Large Language Models in Nursing Education: State-of-the-Art

Daniel RODRIGUES[a,b,1] and Ricardo CRUZ-CORREIA[a,b]
[a] *Department of Community Medicine, Information and Health Decision Sciences (MEDCIDS), Faculty of Medicine, University of Porto, Porto, Portugal*
[b] *VirtualCare, Portugal*

Abstract. This study explores the integration of Large Language Models (LLMs) into nursing education, highlighting a paradigm shift towards interactive learning environments. We aimed to analyze the literature to identify how large language models are being implemented in nursing education, as well as key opportunities and limitations that need to be addressed. English records published since 2022 were retrieved from 4 databases including LLMs in nursing education. A total of 19 records were eligible. As LLMs advanced natural language processing capabilities enable interactive learning experiences, nursing educators are presented with unique opportunities to enhance curriculum delivery, foster critical thinking, and simulate complex clinical scenarios. Through a comprehensive analysis of current applications, limitations and future research, this paper navigates the complexities of adopting LLMs (eg ChatGPT) in nursing education. This paper concludes with a call for action to advance the integration of AI in nursing, enhancing educational outcomes while ensuring ethical, effective use.

Keywords. Large Language Models, nursing education, clinical simulation, ChatGPT, natural language processing

1. Introduction

Since ChatGPT, an advanced language generation model, became publicly available in November 2022 [1], it has sparked significant interest for its potential to transform the delivery, personalization, and experience of every level of education. Large Language Models that allow solutions as ChatGPT are trained on large amounts of text data and can generate human like content in response to user prompts with high levels of accuracy [2].

The integration of AI technologies into higher education, especially in practical fields such as nursing, prompts a balanced discussion on its benefits versus challenges [3]. While AI offers innovative ways to enhance student learning through personalized educational content and efficient creation of diverse teaching materials, it necessitates careful consideration due to its disruptive nature [2]. AI chatbots, in particular, enables educators to develop tailored materials and simulations, facilitating a more interactive learning environment without the traditional constraints of resource availability or high costs [2,4].

---

[1] Corresponding Author: Daniel Rodrigues, VirtualCare, R. Alfredo Allen n.º 455-461, 4200-135 Porto (Portugal); E-mail: danielrodriguesmim@gmail.com.

Additionally, AI chatbots offer healthcare students an innovative educational experience through its interactive clinical simulations, which present them with fictional patient encounters [5], with it being capable to dynamically adjust to the decisions made by the user. It allows students to witness firsthand the consequences of their clinical decisions, enabling them to learn from both their successes and errors in a safe, simulated environment [5, 6].

Furthermore, the incorporation of AI in nursing education aligns with the objectives of preparing a workforce capable of leveraging digital health technologies. As healthcare increasingly embraces digital solutions for patient care, nursing courses must evolve to equip students with the necessary skills and competencies to thrive in technologically advanced healthcare settings [7].

However, there are challenges that warrant careful consideration. Ethical concerns, the potential for bias in AI-generated content, and the need for critical oversight to ensure the accuracy and relevance of AI and LLM learning experiences are paramount. Educators are tasked with incorporating AI tools into their teaching strategies and promoting an educational environment that encourages critical thinking, ethical reasoning, and a deep understanding of its implications in healthcare [8].

This paper explores the opportunities for enhancing clinical simulation and learner engagement, addresses the challenges inherent in adopting AI technologies, and proposes future directions to effectively integrate LLMs into nursing courses to prepare students for the future of nursing practice.

2. Methods

2.1. Database search strategy

The search spanned across PubMed, SCOPUS, IEEE Xplore and Wiley Online Library, with the following string or similar: ("Large Language Models" OR "LLMs" OR "Natural Language Processing" OR "chatGPT" OR "GPT") AND ("nursing education" OR "nursing training" OR "healthcare education").

2.2. Inclusion and Exclusion Criteria

The selection criteria included English language papers that delve into employing LLMs in nursing education. Conversely, exclusions were applied to non-English papers, works not intrinsically linked to nursing education, those
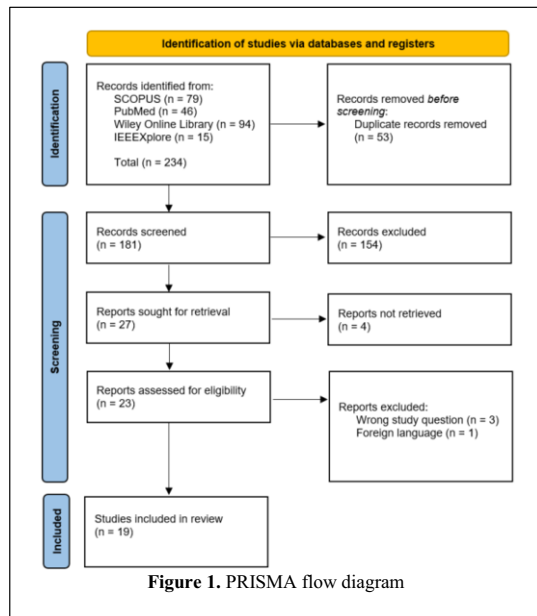

Figure 1. PRISMA flow diagram

beyond the educational scope, and duplicate entries. The complete list of articles analyzed is included in the references section: [7-25].

2.3. Data Extraction

Data extracted from selected publications included: Study objectives, Research methods, Applications and opportunities in nursing education, Limitations, Future directions, and Conclusions.

3. Results

3.1. Research methods

The 19 studies selected can be divided in 3 groups of research methods: (a) Commentary, editorials, contemporary issues and reflections [7,9-11,14,15,17, 19-23, 25]; (b) Reviews [8,24]; (c) Empirical research [12,13,16,18].

3.2. Applications/Opportunities in nursing education and Limitations

In (a) the authors provided insights into the integration and implications of technologies like ChatGPT in nursing. Ahmed discusses its potential to revolutionize nursing by enhancing patient care and education [14], while Abdulai and Hung critically examine ethical challenges, particularly how ChatGPT might conflict with nursing's core values [13]. Lastly, Sharpnack reflects on personal experiences with AI in education, discussing its innovative potential and the challenges it poses to traditional methods [27].
In (b) the authors offer comprehensive analyses applications and implications. A narrative review conducted a SWOT analysis, recognizing ChatGPT's strengths in accessibility and adaptability, and highlights opportunities for enhancing simulations and collaborative learning [12]. However, it also notes weaknesses such as dependency issues and the potential for misinformation, stressing the need for careful implementation [12]. The scoping review similarly praises ChatGPT's potential to personalize education but warns of risks concerning data privacy and academic integrity [28]. Both reviews advocate for responsible usage, ongoing evaluation, and the involvement of all stakeholders in navigating the integration of ChatGPT into nursing education effectively.
In (c), the studies focused mainly on the application of ChatGPT in personalized learning [16,17,22] and clinical simulation [17,20]. One experimental study involved twelve nursing students who interacted with ChatGPT simulating a dyspnea patient, focusing evaluating the acceptability, accessibility, and engagement of students with the virtual patient, providing empirical data that suggested its utility in enhancing student interaction skills within simulated environments [17]. Another study involving two classes of undergraduate nursing students compared traditional teaching methods against AI-enhanced methods using ChatGPT, measuring outcomes such as critical thinking, problem-solving skills, and learning satisfaction. The study offered quantitative evidence that ChatGPT improved educational outcomes, demonstrating its effectiveness over conventional approaches [20]. In a case study that applied GPT 4.0 within nursing education, aligning it with Benner's theory of skill acquisition, explored how tailored

interactions with ChatGPT could support the development of nursing knowledge and skills.

The opportunities and limitations described by the authors can be summarized in the topics presented in Table 1.

Table 1. Opportunities and limitations for Large Language Models in Nursing Education

Opportunities for Large Language Models in Nursing Education	
Personalized Learning Solutions	(7),(8),(10),(12), (13),(18),(20),(21), (24),(25)
Virtual Learning and Simulation	(8),(13),(14),(16), (19),(20),(22),(23),(24)
Educational Content and Skill Development	(9),(11),(12),(14),(15),(17),(23)
Digital Literacy and Efficiency	(9),(15),(20)
Clinical Support and Collaboration	(8),(10),(18),(23)
Limitations of Large Language Models in Nursing Education	
Privacy, Security, and Ethical Concerns	(9),(10),(11),(12),(13),(14),(18),(19), (20),(21),(22),(23)
Impact on Nurse-Patient Relationship	(8),(9),(10),(14),(15),(17),(18),(20),(21)
Limitations in AI's Capabilities and Reliability	(7),(8),(13),(15),(16),(17),(19),(20),(22)
Academic Integrity	(7),(11),(12),(20),(23),(24),(25)
Accessibility and Equity Challenges	(7),(17),(20),(25)

4. Discussion

Empirical research is essential to understand the potential impacts and benefits of using LLMs in nursing education. The analysis of (c) studies, suggests that ChatGPT can effectively simulate real-life scenarios in clinical education. The findings indicated that ChatGPT is acceptable and accessible as a training tool and can engage students effectively and provided quantitative evidence that ChatGPT can be more effective than conventional teaching methods. Future studies should focus on identifying effective strategies to implement LLMs into nursing courses, ensuring that these technologies complement traditional teaching methods and support the development of nursing competencies. Future research should also evaluate how these technologies can be used to simulate real-life clinical scenarios, providing students with valuable hands-on experience in a controlled and safe environment.

Another critical aspect is addressing the ethical considerations that arise with the use of generative AI in in nursing education about data privacy, the accuracy of information provided, and the potential for bias in AI-generated content.

Lastly, nursing educators should explore how they can adopt these technologies in a way that adheres to ethical standards and respects the privacy and dignity of both students and patients.

5. Conclusions

In this paper, we conducted a narrative literature review of LLMs in nursing education, summarizing applications and opportunities, limitations, and future directions. Results showed a lack of original research papers in this field, which emphasizes an essential need for more studies implementing LLMs in nursing education. There are calls for evaluations to ensure AI's adherence to nursing values, developing strategies to mitigate AI biases, and creating privacy and security frameworks, reinforcing ethical

considerations. The majority of the authors also agree it is vital to expand AI literacy within nursing courses and maintain human touch in nursing care alongside AI. This paper concludes with a call for action to advance the integration of AI in nursing, enhancing educational outcomes while ensuring ethical, effective use.

6. References

[1] OpenAI C. Optimizing language models for dialogue, 2022. URL: https://openai com/blog/chatgpt. 2023.
[2] Irwin P, Jones D, Fealy S. What is ChatGPT and what do we do with it? Implications of the age of AI for nursing and midwifery practice and education: An editorial. Nurse Education Today. 2023;127:105835.
[3] Secinaro S, Calandra D, Secinaro A, Muthurangu V, Biancone P. The role of artificial intelligence in healthcare: a structured literature review. BMC Medical Informatics and Decision Making. 2021;21(1).
[4] Swiecki Z, Khosravi H, Chen G, Martinez-Maldonado R, Lodge JM, Milligan S, et al. Assessment in the age of artificial intelligence. Computers and Education: Artificial Intelligence. 2022;3:100075.
[5] Scherr R, Halaseh FF, Spina A, Andalib S, Rivera R. ChatGPT Interactive Medical Simulations for Early Clinical Education: Case Study. JMIR Medical Education. 2023;9:e49877.
[6] Glauberman G, Ito-Fujita A, Katz S, Callahan J. Artificial Intelligence in Nursing Education: Opportunities and Challenges. Hawaii J Health Soc Welf. 2023;82(12):302-5.
[7] Tam W, Huynh T, Tang A, Luong S, Khatri Y, Zhou W. Nursing education in the age of artificial intelligence powered Chatbots (AI-Chatbots): Are we ready yet? Nurse Education Today. 2023;129:105917.
[8] Abujaber AA, et al. A Strengths, Weaknesses, Opportunities, and Threats (SWOT) Analysis of ChatGPT Integration in Nursing Education: A Narrative Review. Cureus. 2023.
[9] Abdulai AF, Hung L. Will ChatGPT undermine ethical values in nursing education, research, and practice? Nursing Inquiry. 2023;30(3).
[10] Ahmed SK. The Impact of ChatGPT on the Nursing Profession: Revolutionizing Patient Care and Education. Annals of Biomedical Engineering. 2023;51(11):2351-2.
[11] Alkhaqani AL. ChatGPT and Nursing Education: Challenges and Opportunities. Al-Rafidain Journal of Medical Sciences. 2023;4:50-1.
[12] Athilingam P, He H-G. ChatGPT in nursing education: opportunities and challenges. Teaching and Learning in Nursing. 2024;19(1):97-101.
[13] Benfatah M, Marfak A, et al. Assessing the efficacy of ChatGPT as a virtual patient in nursing simulation training: A study on nursing students' experience. Teaching and Learning in Nursing. 2024.
[14] Berşe S, Akça K, Dirgar E, Kaplan Serin E. The Role and Potential Contributions of the Artificial Intelligence Language Model ChatGPT. Annals of Biomedical Engineering. 2024;52(2):130-3.
[15] Castonguay A, Farthing P, et al. Revolutionizing nursing education through Ai integration: A reflection on the disruptive impact of ChatGPT. Nurse Educ Today. 2023;129:105916.
[16] Chang C-Y, Yang C-L, Jen H-J, Ogata H, Hwang G-H. Facilitating nursing and health education by incorporating ChatGPT into learning designs. 2023.
[17] Choi EPH, et al. Chatting or cheating? The impacts of ChatGPT and other artificial intelligence language models on nurse education. Nurse Education Today. 2023;125:105796.
[18] Goktas P, Kucukkaya A, Karacay P. Utilizing GPT 4.0 with prompt learning in nursing education: A case study approach based on Benner's theory. Teaching and Learning in Nursing. 2024.
[19] Gosak L, Pruinelli L, Topaz M, Štiglic G. The ChatGPT effect and transforming nursing education with generative AI: Discussion paper. Nurse Education in Practice. 2024;75:103888.
[20] Liu J, Liu F, Fang J, Liu S. The application of Chat Generative Pre-trained Transformer in nursing education. Nursing Outlook. 2023;71(6).
[21] Miao H, Ahn H. Impact of ChatGPT on Interdisciplinary Nursing Education and Research. Asian Pacific Island Nursing Journal. 2023;7.
[22] Qi X, Zhu Z, Wu B. The promise and peril of ChatGPT in geriatric nursing education: What We know and do not know. Aging and Health Research. 2023;3(2):100136.
[23] Sharpnack PA. Made Better by Chat GPT: Cultivating a Culture of Innovation in Nursing Education: Nursing Education Perspectives. 2024;45(2):67-8.
[24] Shorey S, Mattar C, Pereira TL, Choolani M. A scoping review of ChatGPT's role in healthcare education and research. Nurse Educ Today. 2024;135:106121.
[25] Thakur A, Parikh D, Thakur A. ChatGPT in nursing education: Is there a role for curriculum development? Teaching and Learning in Nursing. 2023;18(3):450-1.