursing Ethics")	
	#3 = #1 AND #2	

3. Results

Study Selection

All articles that meet the eligibility criteria, adhere to the temporal restriction (2024-2025), and are available in open access will be included in the review. Studies will be screened for relevance based on their abstract and full-text content, with a focus on those directly addressing the research question: "What are the implications of generative artificial intelligence on ethics in nursing education?" Articles that do not meet these criteria will be excluded (figure 1) (9).

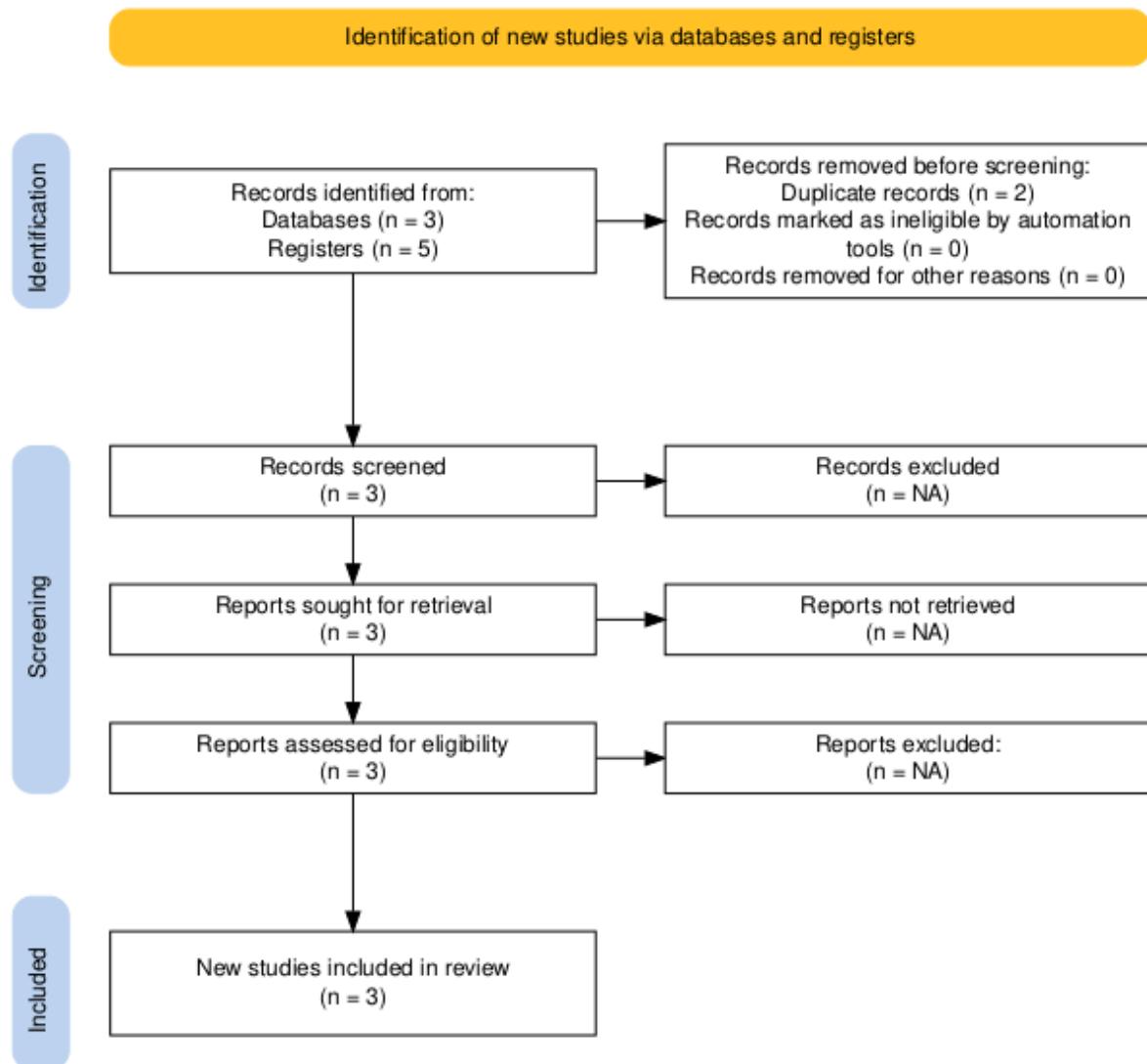


Figure 1. PRISMA 2020 flow diagram.

Data synthesis

Given substantial heterogeneity across study designs (randomized trial, quasi-experimental course evaluation, principle-based ethical analysis), populations, settings, and outcome measures, a quantitative meta-analysis was not prespecified and was not undertaken. Instead, we conducted a narrative thematic synthesis: (i) we summarized study characteristics and effect directions; (ii) we extracted and report key quantitative results from empirical studies (e.g., post-intervention knowledge and attitude scores; nonparametric comparisons for ethical standards and clinical reasoning) without statistical pooling; and (iii) we integrated these findings with a five-principle

ethical framework (beneficence, non-maleficence, autonomy, justice, explainability) to derive pedagogical safeguards and implications. Sensitivity analyses and publication-bias assessments were not applicable due to the absence of meta-analysis.

Outcomes

The outcomes of this study will focus on the key ethical and pedagogical implications identified in the integration of GAI in nursing education, as outlined in the discussion. Specifically, the study will explore how GAI influences the ethical principles of beneficence, non-maleficence, autonomy, justice, and explicability in the context of nursing education. Additionally, the study will examine the implications related to academic integrity, the automation bias, AI "hallucinations," data privacy, and equity, and how these factors impact clinical reasoning and decision-making in educational settings. Furthermore, the study will assess the opportunities GAI presents for enhancing learning and improving knowledge and attitudes among students, conditioned by validated content and human supervision. Finally, the outcomes will include an evaluation of the recommended pedagogical safeguards, such as hybrid designs with "human-in-the-loop," explicit guidelines and responsibilities, transparency, bias audits, data protection by design, and the integration of AI ethics and literacy into nursing curricula, all of which are essential for responsible and measurable adoption in educational and patient safety contexts.

Data Extraction

Data were extracted with a standardized form built around the pre-specified items, applied to every included study by two independent, blinded reviewers. The form captured: Author(s); Year of publication; Origin/country of origin; Aims/purpose; Population and sample size within the source of evidence; Methodology/methods; Intervention type, comparator, and details (including duration); Duration of the intervention; Ethical principles (beneficence, non-maleficence, autonomy, justice, explicability); Academic integrity, automation bias, AI "hallucinations," data privacy, and equity; Opportunities GAI presents for enhancing learning and improving knowledge and attitudes among students; Recommended pedagogical safeguards (hybrid "human-in-the-loop" designs, explicit guidelines and responsibilities, transparency and bias audits, data protection by design, and integration of AI ethics and literacy into nursing curricula). Discrepancies were resolved by consensus and, if needed, by a third reviewer. When items were not reported (NR), this was noted explicitly; study country was inferred from author affiliations when not stated. Ethical-principle coverage was coded dichotomously (present/absent) with exemplar text, and pedagogical opportunities/safeguards were coded thematically with non-mutually-exclusive labels (Supplementary Table S3).

Supplementary Table S3. Characteristics of included studies (part 1).

Authors	Year	Country	Aims / purpose	Population and sample size	Methodology / methods	Intervention type, comparator, and details	Duration of the intervention	Ethical principles
Hyewon Shin, Jennie C. De Gagne, Sang Suk Kim, Minjoo Hong	2024	South Korea	To evaluate the effects of AI-assisted learning on nursing students' ethical decision-making and clinical reasoning in pediatric care.	99 nursing students enrolled in a pediatric nursing course.	Quasi-experimental design with experimental and control groups.	AI-assisted learning with ChatGPT vs. traditional textbooks.	Duration of intervention not mentioned in the summary.	Beneficence, non-maleficence, autonomy, justice, explicability.
Oonjee Oh, George Demiris, Connie M Ulrich	2025	USA	To examine the ethical dimensions of utilizing AI in palliative care.	No specific sample size mentioned, hypothetical cases used.	Ethical analysis based on five moral principles: beneficence, non-maleficence, autonomy, justice, and explicability.	AI technologies like machine learning for mortality prediction, natural language processing for distress detection, and AI chatbots for caregiver support.	No specific duration mentioned for AI technologies in case studies.	Beneficence, non-maleficence, autonomy, justice, explicability.
Shaban M, Osman YM, Mohamed NA, Shaban MM	2025	Egypt	To evaluate the impact of an AI chatbot intervention on knowledge, empowerment, and attitudes toward AI among breast cancer patients.	122 women diagnosed with breast cancer.	Randomized controlled trial with a pre-post design.	AI chatbot-based education plus standard care vs. standard care alone.	Data collected post-intervention; duration of chatbot use not mentioned.	Beneficence, non-maleficence, autonomy, justice, explicability.

Supplementary Table S3. Characteristics of included studies (part 2).

Academic integrity, automation bias, AI hallucinations, data privacy, and equity	Improvements in knowledge and attitudes	Support for clinical learning	Hybrid approach and critical verification	Clear standards and roles	Transparency and bias mitigation	Privacy and equity by design	Specific training in ethics and AI	Academic integrity, automation bias, AI hallucinations, data privacy, and equity
Discusses AI's potential impact on academic integrity, and concerns on biases and inaccurate information propagation.	Enhances nursing students' critical thinking and ethical decision-making skills.	AI helps improve clinical reasoning and ethical decision-making in pediatric nursing.	Hybrid educational approaches combining AI and traditional methods to enhance learning, with attention to critical thinking and verification of data.	Educational frameworks should clarify the roles of AI in the learning process and provide ethical guidelines.	A need for clear explanations of AI processes to students and clinicians to ensure unbiased outcomes.	Developing AI systems that prioritize privacy and ensure equity in healthcare and education.	Training nursing students to critically engage with AI technologies, ensuring they apply ethical standards in their clinical decisions.	Discusses AI's potential impact on academic integrity, and concerns on biases and inaccurate information propagation.
Addressed in terms of ethical concerns like algorithmic bias, privacy issues, and equity in palliative care.	Opportunities to enhance palliative care decision-making and quality of life using AI technologies.	AI applications aim to enhance patient care through personalized decision support.	Ethical guidelines recommend combining AI with traditional healthcare approaches for greater ethical oversight.	Guidelines for integrating AI in clinical practice and healthcare ethics.	The need for transparency in AI's role in decision-making and ensuring fairness.	Ensuring that AI implementations respect patient privacy and ethical standards of equity.	Continuous training in AI ethics and decision-making frameworks for healthcare professionals.	Addressed in terms of ethical concerns like algorithmic bias, privacy issues, and equity in palliative care.
Discussed	Increased	AI	Ensuring that AI chatbots	Ensuring clear	Ethical	Addressing	Incorporating	Discussed

concerns on privacy, data security, and the ethical use of AI.	knowledge and positive attitudes towards AI, enhancing patient empowerment and education in oncology care.	chatbots serve as supplementary tools to reinforce patient education and support in oncology care.	are used to complement traditional care, with ethical safeguards and patient-centered approaches.	roles in managing AI interactions with patients, particularly in healthcare settings.	concerns regarding transparency in AI's operation and mitigating biases during interactions.	privacy concerns and ensuring equity in AI usage for educational purposes in nursing.	AI ethics into nursing education to prepare students for real-world challenges.	concerns on privacy, data security, and the ethical use of AI.
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4. Discussion

This discussion critically examines the integration of GAI in nursing education, articulating four key areas: first, an ethical framework based on beneficence, non-maleficence, autonomy, justice, explicability, and accountability that guides the interpretation of findings; second, the ethical and pedagogical implications identified—including academic integrity, automation bias, AI “hallucinations,” data privacy, and equity—and their impact on clinical reasoning and decision-making; third, the conditioned opportunities that AI offers for scaffolding learning and improving knowledge and attitudes, always subject to validated content and human supervision; and finally, the recommended pedagogical safeguards (hybrid designs with “human-in-the-loop,” explicit guidelines and responsibilities, transparency and bias audits, data protection by design, and AI ethics and literacy integration) requirements for responsible adoption and evaluation in educational and patient safety terms (10-12).

Ethical Framework

The evaluation of GAI use in nursing education should be anchored in the principles of beneficence (1, 5, 13, 14), non-maleficence (5, 15, 16), autonomy (15, 17), justice (18-19), and explicability (1, 4), as well as accountability for its impact on clinical and educational decisions. Operationally, this involves demonstrating tangible educational and care benefits (beneficence) without introducing undue risks such as “plausible” errors or privacy breaches (non-maleficence); preserving the agency of students and faculty with clear information, consent for tool use, and the real possibility to accept, modify, or reject AI recommendations (autonomy); ensuring equitable access, bias mitigation, and alternatives for those facing technological barriers (justice); and demanding sufficient transparency regarding system functionality, limitations, and traceability of outputs to allow critical review (explicability). This framework is completed by defined governance and accountability mechanisms (roles, documentation of human judgment, periodic audits, and appeal routes) so that AI serves as support for clinical and ethical reasoning, without displacing it or obscuring accountability for decisions affecting learning and, by extension, patient safety (10).

Ethical and pedagogical implications

- Academic Integrity and Clinical Reasoning. Regarding its implications, the incorporation of GAI in educational activities can alter clinical reasoning and ethical decision-making; quasi-experimental evidence shows performance differences when learning is assisted by AI, underscoring the need for faculty supervision and robust evaluation criteria (11,18,20).
- Student Autonomy and Automation Bias. Overconfidence in algorithmic outputs can diminish human agency, requiring explicit guidelines to ensure students and faculty can question or depart from AI-generated recommendations without penalties and with ethical justification (1, 4, 5, 10, 21, 22).
- Truthfulness and Hallucinations. Furthermore, generative models may produce plausible yet erroneous content; ethically, this demands systematic source verification, traceability, and explicability mechanisms before incorporating results into educational or care processes (3-5, 10, 16, 23).
- Privacy and Confidentiality. Non-maleficence also entails preventing leaks and improper use of sensitive data; in care contexts, the adoption of AI introduces risks concerning privacy, informed consent, and accountability for assisted decisions (10, 24-25).
- Justice and Equity. From the perspective of justice and equity, the introduction of GAI may amplify inequities (e.g., access barriers and data biases), so its design must incorporate inclusivity criteria and continuous bias evaluation (10, 26-28).
- Explicability and Responsibility. Finally, the opacity of generative systems presents attribution dilemmas, demanding clear governance frameworks and technical transparency for educational and clinical decision-making (10, 29).

Conditioned opportunities

- Improvements in Knowledge and Attitudes. Despite these risks, opportunities exist under appropriate conditions: in health settings, AI chatbots have proven effective in improving patient knowledge and attitudes, suggesting educational potential when the content is validated and accompanied by ethical mentoring (1-4, 12).
- Support for Clinical Learning. Similarly, AI can serve as scaffolding for clinical reasoning if integrated carefully, with faculty supervision and evaluation of ethical and clinical outcomes (3, 5, 11,30).

Recommended Pedagogical Safeguards

- Hybrid Approach and Critical Verification. For responsible adoption, a hybrid approach combining GAI with traditional methods is recommended, reinforcing critical thinking, source verification, and ethical deliberation before accepting AI outputs (10-11, 18, 20).
- Clear Standards and Roles. Clear standards and roles should be defined regarding when and how to use GAI, how to document discrepancies with its recommendations, and who assumes responsibility for errors (1, 4-5, 10, 21, 26, 31).
- Transparency and Bias Mitigation. It is essential to demand comprehensible explanations, periodic audits, and procedures to identify and correct biases (10, 28, 32-33).
- Privacy and Equity by Design. Protecting sensitive data and ensuring accessibility and non-discrimination in implementation (1, 5, 24-26).
- Specific Training in Ethics and AI. Integrating specific training in ethics and AI within the nursing curriculum, linking technical competencies with ethical deliberation (10-11, 14, 34-35).

In summary, GAI offers educational value (especially in supporting and improving knowledge and attitudes when designed rigorously) but introduces concrete ethical risks (truthfulness, autonomy, privacy, justice, and responsibility) that demand a hybrid curricular design, clear standards, critical verification, and ethical and digital literacy for responsible use (10-12).

Limitations and Strength

Among the limitations of this state-of-the-art review is the very small body of eligible evidence (three studies) and their heterogeneity in populations, interventions, comparators, and outcomes, which precluded any meta-analysis. Two of the included studies lacked robust control groups and relied primarily on short-term, self-reported outcomes (e.g., attitudes or perceived empowerment), limiting causal inference and external validity. In addition, the recency of the field and our restricted time window (2023–2025) mean that relevant studies may still be in progress or unpublished; gray literature was not systematically searched, and therefore publication bias cannot be ruled out. Finally, effect sizes are not directly comparable across designs, and long-term ethical/behavioral outcomes were seldom assessed. In terms of strengths, the present review applied a rigorous and transparent methodology aligned with PRISMA-S guidance, used a peer-reviewed multi-database strategy (PubMed, Scopus, Web of Science), implemented independent two-phase screening in Rayyan with consensus resolution, and reported a PRISMA 2020 flow with explicit eligibility criteria and data-extraction procedures—enhancing reproducibility and providing a clear baseline for future studies on generative AI in nursing education.

Future Directions

Next-step research should move beyond short-term, self-reported outcomes to rigorously test generative AI (GAI) in nursing education through randomized and longitudinal designs that compare structured, faculty-scaffolded use versus unstructured access. Studies should include objective, performance-based and ethical-behavioral endpoints (e.g., clinical reasoning quality, integrity breaches, equity impacts), report intervention fidelity and prompting protocols in detail, and adopt a core outcome set to enable cross-study comparability. Implementation-science

approaches are needed to examine feasibility, acceptability, and sustainability across diverse programs, including resource-constrained and multilingual settings. Faculty development, co-design with students and patients, and transparent governance (audit trails, human-in-the-loop oversight, data-protection safeguards) should be embedded in trials.

5. Conclusions

The implications of GAI on ethics in nursing education are dual and structural. Normatively, GAI requires its use to be anchored in beneficence, non-maleficence, autonomy, justice, and explicability, with clear accountability mechanisms, as it introduces specific risks: degradation of ethical reasoning, automation bias, generation of plausible yet erroneous content, and tensions in privacy, equity, and responsibility attribution. Pedagogically, its impact on clinical training is ambivalent: it can serve as scaffolding for reasoning with human supervision and rigorous evaluation, but it can also negatively affect performance in ethical domains if used without appropriate curricular and methodological safeguards. Opportunistically, GAI shows potential to enhance knowledge and attitudes when implemented with validated content and data protection, justifying its conditional and assessable adoption. In summary, ethical implications mandate governance and transparency frameworks; hybrid designs with “human-in-the-loop;” AI literacy and ethics training; and bias and data security audits; only under these conditions can GAI enhance learning without displacing professional judgment or compromising patient safety.

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6. References.

1. De Gagne JC, Hwang H, Jung D. Cyberethics in nursing education: Ethical implications of artificial intelligence. *Nurs Ethics*, 2024, 31(6), 1021-1030. <https://doi.org/10.1177/09697330231201901>
2. Abuadas M, Albikawi Z, Rayani A. The impact of an AI-focused ethics education program on nursing students' ethical awareness, moral sensitivity, attitudes, and generative AI adoption intention: a quasi-experimental study. *BMC Nurs*, 2025, 24(1), 720. <https://doi.org/10.1186/s12912-025-03458-2>
3. Borromeo A., Manaloto A., Santos M., Antonio R., Soyosa M., & Wider W.. Harnessing generative ai in nursing education: a bibliometric review. *Teach Learn Nurs*, 2025, 20(4), e1002-e1011. <https://doi.org/10.1016/j.teln.2025.04.014>
4. Simms RC. Generative artificial intelligence (AI) literacy in nursing education: A crucial call to action. *Nurse Educ Today*, 2025, 146, 106544. <https://doi.org/10.1016/j.nedt.2024.106544>
5. Shen M, Shen Y, Liu F, Jin J. Prompts, privacy, and personalized learning: integrating AI into nursing education-a qualitative study. *BMC Nurs*, 2025, 24(1), 470. <https://doi.org/10.1186/s12912-025-03115-8>
6. Badawy W, Zinhom H, Shaban M. Navigating ethical considerations in the use of artificial intelligence for patient care: A systematic review. *Int Nurs Rev*, 2025, 72(3), e13059. <https://doi.org/10.1111/inr.13059>
7. Rethlefsen ML, Kirtley S, Waffenschmidt S, Ayala AP, Moher D, Page MJ, Koffel JB; PRISMA-S Group. PRISMA-S: an extension to the PRISMA Statement for Reporting Literature Searches in Systematic Reviews. *Syst Rev*, 2021, 10(1), 39. <https://doi.org/10.1186/s13643-020-01542-z>
8. Mourad Ouzzani, Hossam Hammady, Zbys Fedorowicz, and Ahmed Elmagarmid. Rayyan — a web and mobile app for systematic reviews. *Syst Rev*, 2016, 5, 210 <https://doi.org/10.1186/s13643-016-0384-4>

9. Haddaway NR, Page MJ, Pritchard CC, McGuinness LA. PRISMA2020: An R package and Shiny app for producing PRISMA 2020-compliant flow diagrams, with interactivity for optimised digital transparency and Open Synthesis. *Campbell Systematic Reviews*, 2022, 18(2), e1230. <https://doi.org/10.1002/cl2.1230>
10. Oh O, Demiris G, Ulrich CM. The ethical dimensions of utilizing Artificial Intelligence in palliative care. *Nurs Ethics*, 2025, 32(4), 1285-1296. <https://doi.org/10.1177/0969733024129674>
11. Shin H, De Gagne JC, Kim SS, Hong M. The Impact of Artificial Intelligence-Assisted Learning on Nursing Students' Ethical Decision-making and Clinical Reasoning in Pediatric Care: A Quasi-Experimental Study. *Comput Inform Nurs*, 2024, 42(10), 704-711. <https://doi.org/10.1097/CIN.0000000000001177>
12. Shaban M, Osman YM, Mohamed NA, Shaban MM. Empowering breast cancer clients through AI chatbots: transforming knowledge and attitudes for enhanced nursing care. *BMC Nurs*, 2025, 24(1), 994. <https://doi.org/10.1186/s12912-025-03585-w>
13. Sharma M, Sharma S. A holistic approach to remote patient monitoring, fueled by ChatGPT and Metaverse technology: The future of nursing education. *Nurse Educ Today*, 2023, 131, 105972. <https://doi.org/10.1016/j.nedt.2023.105972>
14. Shelke M, Wamane SA, Madhusudhana KG, Kore S, Gawade U. AI-driven nursing education: transforming training and skill development. *AIP Conf Proc*, 2025, 3306, p. 030038 <https://doi.org/10.1063/5.0276466>
15. Han S, Kang HS, Gimber P, Lim S. Nursing Students' Perceptions and Use of Generative Artificial Intelligence in Nursing Education. *Nurs Rep*, 2025, 15(2), 68. <https://doi.org/10.3390/nursrep15020068>
16. Hong M, Shin H, Kim SS, De Gagne JC. Nurse Educators' Perceptions and Experiences of Generative Artificial Intelligence: A Cross-Sectional Study Analysis. *Comput Inform Nurs*, 2025, 43(7), e01273. <https://doi.org/10.1097/CIN.0000000000001273>
17. Summers A, Haddad ME, Prichard R, Clarke KA, Lee J, Oprescu F. Navigating challenges and opportunities: Nursing student's views on generative AI in higher education. *Nurse Educ Pract*, 2024, 79, 104062. <https://doi.org/10.1016/j.nedp.2024.104062>
18. Amankwaa I, Ekpor E, Cudjoe D, Kobiah E, Fuseini AJ, Diebieri M, Gyamfi S, Brownie S. Patterns, advances, and gaps in using ChatGPT and similar technologies in nursing education: A PAGER scoping review. *Nurse Educ Today*, 2025, 153, 106822. <https://doi.org/10.1016/j.nedt.2025.106822>
19. Rony MKK, Ahmad S, Tanha SM, Das DC, Akter MR, Khatun MA, Begum MH, Khalil MI, Peu UR, Parvin MR, Alrazeeni DM, Akter F. Nursing Educators' Perspectives on the Integration of Artificial Intelligence Into Academic Settings. *SAGE Open Nurs*, 2025, 11. <https://doi.org/10.1177/23779608251342931>
20. Simms RC. Work With ChatGPT, Not Against: 3 Teaching Strategies That Harness the Power of Artificial Intelligence. *Nurse Educ*, 2024, 49(3), 158-161. <https://doi.org/10.1097/NNE.0000000000001634>
21. Lane SH, Haley T, Brackney DE. Tool or Tyrant: Guiding and Guarding Generative Artificial Intelligence Use in Nursing Education. *Creat Nurs*, 2024, 30(2), 125-132. <https://doi.org/10.1177/10784535241247094>
22. Sengul T, Bilgic S, Macit B, Sevim F, Alik S, Kirkland-Kyhn H. Evaluation of nursing students' ethical decision-making biases and attitudes toward artificial intelligence in nursing education. *Nurse Educ Pract*, 2025, 86, 104432. <https://doi.org/10.1016/j.nedp.2025.104432>
23. Srinivasan M, Venugopal A, Venkatesan L, Kumar R. Navigating the Pedagogical Landscape: Exploring the Implications of AI and Chatbots in Nursing Education. *JMIR Nurs*, 2024, 7, e52105. <https://doi.org/10.2196/52105>
24. Uddagiri C, Isunuri BV. Ethical and Privacy Challenges of Generative AI. In: Raza K, Ahmad N, Singh D, editors. Generative AI: Current Trends and Applications (Internet). Singapore: Springer Nature Singapore, 2024. p. 219–44. https://doi.org/10.1007/978-981-97-8460-8_11
25. Wang N, Li Y, Cong F. University Students' Privacy Concerns Towards Generative Artificial Intelligence. *J Acad Ethics*, 2025, 24. <https://doi.org/10.1007/s10805-025-09658-4>

26. El Arab RA, Al Moosa OA, Abuadas FH, Somerville J. The Role of AI in Nursing Education and Practice: Umbrella Review. *J Med Internet Res*, **2025**, 27, e69881. <https://doi.org/10.2196/69881>
27. Francis NJ, Jones S, Smith DP. Generative AI in Higher Education: Balancing Innovation and Integrity. *Br J Biomed Sci*, **2025**, 81, 14048. <https://doi.org/10.3389/bjbs.2024.14048>
28. Mohammed SAAQ, Osman YMM, Ibrahim AM, Shaban M. Ethical and regulatory considerations in the use of AI and machine learning in nursing: A systematic review. *Int Nurs Rev*, **2025**, 72(1), e70010. <https://doi.org/10.1111/inr.70010>
29. Wynn M. The ethics of non-explainable artificial intelligence: an overview for clinical nurses. *Br J Nurs*, **2025**, 34(5), 294-297. <https://doi.org/10.12968/bjon.2024.0394>
30. Park GE, Kim H, Go UR. Generative artificial intelligence in nursing: A scoping review. *Collegian*, **2024**, 31(6), 428-36. <https://doi.org/10.1016/j.colegn.2024.10.004>
31. Zlotnikova I, Hlomani H, Mokgetse T, Bagai K. Establishing ethical standards for GenAI in university education: a roadmap for academic integrity and fairness. *Journal of Information, Communication and Ethics in Society*, **2025**, 23(2), 188-216. <https://doi.org/10.1108/JICES-07-2024-0104>
32. Gunawan A, Wiputra R. Ethical Implications of Generative AI in Medicine: A Systematic Review of Current Practices and Future Directions. In: *2024 IEEE 12th Conference on Systems, Process & Control (ICSPC)*. **2024**, p. 239-44. <https://doi.org/10.1109/ICSPC63060.2024.10862569>
33. Hasan SS, Fury MS, Woo JJ, Kunze KN, Ramkumar PN. Ethical Application of Generative Artificial Intelligence in Medicine. *Arthroscopy*, **2025**, 41(4), 874-885. <https://doi.org/10.1016/j.arthro.2024.12.011>
34. Deng X (Nancy), Joshi KD. Promoting Ethical Use of Generative AI in Education. *SIGMIS Database*, **2024**, 55(3), 6-11. <https://doi.org/10.1145/3685235.3685237>
35. Jiang Y, Kong M. The evolution of artificial intelligence on nursing education in China. *Multidiscip. Rev*, **2024**, 7(12), 2024291. <https://doi.org/10.31893/multirev.2024291>



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