A Review on Artificial Intelligence – Insights from Nursing Care and Implementation in Nursing Education

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Abstract

Artificial intelligence (AI) refers to a digital computer or computer-controlled robot's ability to do tasks that are generally associated with humans. AI in nursing care can improve clinical decision-making and provide evidence-based care to their patients. Therefore, its implementation in nursing practice and education is essential to further receive the benefits of AI, to the patients and health-care professionals such as nurses and nurse practitioners. The integration of the AI concept has been a key advance in higher education, with the potential to improve education by offering students more tailored and efficient learning experiences. This review provides an overview of AI in nursing care and its benefits of implementation in nursing curriculum.

Key words: Advancing health care, artificial intelligence, decision-making, machine learning, nursing care, nursing curriculum

INTRODUCTION

More recently, cutting-edge technology has been implemented into health care, one of which is artificial intelligence (AI), which is being used in a variety of industries, including health care.[1-3] In contrast to the related intelligence of living beings, AI is operated by machines, specifically computers.[4] It creates and analyzes methods and software that enable robots to observe their surroundings and take actions that maximize their chances of reaching set goals, thereby performing tasks traditionally associated with human intelligence. These devices may be referred to as AI.[5,6] In other terms, AI is an intelligence system of computers that can do activities that normally need human intellect, such as speech recognition, visual perception, decision-making, and language translation, and are more frequently referred to as AI.[4,5]

This concept suggests that AI works similarly to humans, but not identically, although this function is currently being developed.[4-6] AI is revolutionizing data science and information technology by advancing automated tasking technologies. However, AI is weak, with weak AI systems being those that are designed for certain tasks.[1,7] They may recognize objects that are similar to what they know and classify them

appropriately. This gives a human-like feeling, yet it is simply a simulation.[1,7] There are several types of AIs.[1,7] The AI might not comprehend your instructions, but it is going to respond using algorithms. Apple's Siri is an example of a weak AI because it relies on the Internet as a powerful database. A sophisticated AI, on the other hand, is a machine that can mislead a person into believing it is likewise human. They are supposed to possess human cognitive capacities.[1,7] Additionally, another aspect of AI is robotic process automation, which refers to the use of software robots to automate various tasks in health care, industries, and various simulations those AI robots are known as physical robots or physical machines that can be programmed to perform various tasks in the physical world.[8-10]

AI AND ITS MAIN CHARACTERISTICS

Machine-learning-based systems

These AI systems use algorithms to analyze data and improve their performance on a specific task through understanding.

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It consists of complex architecture, a neural network, and extensive knowledge.[8,9] Furthermore, the success of machine-learning AI systems may be influenced by the quality and quantity of data used for training, algorithm selection, and system architecture [Figure 1].[8-10]

Robotic process automation

These AI systems work by automating tedious, repetitive, and time-consuming operations using computerized robots.[9,10] This indirectly saves processing time and reduces individual needs.[8,9] In addition, robotics can retrieve pertinent data and update earlier records. Furthermore, they provide advantages such as enhanced productivity, fewer errors and manual interventions, better compliance, and cheaper costs when compared to traditional manual procedures [Figure 1].[8,9]

Natural language processing systems

This is another sort of AI that can extract and analyze clinical information from descriptive data, as well as classify and anticipate reactions based on previous consultations.[8-10]

Physical robots

These are machines that resemble humans and are meant to accomplish a certain activity or set of duties.[9,10] Capability to collaborate in health-care processes. Physical robots can be basic, single-function gadgets or complicated, multi-functional systems that can operate in a variety of contexts, including industrial, home, and hazardous settings.[9,10]

HISTORY AND UTILIZATION OF AI

Six decades ago, AI was introduced into the academic curriculum, and Alan Turing was the first to perform extensive research on the topic that he named machine intelligence. The field experienced multiple phases of exhilaration,[11] followed by times of disillusionment and funding loss.[11] Researchers started looking into computer-assisted instruction in the 1960s, and by the late 1960s, natural language processing had started. This was one of the first examples of a functional machine-learning system, and it improved through self-play.[12] Funding and interest increased dramatically after 2012, when deep learning beat all previous AI techniques[11,13] and after 2017 with the transformer architecture.[11-15] This culminated in the AI boom of the early 2020s, with companies, universities, and laboratories mostly based in the United States driving significant advances in AI.[13-15]

According to the literature, countries have already adopted the usage of AI technologies for various applications,[1,4-6,9] including the United States, Australia, Canada, and China's health-care systems.[16-18] In addition, students who were antagonistic to AI recognized the value of including a basic understanding of AI in their curricula.[18] Furthermore, the Chinese State Council has released a guideline on AI development, noting that the broad use of AI will increase the level of precision in medical services. According to Saudi Arabian literature, radiology specialists are already using AI in their jobs, implying that the usage of AI in many sectors of health care may become more common in the future.[4] Therefore, posing adequate knowledge regarding AI and machine learning (ML) is useful when AI is implemented, health-care professionals such as physicians, pharmacists, and nurse practitioners could use them and anticipate them to play an essential role in their clinical and workflow. A lack of awareness and knowledge among health-care workers in AI and ML may result in lower patient outcomes due to a lack of understanding about selecting and integrating value-added solutions into patient care. Therefore, incorporating AI technologies in health-care education like nursing is crucial for achieving better health outcomes.

AI APPLICATIONS IN NURSING CARE

The literature demonstrated that AI has a significant impact on the workflow, where it may be applied.[1,4,18,19] For example, the application of AI in a variety of health-care processes, including in keeping patient records, medical diagnosis, surgical aid, and treatment.[19,20] In addition, several earlier studies revealed that AI plays a variety of roles in the health-care industry.

- These include enhancing human decision-making and efficiency
- Assisting with disease conditions such as radiology, neurosurgical imaging, skin lesions, tumors, chest pain, and neurological diseases such as Alzheimer's disease.
- In the management and treatment of breast cancer diagnosis.
- Developing new drugs and selecting therapies, particularly for patients with co-occurring conditions and on multiple.[21-24]
- In addition to this, AI prediction algorithms can be incorporated into the electronic health record to provide nurses with digital notifications when patients are in the high-risk category.
- In addition to this, AI in nursing care helps in relieving nurses of tedious and physically demanding activities, allowing them to concentrate on more intricate and patient-centered care. Better patient outcomes, lower expenses, and more job satisfaction for nurses can result from this robotic technology.[25]
- Furthermore, literature revealed that AI-assisted technology in nursing such as Robots can assist with repetitive duties including moving and transferring patients, delivering meals and medication, and retrieving medical supplies. In addition, robots can help from the training employees.[25]

These AI apps will help clinical decision-making, allowing nurses to be more proactive in preventative care. Furthermore,
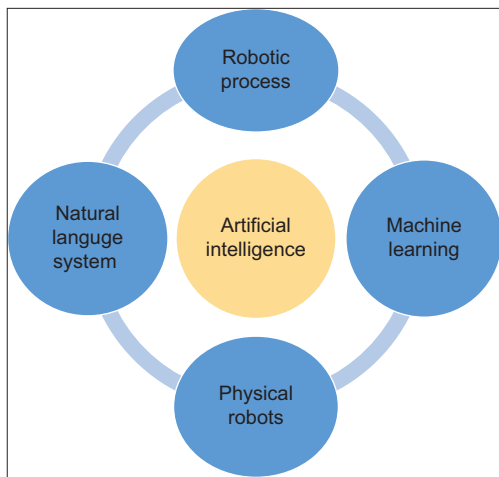
Figure 1: Types of artificial intelligence in health care

literature suggested that AI has the potential to influence multiple facets of nursing, including improving patient care, increasing efficiency, and assisting health-care staff. AI can help nurses with their responsibilities, but it cannot replace their role as caregivers and advocates for patients.[20] In the future, AI can greatly improve the nursing profession by increasing efficiency, efficacy, and work-life balance. Nurses must be actively informed about the expanding use of AI in their organizations and do not subcontract that role to others, especially non-clinicians.[21]

AI is fast exhibiting its adaptability in preventive care, such as increased accuracy in screening, reduced medical errors, and increased productivity and efficiency among health-care personnel.[22] AI-augmented primary care settings may also benefit elementary care nursing. These settings could lead to improve population health management through patient-focused information technologies that more successfully encourage healthy behaviors, as well as personalized patient digital health coaching and real-time identification of health and illness trends using data from wearable devices.[23,24] Nurses will directly influence future AI products, in addition to the way, AI will affect nursing practice.[24]

Nurses advise patients on their rights and autonomy, such as respecting their rights in clinical decision-making, maintaining confidentiality in health-related matters, and gaining informed permission from them.[25,26] On the other side, AI can aid with critical thinking and clinical decision-making by analyzing patient data to identify trends and potential risk factors, as well as offering decision-support tools with evidence-based nursing care recommendations.[25,26] AI systems can analyze data to detect subtle changes in medical diseases at an early stage, perhaps allowing for early intervention and avoiding complications. Predictive analytics can help to anticipate patient outcomes and prepare appropriate actions. Basic tasks can be automated, freeing up nurses' time for critical thinking and complex problem-solving.[25,26]

AI IN NURSING EDUCATION

A crucial part of nursing education and clinical practice is simulation. It is frequently used as a teaching technique to enhance clinical decision-making, interpersonal and communication skills, and practical patient care abilities. It is also employed to explore difficult subjects including end-of-life challenges, critical illness, and cultural sensitivity.[26] AI can enhance simulation in this method of nursing education by offering realistic scenarios that are tailored to each student's unique learning needs. Using AI-enhanced robots to engage with nursing students in a more realistic way than current high-fidelity simulators is one example of AI-enriched simulation.[27,28]

Although according to a recent review on the state of AI in nursing education which was published in 2023, revealed that multiple countries in the world are investing in AI research and education as a result of the increased attention that AI is receiving in higher education. To make substantial advancements in AI research and innovation by 2030, China has initiated a national AI development plan.[29,30] To develop human capacity and prepare for changes in the labor market, the Republic of Korea has allocated a substantial amount of funds to AI education and research. The nation is also taking steps to develop AI talent, including expanding the number of AI graduate schools and providing short-term in nature intensive educational programs.[29,31] By encouraging the use of AI in higher education, the European Union's Digital Learning Action Plan 2021-2027 seeks to improve student education and assist instructors and support employees in teaching.[29,32]

AI is additionally utilized in the fields of virtual and augmented reality applications to create realistic simulation experiences. A potential use for this sort of technology is to mimic circumstances that are difficult to get to in the real world.[27,28] For example, scenarios for simulation may feature medical emergencies in which nursing students could practice skills that would otherwise be difficult to replicate in typical educational settings.[27-33] In addition, nurse educators believe that AI has a place in nursing education and can be beneficial, especially when used as a tool to support students in the development of clinical judgment. Based on AI-generated forecasts and clinical care recommendations, this AI tool is already being deployed in clinical practice, allowing nurses to provide more appropriate and timely interventions.[29-33]

To prevent catheter-associated urinary tract infections, for instance, newly developed AI-enhanced clinical decision support technologies can swiftly produce nurse diagnoses, calculate patient fall risk estimates, and build decision trees.[29-33] While nurses can perform these tasks without AI, emerging AI clinical tools have the advantage of being able to rapidly assess vast amounts of data and automate the adjustment of risk estimations to produce more precise forecasts. Faculty educated in these new AI-based patient

care assistance tools will be able to advise students on how to use them effectively and efficiently. AI offers potential in research and writing, notably in the health-care field.[29-36] The literature found that nursing professors used AI approaches to contribute content to publications by evaluating data and developing textual responses based on prompts.[33-36]

With the integration of AI into the academic curriculum, particularly in nursing, students can better prepare for the AI-related skills required in the profession. This can take various forms, such as teaching students how to design AI stimuli for research, performing reviews of the literature, and utilizing AI medical applications.[34-36] With the growing usage of AI in the educational environment and workplace, colleges universities, and prospective employers must maintain contact to guarantee that learners have the skills to meet industry demands.[29-36] Research on AI in education is ongoing on a global scale, with its main objective of preparing students for the future workforce.[31-36] A more thorough comprehension of students' use of AI for coursework is required to properly educate them toward excellent norms. Such data is going to be used to inform educational guidelines about the usage of ML.

CONCLUSIONS

This review offers the available evidence on the different applications of AI-based support systems in nursing and health care and its implementation that can be applied in nursing practice through introduction in the academic curriculum. Furthermore, AI-based support systems demonstrate better results in different health-care processes. Despite the limitations that still exist with this type of technology, AI-based systems can assist in early diagnosis, clinical decision-making, patient monitoring, and workflow optimization in nursing care.

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