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Artificial Intelligence-Assisted Nursing Interventions in The Care of Children with Cancer: A Review Study

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Abstract

Background: Children with cancer face significant physical and psychological challenges that impact their overall well-being and quality of life. The prevalence of childhood cancer is significant. Artificial intelligence (AI) is increasingly being integrated into nursing interventions for children with cancer, enhancing care through various innovative approaches. AI technologies facilitate improved decision-making, patient monitoring, and psychosocial support, ultimately aiming to improve the quality of life of pediatric oncology patients.

Materials and Methods: Data were collected from PubMed, Scopus, SID, Google Scholar and Web of Science databases for articles published between 2019 and 2025. Keywords such as "AI", "nursing interventions", "children" and "cancer" were searched. A search strategy was created in PubMed using AI [title/abstract], nursing interventions [title/abstract], children [title/abstract], and cancer [title/abstract].

Results: AI tools can help nurses identify early signs of cancer through analysis of patient data, imaging, and biomarkers, enabling timely interventions. Nurses can use AI-powered simulations to practice complex cancer care scenarios, improving their skills and confidence.

Conclusion: AI nursing interventions promise to revolutionize cancer care by increasing accuracy, efficiency, and patient-centeredness. However, successful integration requires addressing technical, ethical, and practical challenges while ensuring that nurses remain at the forefront of care delivery. By using AI as a complementary tool, nurses can provide more comprehensive, evidence-based care that meets the complex needs of pediatric oncology patients.

Key Words: Artificial intelligence, Children, Cancer, Nursing interventions.

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1- INTRODUCTION

Cancer remains a primary cause of mortality globally, and enhancing patient survival hinges on the timely detection of the disease. Early diagnosis coupled with swift treatment is essential to boost patient survival rates and decrease the extensive morbidity and mortality linked to cancer. The contribution of nursing to cancer care is indispensable. Nurses play a pivotal role in administering cancer survivorship care, which is integral to sustaining an elevated quality of life for patients. This type of care significantly mitigates stress, serving as a strategic approach to enhance the quality of life (1).

Children diagnosed with cancer encounter numerous physical and psychological hurdles that affect their overall health and quality of life. Annually, around 200,000 new cases of childhood cancer are identified worldwide, primarily affecting children with an average age of 7.6 years. It is crucial to comprehend the complex impact of cancer on these young patients to devise effective support mechanisms. The field of cancer care is extensive, and it is inconceivable to overlook the potential contributions of Artificial intelligence (AI) in this arena (2). AI has proven to be a valuable asset in cancer diagnosis, employing learning algorithms to analyze large datasets for precise and efficient outcomes. Moreover, AI is progressively being incorporated into nursing practices within cancer care, presenting novel approaches that enhance patient results, optimize workflow, and improve care quality (3).

While AI holds the promise to revolutionize cancer diagnosis, several challenges must be addressed, including the requirement for extensive data, technological constraints, and ethical considerations. Exploring AI's capabilities in cancer diagnosis allows researchers to better understand its benefits in enhancing patient outcomes and reducing mortality rates. AI algorithms have the capacity to process enormous amounts of data, performing analyses and integrations that surpass human capabilities (4).

Traditional nursing practices, which often rely on rote memorization or skill acquisition through repeated practice, are becoming increasingly obsolete. Nonetheless, nurses must adapt to utilizing AI -generated information confidently, necessitating new competencies such as a deeper understanding of data science, programming, and statistics. These skills will empower nurses to input data accurately, interpret algorithmic results, and convey AI -informed care plans to patients effectively (5).

Ignoring the role of AI in nursing parallels past failures to adopt technological innovations. However, it is critical to recognize that indiscriminate acceptance of AI also poses risks. Misdiagnoses can occur within clinical processes where AI assists decision-making; hence, responsibility and accountability must be integrated into these systems. Although AI may have fewer inherent errors and biases than humans, these can still result in misdiagnoses and harm to patients (6). Therefore, careful monitoring and the establishment of stringent guidelines and policies are essential for the application of AI in nursing practices, ensuring oversight by adequately trained specialist nurses (7).

Concerns will arise regarding the confidentiality of patient data and the extent of informed consent necessary for sharing clinical datasets with computer algorithms (8). It is essential that nurses receive training to manage and understand their control over this data, including its usage and the associated risks and benefits. While decision-making facilitated by computer algorithms may be more precise, repeatable, and reliable, it necessitates a comprehensive understanding and assurance that privacy and security are upheld. The role of nurses will be pivotal

in fostering the trust that exists between them and their patients (9).

2- MATERIALS AND METHODS

The design of this review study was conducted to identify the role of AI-assisted nursing interventions in the care of children with cancer using a review study. Data from the search strategy were collected from electronic databases including PubMed, Scopus, and Web of Science. English-language articles published between 2019 and 2025 were included in the search. The databases were searched using keywords such as “AI”, “Nursing Interventions” , “Children” and “Cancer”. In PubMed, the search strategy was: (AI [title/abstract]) and (Nursing Interventions [title/abstract]) and (Cancer [title/abstract]) and (Child [title/abstract]). The search strategy was supervised by a highly experienced informatics expert. To broaden the search process, a manual search was conducted in the reference lists of retrieved articles, and grey literature was also searched. Out of the 200 studies initially identified, only reputable articles published in reputable journals, quantitative, experimental or mixed studies, and articles published between 2019 and 2025 were reviewed. Analysis was conducted by combining findings across studies to identify common themes and variations in outcomes. A total of 21 studies met the inclusion criteria and were included in the final analysis. Studies that did not address barriers to process implementation were excluded (Figure 1) (10).

3- DISCUSSION

AI has the capability to analyze various patient data, such as genetic profiles, treatment histories, and lifestyle choices, to predict responses to treatments and tailor personalized care plans (11). AI-powered tools equip nurses with evidence-based suggestions for managing symptoms, adjusting medications, and providing supportive care. These tools also enable patients to report symptoms instantly, allowing for swift nursing interventions. Moreover, AI can offer patients self-care advice and reminders for medications or appointments.AI is valuable in identifying patients who might need palliative care by forecasting disease progression and survival rates. In pediatric oncology, AI is being increasingly incorporated into nursing practices, enhancing care through innovative methods that support decision-making, patient monitoring, and psychosocial care, ultimately aiming to enhance life quality (12).

AI technologies assist nurses in detecting early signs of cancer through the analysis of patient data, imaging, and biomarkers, which facilitates timely medical actions. Nurses can utilize AI-driven simulations to rehearse complex cancer care scenarios, thereby boosting their proficiency and confidence (13). Research by Saber et al. (2024) demonstrates that AI tools, including predictive models, natural language processing, and mobile applications, provide novel means for early disease detection, risk evaluation, personalized care planning, and continuous support in patient and nursing care. AI also offers nurses decision-support tools for evidence-based interventions, which help reduce care variability and enhance adherence to clinical protocols (14).

Papachristou et al. (2023) highlighted the importance of nurses understanding the distinct aspects of data science, analytics, and automation for the successful creation and implementation of AI-assisted data-driven interventions in cancer care. Adhering to established AI principles and frameworks is crucial for the ethical and secure use of AI in oncology nursing. Efforts should be directed towards making AI -assisted nursing interventions accessible and effective across varied healthcare systems and populations (15).

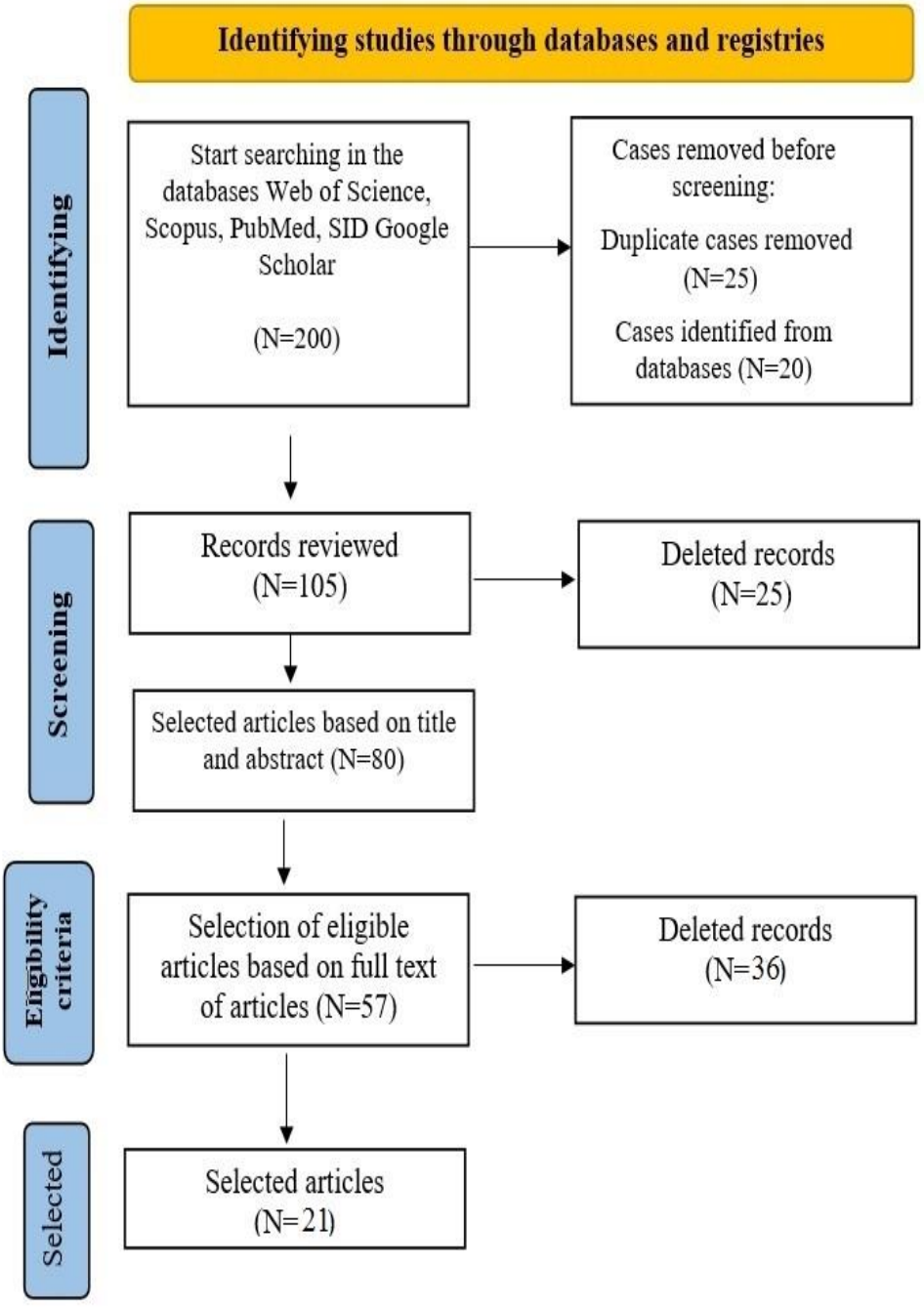

Figure-1. article search flowchart (10).

According to Fionda et al. (2024), AI holds significant potential in supporting patients receiving modern interventional radiotherapy (brachytherapy) (16).

The incorporation of AI into healthcare has enhanced the efficiency and customization of treatments according to individual patient needs and preferences, thereby elevating the quality of care and patient outcomes (17). AI technologies are capable of analyzing behavioral and clinical data to identify patients who may be at risk of conditions such as anxiety, depression, or other psychosocial issues. This allows nurses to either intervene directly or refer these individuals to mental

health specialists for further care (18). Research by Tran et al. (2019) highlights that AI's role in cancer care extends beyond enhancing diagnostic accuracy and treatment efficacy. It also contributes significantly to the fields of precision medicine and the evaluation of patient-reported outcomes. Furthermore, AI is increasingly being employed in nursing practices within oncology, improving patient support and management (19).

Dalmini et al. (2020) have documented the current advantages of AI in healthcare, noting rapid advancements and the ongoing emergence of new applications. For AI to be effectively integrated into clinical settings, its performance must match or surpass that of human practitioners, particularly when systems are fully integrated. However, the integration of AI into nursing practice is not without challenges (20). Issues such as data privacy and the necessity for human oversight in complex situations remain concerns. Despite these hurdles, AI has the potential to enhance the interpretation of patient-reported symptoms, aid in clinical management, and improve communication between nurses and patients, facilitating better-informed decision-making processes. In pediatric oncology, AI techniques could play a crucial role in enhancing early cancer detection, thus minimizing missed diagnostic opportunities and strengthening the overall safety net for young patients. Although some successful examples of phased validation exist, much of the research in this area is still in preliminary stages (21).

4- CONCLUSION

AI-assisted interventions in cancer care hold immense promise for transforming the field of oncology nursing by making care delivery more efficient, personalized, and effective. Nonetheless, the successful deployment of these technologies requires careful navigation of ethical, technical, and human considerations to ensure that nurses continue to play a central role in patient care. AI -driven tools in cancer care are reshaping how nurses manage care by supporting decision-making processes, personalizing patient interactions, and optimizing the use of resources. These technologies provide precise, timely information about patients' conditions and available treatment options, along with self-care advice. They also offer emotional support and address common patient inquiries, thereby alleviating some of the pressures on nursing staff. Overall, AI-assisted nursing interventions are set to revolutionize oncology care by enhancing accuracy, efficiency, and patient focus. However, integrating these technologies successfully will require overcoming significant technical, ethical, and practical challenges while ensuring that nurses maintain their critical role in healthcare delivery. By using AI as a complementary tool, nurses can provide more comprehensive, evidence-based care that meets the complex needs of cancer patients. As the field continues to evolve, ongoing collaboration, education, and innovation will be key to realizing the full potential of AI in cancer nursing.

5- CONFLICTS OF INTEREST

The authors declare that they have no competing interests.

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