

Artificial Intelligence Application In Nursing: A Review

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I. INTRODUCTION

The integration of artificial intelligence (AI) in the organization of nursing care has continually evolving, driven by the need for innovative solutions to ensure quality of care. AI is the field of computer science that focuses on developing intelligent machines capable of performing tasks that typically require human intelligence. The aim is to synthesize the evidence on the use of artificial intelligence in the organization of nursing care.¹

Artificial intelligence is a generic term for techniques used to teach computers to mimic human-like cognitive functions like reasoning, communicating, learning, and decision-making. Some of the many branches of AI are robotics, machine learning, deep learning, and natural language processing. AI is the simulation of human intelligence by machines, especially computer systems. In general, AI system work by ingesting large amounts of labelled training data, analysing the data for correlations and patterns, and using these patterns to make predictions about future states and future purposes.

AI in Health Care System

The role of AI in the healthcare system is very important at present; it has been effectively used in the health care system in several working areas. Challenges faced by the Indian health system, such as a shortage of qualified healthcare professionals and infrastructure, poor affordability of increasing health care expenses, lack of awareness, and lack of access to healthcare services, which leads to substantial distances for basic and advanced health services and non-uniform access to healthcare across the country, increase the need for AI in the healthcare system.

AI has made significant strides in revolutionizing the healthcare system and improving patient outcomes by saving time, energy, and money in the health sector. It avoids unnecessary visits to the hospital for minor ailments, reduces

the burden on outpatient and inpatient departments at tertiary care hospitals, provides specialist-based care for the rural

population, avoids misguidance, and connects peripheral hospitals with tertiary-level hospitals through an e-referral system. AI is also integrated into nursing care, and this integration has the advantages of efficiency and data-driven decision-making. The synergy between AI and human nursing care is crucial, where technology supports the work of nurses without replacing their compassion and empathy.²

AI comprises many health care technologies to transforming nurses' roles and enhancing patient care. In healthcare, AI typically refers to the ability of computers to independently convert data into knowledge to guide decisions or autonomous actions.³

AI Enhances Nursing Care:

AI technology integration has demonstrated its potential to enhance nursing care by reducing the diagnostic errors, improving emergency response times, improving patient care quality and psychological support and enabling remote care for elderly patients through smart technology. Smart monitoring systems collect physiological data from patients using sensors and wearable devices, aiding nurses in providing better patient care. AI can facilitate communication between nurses and patients, especially in situations where language barriers exist. Nurses benefit from the patient's sleep cycle in providing better care and meeting their patients' needs more effectively. AI in nursing has the potential to enhance treatment, diagnosis, and care processes through the use of data-driven solutions and specialized algorithms.⁴

In healthcare, algorithms and data analysis techniques used by AI help to analyse medical data, aid in therapeutic decision making, automate management procedures, increase patient tracking and better coordinate treatment process and steps. The integration of AI in nursing holds immense promise for revolutionizing patient care. AI powered technologies can assist nurses in numerous ways, optimizing clinical work

flows and decision-making processes. One significant avenue is the use of AI for predictive analytics, which can help identify patients at risk of deteriorating health conditions. By analysing the vast amounts of patient data, AI algorithms can recognize patterns and alert nurses to potential issues before they become critical, enabling proactive interventions and improved patient outcomes. Another potential area of advancement lies in diagnosis and treatment planning.^{5,7} AI has seen a meteoric rise in popularity in recent years, transforming industries across the board. Its potential to revolutionize healthcare, a field intrinsically linked with human well-being, is especially promising. Nursing, at the frontline of patient care, stands to benefit considerably from the integration of AI technologies.⁶

AI in Nursing Education:

The impact of AI on nursing education is of great importance. It exerts its influence on curriculum design and instructional methodologies. The integration of virtual simulations and AI has driven an educational tool that provides nursing students with immersive learning experiences. Moreover, AI is capable of assessing students' clinical skills and identifying areas of knowledge gaps, thereby enabling customized educational interventions. Additionally, AI technologies grant access to the most current information and evidence-based practices, there by fostering continuous learning and professional development. Nonetheless, there are challenges that need to be addressed, such as the necessity for faculty training, investment in infrastructure, and the ethical use of AI within educational environments. Nursing educators must adeptly navigate these changes in order to fully leverage the benefits of AI in enhancing the quality and effectiveness of nursing education.⁷

AI in Clinical Practice:

One area where AI has shown great promise is in clinical practice. The incorporation of AI into clinical settings introduces a range of advantages and challenges, accompanied by notable implications for ethical and legal considerations. AI holds the potential to enhance diagnostic precision, streamline administrative tasks, and personalize treatment plans. Through the analysis of extensive medical data, AI systems can discern patterns and correlations that may elude human observation, leading to more accurate and timely interventions. Moreover, AI has the capacity to contribute to cost-effective healthcare solutions, ultimately improving overall patient outcomes. The integration of AI technology facilitates informed clinical decision-making processes, there by promising advancements, such as quicker and more accurate diagnoses, personalize treatment plans, and reduced health care costs. While the

potential benefits of AI in clinical practice are substantial, ethical and legal complexities emerge. The utilization of AI in clinical decision-making raises concerns about transparency, accountability, and the potential bias within algorithms.⁸

AI Opportunities in Nursing Care

Turning our attention specifically to nursing care settings, the primary opportunities for applying AI include application scenarios such as decision support in complex care situations. AI also hold great promise for supporting nurses in tasks considered to take place remotely from direct patient interactions. High expenditures of nurses' working hours are frequently reported as being used for the documentation of care processes, with some care facilities reporting up to almost a third of daily working hours being expended for documentation processes. This represents one of the many starting points from which to develop AI solutions to consistently improve the nursing care processes and support nurses efficiently in their daily working tasks. AI applications for the direct support of care-dependent persons and their informal caregivers are another starting point.

Furthermore, the transformative effect of AI, resulting from its ability to change the intrinsic nature of health care delivery, is accompanied by ethical risks, namely, concerning the validity of evidence, the fairness of outcomes, and the traceability of harm caused by algorithmic activity. Furthermore, although consensus on the potential of health technologies powered by AI to enhance nursing practice has been reported. The critical ideological and ethical nature of nursing practice still needs to be considered, and the role of decision-making, enhanced and burdened by an amplified understanding of opportunities granted by AI applications remains uncertain in the context of providing ethical and transparent nursing care.⁹ The potential benefits of AI in the health care arena promise to revolutionize the approach to some of the most vexing care and systems problems. These include improved diagnosis and treatment; enhanced health research and drug development; and additional aid with the public health interventions, such as disease surveillance, outbreak response, and health systems management.¹⁰

AI Challenges for Nursing Education

1. Overreliance on Technology

With the wide availability of chat-based AI tools, nurse educators are increasingly worried that nursing students will rely too heavily on AI tools, neglecting critical thinking, relationship building, and communication skills. Plagiarism is also a major area of concern. While AI tools like Chat GPT

can enhance learning and engagement, their ability to rapidly generate text may facilitate student plagiarism, undermining academic integrity. One preliminary strategy being adopted at universities is to outline acceptable use of AI in the course syllabus, with various approaches being discussed ranging from prohibitive to permissive.¹¹ Nurse educators will need to adopt strategies for incorporating AI into the learning environment in ways that promote ethics and original thinking, while exploring and highlighting its limitations.

2. AI Algorithm Bias

Bias in AI models is a major concern, especially for programs preparing nurses to work in areas with large minority and Indigenous populations. AI uses algorithms to assess data and make inferences. Current AI systems may perpetuate biases inherited from training data that may compound existing inequities based on race/ethnic background, socioeconomic status, gender or sexual orientation, thereby entrenching disparities in health care systems and possibly even exacerbating them.¹² For example, algorithms trained using data aggregated from White patients may not have the same accuracy as when applied to other races, and may prioritize White patients with less severe illnesses over sicker patients of other racial groups. Health care systems may not have the adequate data infrastructure needed to collect the data to optimally train algorithms to fit their local population and/or the practice patterns, and may not be able to identify bias to assure that AI algorithms perform consistently across patient cohorts. AI models trained on Indigenous populations' health data exist,^{13,14} but they are sparse.¹⁵ This is of great concern for nurse educators and will require greater understanding of how to identify algorithmic bias in health care and use their clinical expertise to serve as advocates when providing health services to Hawai'i's extremely diverse student and patient populations.

3. Privacy and Security

Generative AI poses several privacy concerns for nursing educators and students. Personal identifiable information, such as names, addresses, and contact information, as well as health information, may be collected during interactions with AI tools. This may result in unintended exposure or misuse of sensitive information.¹⁶ Privacy advocates, educators, and administrators have yet to create or finalize policies that put human interests before that of machines.

4. Preparing Students for AI-enhanced Healthcare Workplaces

AI can be integrated in nursing programs to prepare students for the AI-related skills needed in the workplace. This may take varied forms such as teaching students how to engineer generative AI prompts for research, conducting literature reviews, or practicing how to use AI clinical tools. With the increasing prevalence of AI use in the classroom and workplace, it will be important to maintain communication between academic institutions and potential employers so that students are equipped to meet workplace needs. Research efforts to examine AI in education are occurring on a global scale with a principal objective to prepare students for the future workforce.¹⁷ Greater understanding of students' use of generative AI for coursework is needed to appropriately guide them toward best practices. Such information will help inform academic policies related to AI use.

While AI offers tremendous opportunities to transform nursing education, there are still serious challenges that will need to be considered and addressed. To best position nursing practice for the changes that AI will bring to the health system and patient care, nurse educators must proactively examine ways AI will influence nursing education in a responsible manner. Nurse educators will play a crucial role in assuring that AI will serve as a tool to prepare compassionate, competent, and technologically adept nurses now and in the future.

II. CONCLUSION

To conclude, a new era seems to have come in which AI applications might greatly influence nursing practices. However, many questions remain and further validation will be needed before AI can be incorporated into routine care. To ensure that this new era aligns with core nursing values and that new applications are relevant to clinical practices, healthcare workers and patients should be placed in key positions in the development of AI.

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