



Can Artificial Intelligence Assist Nurses in Planning the Nursing Care of a Child with Acute Lymphoblastic Leukemia?

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Abstract

Background Today, the rapid development of artificial intelligence (AI) based technologies and their widespread use in the health sector offer important opportunities in the field of nursing practices and patient care. Therefore, there is a need for research to better understand and evaluate the impact of AI-based applications on nursing. In this study, we aimed to determine and evaluate the nursing care practices planned by AI for a pediatric case diagnosed with acute lymphoblastic leukemia.

Methods Within the scope of the study, a hospitalization scenario for a child diagnosed with acute lymphoblastic leukemia was created by the researchers in line with the literature. The scenario and five open-ended questions were directed to ChatGPT (OpenAI), an AI application. The responses were evaluated in line with the literature.

Results It was determined that AI did not include the measurement of vital signs in the planning of nursing care for the current problems of the child diagnosed with acute lymphoblastic leukemia, and could not detect anemia, thrombocytopenia, alopecia, and nausea/vomiting among the possible problems of the child.

Conclusion Although it is thought to address the patient in a multidimensional way with its responses, the knowledge, experience, and equipment of the nurse are needed to filter the information provided by AI. In line with the data obtained, it is recommended that nurses make a final assessment for the appropriateness of the intervention when deciding to follow an AI-based recommendation.

Keywords

- ▶ acute lymphoblastic leukemia
- ▶ artificial intelligence
- ▶ nursing care
- ▶ pediatric nursing

Introduction

Artificial intelligence (AI) is a general term used to describe techniques developed to teach computers to mimic human-like cognitive functions such as learning, reasoning, communicating, and decision-making.¹ Research on the use of AI-based technologies in health care has increased in recent years, and AI applications have great potential to assist patient care and improve care practices.²

During clinical practice, nurses are always faced with situations that require careful decision-making. Inherent in the decisions to be made is the choice between choices that can be complex.³ It is critical for the nurse to reach an effective clinical decision through comprehensive information sources and reliable information in a supportive environment.⁴ With the support of AI technology, it is aimed to improve empirical nursing knowledge and facilitate nursing care by creating clinical nursing guidance for different patients.⁵

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If AI algorithms can be effectively translated into patient care practices, both nurses and patients can benefit.⁶ In this regard, it is necessary to determine the contributions of AI-based technologies to nursing.¹ One of these AI-based technologies is ChatGPT, which has recently gained a lot of attention. Developed by OpenAI (OpenAI, L.L.C., San Francisco, CA, United States), ChatGPT is a chatbot (a program that can understand and generate responses using a text-based interface) and generative pretrained transformer.⁷ Despite the growing popularity and performance of ChatGPT, there is still a lack of studies evaluating its use in clinical practice.⁸ ChatGPT is programmed to have a humanlike conversation and is tasked with answering questions, including clinical situations that clinicians encounter in their daily practice. However, there are concerns that ChatGPT can be directly relied upon to generate scientific evidence for clinical decision-making. This is because it is debatable whether ChatGPT can replace the standard practice of evidence synthesis, which involves literature review, critical appraisal, data collection, and combining the findings of various studies to obtain an evidence-based answer to a clinical question.⁹

In the literature, studies utilizing AI in the care delivery of pediatric hemato-oncology patients are rare. In one study, ChatGPT was asked, "What should be said when leukemia is suspected in a child under the age of 7?" and it was found that ChatGPT generated a text appropriate for the child's age, explained the illness in simple terms, and reassured the child that they would not be alone in the hospital.¹⁰ With such capabilities, ChatGPT can be a significant support tool in the care of pediatric hemato-oncology patients.

As both potential users of AI-based technologies and professional caregivers, nurses are in a key position to drive the evolution of modern AI in nursing.¹¹ Studies contributing to the literature are needed to elucidate the impact of AI-based technologies on nursing, including implementation and clinical outcomes.² Therefore, this study aimed to determine and evaluate the care practices planned by ChatGPT for a pediatric patient diagnosed with acute lymphoblastic leukemia (ALL).

Methods

In the first stage of this review study, the researchers created a hospitalization scenario of a child diagnosed with ALL in line with the literature.¹²⁻¹⁴ ChatGPT, an AI application, was used for this study. Five open-ended questions were directed to the AI with the scenario prepared to evaluate ChatGPT's suggestions for nursing care in this case. The questions were directed to the AI one by one and the responses from ChatGPT were recorded. In the discussion part of this study, the responses obtained from ChatGPT are evaluated in line with the experiences of the researchers and literature information.

- What are the nursing interventions for this child's current problems?
- What are the nursing interventions for this child's possible problems?

- What are the nursing interventions for this child's laboratory findings?
- What are the nursing interventions for the side effects of the medicines used by this child?
- What are the nursing interventions that should be addressed psychosocially for this child?

Case Presentation

An 11-year-old girl, H.A., was admitted to the hospital with complaints of abdominal pain, loss of appetite, weakness, cough, and fever (38.2°C). As a result of bone marrow aspiration, a diagnosis of ALL was made and she was hospitalized for chemotherapy. Anthropometric measurements revealed a weight of 25 kg (<3rd percentile) and a height of 135 cm (3th-10th percentile). The patient's laboratory findings were hemoglobin (HGB): 9.7 g/dL; hematocrit (HCT): 28.2%; red blood cell (RBC): $3.42 \times 10^6/\mu\text{L}$; white blood cell (WBC): $10.56 \times 10^3/\mu\text{L}$; platelet (PLT): $125 \times 10^3/\mu\text{L}$; and C-reactive protein (CRP): 4.3 mg/L. The physician prescribed methylprednisolone 60 mg/m²/d intravenously (divided into 3 doses), vincristine sulfate 1.5 mg/m²/dose intravenously, L-asparaginase 5,000 IU/m²/dose as a 1-hour infusion, methotrexate 12 mg, and metoclopramide hydrochloric acid (HCL; as needed).

Discussion

The treatment and care of leukemia is complex.¹⁵ Pediatric nurses are at the forefront of the care provided to these patients.¹⁶ In the literature, it is stated that AI applications such as ChatGPT may have benefits in terms of patient-specific planning in the treatment and care of complex diseases.¹⁷ Within the scope of this study, we aimed to examine and evaluate the practices that AI can predict in pediatric nursing care of a complex disease such as ALL. For this purpose, in the first question we directed to ChatGPT, it is seen that nursing care for the current problems of the patient is presented in a very comprehensive manner. Vital signs are important indicators for monitoring the side effects of chemotherapeutic drugs and early detection of complications related to the disease. Vital signs such as body temperature, pulse, respiration, and blood pressure are important parameters that should be carefully monitored in children with ALL.¹⁴ When the AI's responses to our case and our input question were examined, no output regarding the measurement of vital signs within the scope of the child's nursing care was found. It was observed that only body temperature monitoring was included under the fever management output (► **Supplementary File** - Box. Nursing Interventions for Current Health Problems).

AI provided comprehensive nursing interventions in identifying potential problems and offering solutions for a child with ALL. In addition to physical problems such as pain, infection, mucositis, and nutritional problems that may develop in the child, the answers suggesting to address the psychosocial aspects of the child and family are noteworthy in terms of holistic care delivery. On the other hand, although AI addressed neutropenic precautions, it did not address the issue of food

hygiene that should be considered in a child with ALL and low neutrophil count. Similarly, although the child in this case had a low PLT count, there were no recommendations for the assessment of thrombocytopenia and management of bleeding risk. It is known that children with ALL experience nausea and vomiting due to chemotherapeutic agents and this is a symptom that decreases the quality of life of children with ALL. It is remarkable that nausea and vomiting were not included among the potential problems (► **Supplementary File - Box. Nursing Interventions for Possible Health Problems**).

In the AI's responses to the laboratory findings of our patient, it was observed that data unrelated to the laboratory findings were presented. Irrelevant data (pain management, psychosocial support, education, etc.) may cause AI to create confusion on clinician nurses, which may cause time loss in patient care planning or delivery. This may indicate the need for nurses to filter the information needed by the patient from the AI's responses, and thus the need for knowledge and experience on the part of the nurse. Moreover, although the case had anemic findings, there was no suggestion in the outputs of the AI to include iron-rich foods in the child's diet (► **Supplementary File - Box. Nursing Interventions for Laboratory Findings**).

AI provided detailed information separately for five different drugs included in the child's order. However, it was observed that alopecia, a common and widespread side effect of chemotherapeutics, was not mentioned. In addition, in the case presented to the AI, although the patient's order stated that methylprednisolone would be administered intravenously, the AI ignored this input and suggested "Administer the medication with food or milk to minimize gastrointestinal upset" for oral medication use (► **Supplementary File - Box. Nursing Interventions for Side Effects of the Medicines**). In health care, accuracy of information is very important and the presence of misinformation can lead to serious problems. It is very important for nurses to conduct a meticulous review process to ensure that AI practices do not cause patient safety problems.

When the responses within the scope of psychosocial care of the child with ALL were examined, it was seen that AI offered suggestions in line with atraumatic, holistic, and family-centered care approaches. In addition, the fact that AI addresses issues such as sibling support, self-care for caregivers, cultural and spiritual needs, which may be overlooked by nurses in the case of a disease such as ALL, whose care is quite complex, was evaluated as an innovation that can support nursing care. It can be stated that this approach of AI has positive results in terms of strengthening the capacity of nurses to provide multidimensional care (► **Supplementary File - Box. Psychosocial Nursing Interventions**).

Conclusion

AI can be considered as a guiding technological development in nursing care. In this study, which evaluated the responses of AI application for the care of a child with ALL, AI was found to provide comprehensive recommendations in patient care. In the near future, AI technology may be a supportive source

of information for nurses to provide individualized evidence-based care. Although it is thought to address the patient in a multidimensional way with its responses, knowledge, experience, and equipment of the nurse are needed to filter the information provided by AI. Although AI provides detailed information about patient care, it makes this assessment with the data collected by the nurse's observations, physical examination practices, and communication skills in planning care for the patient. Nursing care involves dynamic processes such as collecting data from the patient and observing the patient. Therefore, in order to receive information from AI, the nurse needs to determine the current data and changes related to the patient and present them to AI. Nurses can make more effective decisions by integrating the information provided by AI with their clinical experience and theoretical knowledge. For instance, they can evaluate AI recommendations in light of the patient's individual condition and medical history, while also considering the patient's specific needs. In this way, by combining theory and practice, nurses can utilize the information provided by AI to its fullest extent. In line with the data we obtained, we should emphasize the need for nurses to make a final assessment of the appropriateness of the intervention when deciding to follow an AI-based recommendation. Additionally, nurses must remember that each patient is unique, with individual characteristics and needs, and the importance of personalized care should not be forgotten. In the future, it is recommended to use comprehensive research designs that include clinical nurses in the integration of AI-based technologies into practice. Such research, by incorporating the experiences and feedback of nurses, can facilitate the more effective and safe integration of AI into patient care processes.

Limitations

This study has some limitations. First, ChatGPT is sensitive to the prompts addressed to it. Therefore, the outputs generated by ChatGPT may change depending on changes in the input questions. Another limitation is that ChatGPT cannot make recommendations on clinical guidelines and medicines developed after September 2021.¹⁸ In addition to all of this, NANDA (North American Nursing Diagnosis Association) plays a significant role in professional nursing practices by providing a systematic approach to assessing and caring for patients. However, it is noted that ChatGPT is still not sufficiently specific for nursing diagnoses and can sometimes lead to incorrect responses.¹⁹ Therefore, we could not approach the case included in our study directly through NANDA nursing diagnoses.

Ethical Considerations

The case used in this study was prepared by the researchers in line with the literature. Therefore, ethics committee permission was not obtained.

This manuscript has been read and approved by all the authors.

Patient Consent

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Conflict of Interest

None declared.

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