

Artificial Intelligence Applications in Nursing

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Abstract

The nursing profession is complex and flexible, able to adjust to the unique needs of each patient. These days, artificial intelligence (AI) is integrating with this flexible architecture to bring a range of new technologies that have the potential to significantly improve operational workflows and patient care. This paper explores the new role artificial intelligence (AI) is playing in nursing, with a particular emphasis on how it is being incorporated into traditional clinical tasks including patient support, diagnosis, and treatment administration. It looks at how AI might affect various fields and provides supporting information about its real-world uses. This study offers a critical overview of artificial intelligence's potential impact on nursing in the future, giving administrators, physicians, and the general public information on how this rapidly developing technology is expected to develop. Artificial intelligence is the computerized performance of tasks that conventionally need human intelligence. Artificial Intelligence is already in use in many areas of our daily lives, including the home, job, and educational system. There are two types of AI: strong and weak. While the weak AI argument advocates for the replication of human cognition by machines, the strong AI proposal contends that it is possible for machines to express intelligence. Nowadays, the latter, 'weak' version of AI predominates in the field. Many people use artificial intelligence (AI)-powered devices in their homes, frequently without realizing it. Voice recognition is used by technologies such as MacSIRI and Windows Cortana for routine tasks like text messaging, online navigation, and reminder setting. But as technology developed, it was used more and more in medicine to do increasingly complex tasks. Watson from IBM is a prime example. Watson uses machine learning and natural language processing to glean insights from enormous unstructured data volumes. As a result, Watson has the capacity to analyze and interpret vast amounts of medical material, which could help with forecasting and provide direction in complex decision-making situations. Its application extends to health sciences education as well as a number of healthcare sectors. Watson is a significant tool for nurses because of its ability to facilitate complex clinical decision-making.

Keywords: *artificial intelligence (AI), nursing.*

I. Introduction

Operations and the provision of healthcare are significantly impacted by artificial intelligence (AI). Actually, the application of AI in healthcare has only been going on for ten years. Although the main purpose of medical technology is frequently to attain particular health outcomes and goals, an increasing number of applications incorporate artificial intelligence (AI) features that allow them to learn from data over time. Applications of AI aren't being completely utilized, though. Artificial intelligence (AI) applications can mimic human intelligence, which can be defined as using computer systems to carry out tasks that would typically need human intelligence. This covers learning, problem-solving, and speech recognition. Artificial intelligence (AI) has the potential to significantly alter and effect information power and healthcare reforms. The opportunities and difficulties that AI brings to healthcare will be discussed throughout the essay. The ways in which AI has been incorporated into particular healthcare industries and its effect on costs will provide more context for this. AI's application in healthcare has many benefits. One instance is task automation, which reduces the need for human intervention by utilizing machines to perform certain jobs. This may result in financial savings and a subsequent drop in medical expenses. Cost is not a major concern in nations where there is a public health industry, but as will be covered in the next paragraph, automating important tasks can increase patient safety and efficiency. Complications can be significantly decreased by effectively managing chronic illnesses and preventing readmissions to hospitals. Imagine a virtual AI nurse that uses information from previous patient assessments to visit a patient with a chronic illness on a regular basis. The problems of chronic disease can be reduced if it helps recognize when the condition is starting to worsen and if it intervenes in the high-risk patient to stop an acute phase between visits. Clearly, the best data integration is needed for this. Less severe examples include the automation of discharge, where more beds can be made available by using an AI system to identify patients and situations that are safe to be discharged. Because AI works so well, we live in a time where a machine is considered necessary. One excellent illustration of this is

the AI care coordinator. This artificial intelligence application is designed to assist individuals with chronic illnesses by educating them and encouraging them to practice self-care and steer clear of risky behaviors. Success metrics demonstrate how widely AI is being used and how it might improve health. While AI poses few obstacles compared to its many benefits, its effects are far-reaching. Outdated curriculum is a problem for evidence-based practice and the training of future doctors. Students trained to use the older procedures may not learn the new practices that AI has replaced if better results are expected. Regretfully, these tools have the potential to reduce future physicians' access to such knowledge while supporting nurse practitioners' independent practice by offering decision help. By causing a difference in care between patients who have access to and do not have access to such technology, the availability of the AI system may provide a threat to equitable access. The risk of disclosing personal patient information increases with increased usage of clinical data and medical record analysis, posing an extra difficulty in terms of privacy. Finally, a computer error or system failure can have a significant, if not fatal, impact. Errors in the automation of a crucial operation might have high implications.



1.1. Artificial Intelligence Definition

AI is capable of simulating aspects of human intellect like learning, problem-solving, and cognitive processes. AI systems will never be able to comprehend the meanings contained in language. With the use of AI technology, clinical data can yield novel and significant insights. Cognitive simulations are already being used; one example is a model of emergency admissions that predicts patient flows to help hospitals make decisions. Another kind of AI application is problem-solving software, which imitates human comprehension in a particular field by using data and logic-

based algorithms. This kind of AI has a lot of promise for supporting clinical decision-making, including evidence-based diagnosis and treatment recommendations for a variety of ailments. The only kind of medical technology that can effectively utilize a population's clinical and other health data is artificial intelligence. Data mining, machine learning, and pattern recognition are a few of the AI technologies that are now in use or being studied. Finding patterns in huge datasets is known as data mining, and it makes use of techniques from the fields of artificial intelligence, statistics, and database systems. Applying clever techniques to extract data patterns is a crucial step. Through the use of machine learning, an artificial intelligence technique, a system can learn from data instead of explicit programming. An branch of artificial intelligence called pattern recognition works to categorize information. In order to support clinicians at the point of care, these strategies can be used to conceptual knowledge such as guidelines and best practices for a wide range of disorders. AI methods can give different health information systems the capacity to carry out administrative and clinical tasks. Current technology, however, limits some uses; therefore, it's helpful to think about how AI can support developing eHealth and health information systems. The need for intelligent surveillance to enhance and comprehend unfavorable events has increased as a result of widespread initiatives to improve healthcare quality and safety. This is seen to be very helpful for patient safety, and there may be future uses that address the problem of adverse events at the point of care in real time. The application of artificial intelligence technology in healthcare could result in significant cost savings, particularly when it comes to the automation of administrative duties that would have otherwise required human labor. The AI applications must, however, also take into account the practical aspects of patient care and communication with medical professionals.

The goal of computer science's artificial intelligence (AI) field is to build computer systems that are capable of tasks that call for human intelligence. AI in healthcare represents a significant advancement for the sector. AI-based applications are developing to help physicians in their day-to-day work. AI is changing healthcare at a quick pace, but before

this technology can be successfully incorporated into a clinical context, a number of issues must be resolved. Artificial Intelligence (AI) is the newest wave of technology, and its application in healthcare research is expanding quickly. AI is a branch of study that aims to use computers to mimic human intellect and make decisions based on the best available data. Enhancing clinical outcomes is the main goal of healthcare research, and a number of studies indicate that artificial intelligence (AI) can help advance these goals. The influence of AI applications in healthcare has been compared using the Saaty's scale, and it has received the same rating as improvements in patient tools and modifications to medical standards.

1.2. An Overview of Nursing

Putting in place a computerized physician order entry (CPOE) system is one method to accomplish this aim. CPOE systems are a more efficient way to enter and send orders, reduce delays in order implementation, reduce errors, and improve communication for patient care. Physicians can enter medical orders (medications, tests, consults, referrals, diets, and treatments) into a computer system using CPOE applications. The computer system then sends the instructions directly to the location where the order will be carried out (pharmacy, laboratory, nursing unit, etc.). The doctor will be relieved of a major duty in the patient's care if an AI takes over as a medical professional or even works in tandem with one to rationally process common diagnoses and symptoms of a sickness or ailment and produce the appropriate diagnosis and prescription. This will therefore free up a doctor's time and make it possible to determine the appropriate treatment orders. It is not ideal for AI to diagnose or even treat medical conditions in place of doctors because some cases are more complex and call for creative solutions, intuition, or critical thinking. But it would present a chance to free up the doctor and guarantee the best possible treatment for the patient. This is advantageous since research indicates a clear correlation between patient happiness and the quality of care provided by physicians and effective communication between them. In this instance, knowing the treatment order, having fewer nursing errors in execution, and letting the patient know about his treatment plan first are examples of good communication. Feigenbaum

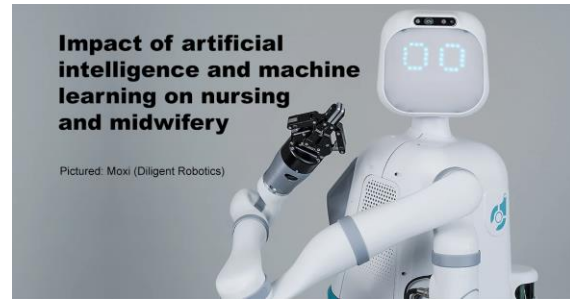
et al.'s approach uses a system with a higher spectrum of AI to represent the reasoning and knowledge involved in medical diagnosis.

As both a science and an art, nursing's principal objective is to give patients the care they need to reach or maintain the best possible degree of wellness. However, it is now harder for nurses to do the wide range of tasks expected of them due to the nursing shortage, changes in healthcare requirements, and the increasing acuity of patients. By handling the tedious tasks, AI has the potential to significantly impact the nursing profession and free up more time for nurses to spend with patients and attend to their general well-being.

Building intelligent machines that can carry out tasks that normally need human intelligence is the focus of the computer science field of artificial intelligence (AI). Artificial Intelligence is driving technology toward more effective and efficient methods.

2. AI-Powered Diagnostics and Therapy

The main focus of AI-assisted diagnostics is classifying a person's health state; this was demonstrated in a study where an AI was able to identify different cancer types by examining millions of clinical reports and tens of thousands of patient histories. While sensitive news may be better served by a human touch, artificial intelligence (AI) acts as a diagnostic helper to improve the accuracy of medical practitioners. It harmonizes the diagnostic procedures, reduces the possibility of human mistake, and might prevent serious misdiagnoses, thus saving lives. These systems, like the UC San Diego melanoma predictor developed by Dr. Wong, are only as good as the data that feeds into them. Its accuracy is limited to 65.5% for specific melanoma diagnoses because it compares against an existing database, showing that AI is still not as sophisticated as seasoned doctors. There are concerns over the cost-effectiveness of implementing these systems and their potential superiority over human judgment alone.



2.1. Diagnoses Assisted by AI

Giving patients relevant therapies and prognostic information requires an accurate diagnosis. This ties into the field of artificial intelligence, as described in the University of Pittsburgh article "The future of medicine - Computer-based clinical practice". It defines diagnosis and treatment selection as a choice analysis, usually shown as a decision tree with multiple techniques and possible outcomes. The fidelity of these analyses is improved, making them more reliable and knowledgeable than human cognitive capacities alone. This is achieved by utilizing sophisticated AI techniques, such as fuzzy logic, to handle ambiguity and complex simulations. By using neural networks to compare newly discovered patient data with previous cases, AI can further automate decision-making while improving results. One poignant example is the treatment of cancer, where proton therapy is a state-of-the-art treatment yet has restricted and expensive uses. A decision tree and Markov model were used in an analysis titled "Modeling the cost-effectiveness of treatment strategies for children with cancer" to effectively plan therapies for young cancer patients in North America. Proactive AI simulation and automation of this kind has the potential to improve and make advanced therapies, including proton therapy for different forms of cancer, more accessible.

2.2. AI-Powered Therapy Scheduling

AI is causing a revolutionary change in the healthcare industry by automating nursing, leading to significant improvements in the quality of patient care. The first study highlights AI's potential to improve patient outcomes and nursing practice by addressing the technology's role in treatment layout. Early attempts with AI focused on automating routine clinical care to reduce administrative costs, but more recent studies show that AI may also greatly improve the quality of care. AI might be

used to carefully examine patient data and create customized treatment regimens using evidence-based algorithms—which, at least in the short term, more closely resemble clinical decision support systems than autonomous AI. A successful prototype demonstrates the potential for AI to automate the creation and upkeep of customized care plans in the future. Because of the resources required to maintain manual nursing care plans, they often become outdated. This approach is an excellent example of efficiency. Given the cultural relevance of manual care planning for nurse education, this groundbreaking research represents an investment in the future, promising to enhance patient outcomes and simplify unit costs—even though it must overcome institutional inertia.

2.3. AI-Driven Precision Health Care

The goal of precision medicine, which aims to customize therapies to patient-specific traits with ground-breaking ramifications, embodies the cutting edge of therapeutics. This kind of fine tuning is embryonic, arising from genomic analysis that identify the best cancer treatments. AI's many methods make this delicate matching procedure easier. For example, researchers at the University of Cincinnati have used AI to analyze images and identify patterns of metastasis in a subset of breast cancer cases, indicating a sophisticated approach to therapy selection. Concurrently, a joint study conducted by the University of Toronto and Institut Curie demonstrated AI's prognostic ability for successful drug symbioses in the treatment of that cancer. With the use of the data, a decision support tool that simulated effective therapies was created, ushering in a new era of personalized cancer care. These are early, yet revolutionary, uses of AI in precision medicine that use technology to provide individualized cancer treatment plans.

3. Patient Care and Monitoring

With the ability to create individualized treatment plans, intelligent care systems like IBM Watson are revolutionizing oncology. The platform evaluates a patient's medical records in comparison to international research in order to provide customized treatments and calculate their efficacy. For those with complicated co-occurring disorders, such innovation is extremely helpful as it prevents care from

becoming disorganized and confusing in terms of the best course of action. Research combining algorithms has predictively identified persons at elevated risk for Alzheimer's disease with a 70% accuracy rate, six years ahead of clinical diagnosis, by using machine learning to find previously unknown population health patterns. AI predictive analytics proactively provides projections of potential medical issues, triggering the implementation of preventive measures. This can improve patient quality of life and significantly lower death rates. In the event that AI algorithms identify a patient's risk of developing sepsis after surgery, timely intervention could be taken to prevent severe sepsis instances.

3.1. AI-Powered Remote Patient Monitoring

"Ginger.io," which, in collaboration with UCSF, accurately predicted the approaching recurrence of depressive episodes two weeks before to observable symptoms, is a prime example of the innovative influence of AI in remote patient monitoring and highlights the promise of AI in preventive health interventions. Conventional RPM systems relied on patient data that was submitted on a regular basis and evaluated infrequently; notable variations would prompt action. AI enables continuous real-time data monitoring and analysis, identifying abnormalities or serious concerns that can result in immediate alerts. It can also occasionally offer action recommendations to medical professionals, facilitating prompt responses that could avert serious health complications. Over time, RPM technology in telehealth has developed, and the inclusion of AI has yielded significant benefits, including improved interpretability of monitored data, improved patient care, and decreased healthcare costs.

3.2. AI-Powered Prognostic Analytics

AI predictive analytics has proven to be very useful, having an impact on several healthcare industries. One example is the use of unsupervised learning by Shameer et al. to classify cohorts at high risk of heart failure using electronic health information, which has an effect on patient monitoring and care. Additionally, predictions are first steps toward healthcare systems that learn to adapt and adjust their treatment plans. Predictive proficiency, according to Obermeyer and

Emanuel, should go beyond typical triage to allow for customized patient care at the right time. AI techniques that predict health outcomes and identify therapy beneficiaries, like neural networks (NNs), Bayesian networks, and support vector machines (SVMs), are increasingly being used to inform prognostic models. AI can improve clinician decision-making by correlating input variables with possible outcomes and continuously testing and improving its predictive accuracy. This is made possible by the availability of large datasets. Although classic statistical prediction approaches are accurate, they have limitations such as managing high-dimensional, complex longitudinal patient data, breaking linear assumptions about covariate effects, and not being able to automatically extract features from a variety of electronic data. Furthermore, these studies are frequently not incorporated into clinical procedures.

3.3. AI-Powered Customized Health Plans

Artificial intelligence has a profound and wide-ranging revolutionary impact on healthcare. AI's potential to improve diagnosis and treatments grows as both technology and healthcare advance. Artificial Intelligence (AI) is a cognitive simulation that runs on machine-processed code that mimics human reasoning and gives it predictive capabilities. Advances in artificial intelligence produce computational models that use statistical techniques to infer results when given parameters and past data. Artificial intelligence (AI) is revolutionizing healthcare by advancing fields like robotic surgery and detailed analysis for symptom detection. However, its greatest use is when it comes to providing tailored patient care, which represents a major paradigm change in the field of medicine.

4. Efficiency and Workflow Optimization

Those working in nursing are facing more and more difficulties. They deal with an increase in patients in ERs, shorter hospital stays, more severe patients, and patients being released without further treatment. It is becoming unfeasible to assign a nurse to a single patient for the entire of their hospital stay due to limited patient care time and an increase in preventative and ambulatory care. Sophisticated technological interventions in treatment and care will probably increase in the

upcoming years. This shift calls for nurses who are proficient in the use of information technology and who can incorporate it into their practice to complement human skill rather than replace it. AI has the potential to completely transform patient care by leveraging the growing amount of patient data to create new insights that will improve the standard and safety of care. Specialized illness registries and consolidated health records are included in this data goldmine. Artificial intelligence (AI) can find signs that predict treatment results and best practices through advances in data processing and analytics, which can improve clinical decisions. This information could eventually be integrated into decision-support systems, such as the well-known GRACE risk score for cardiac events, or web-based applications integrated with patient records that provide real-time treatment recommendations. Additionally, AI with a foundation in evidence-based practice has the capacity to understand the effects of different treatment approaches, which could influence healthcare policies and optimize resource allocation to attain the best possible public health results.

4.1. Patient Triage Driven by AI

AI-powered patient triage could help direct patients to the right degree of care. By connecting patients with appropriate primary, community, or specialty care, Darzi's design recommends using computerized decision aids. This improves nurses' ability to evaluate patients by allowing for electronic data input. With the use of chatbots like Babylon and Your.MD, AI-powered triage has demonstrated impressive accuracy. Chatbots are inexpensive tools that offer continuous round-the-clock advice while concurrently interacting with several patients via interactive symptom evaluations and guiding them to the appropriate treatment level. Growing patient populations are likely to favor technology, which could ease the burden on human healthcare practitioners even though some patients may be reluctant to trust technology with their health. For example, the NHS 111 helpline in the UK, which is primarily run by non-clinical operators, could become more reliable with the use of AI reinforcement.

4.2. AI-Powered Resource Distribution

The efficient use of resources is essential to providing healthcare, especially in the nursing

field where matching human and material resources is critical to providing patients with safe, high-quality care. AI is going to change resource management, making it more effective and efficient. This is demonstrated in Zandstrup and Christiansen's work, which evaluates the effects of a 20% shift in patient demand over 30 days on resource allocation in community nursing using an AI simulation. By intelligently matching nursing competencies to patient demands and accounting for dependencies and resource costs, the AI-generated timetable outperformed existing approaches. Beyond simulation, AI can be used in predictive modeling to foresee patient outcomes and allocate resources in advance. It can also be used to match caregiving resources to patient needs in high-acuity situations, which improves nursing workflows and maintains safety regulations.

4.3. Workflow Automation Driven by AI

AI uses its expertise to forecast symptom complexes, which improves the management of chronic health disorders and makes it possible to create comprehensive care regimens. Using dynamic scheduling algorithms, AI can make appointments and required exams across departments easier for nurses to handle and reduce long-term management disparities by materializing them in a decision support system. Workload automation using AI is the deliberate use of AI to carry out jobs or parts of activities with the least amount of human supervision. This could entail automating follow-ups for no-shows, patient notifications, and appointment scheduling in nursing offices. Research shows that AI-powered workflow automation boosts service provider productivity, promotes departmental cooperation, and is essential to a strong return on investment in the healthcare industry. AI might free up nursing staff to focus on important patient-care needs instead of juggling administrative tasks by taking on mundane organizing activities.

5. Ethical Issues and Difficulties

To support AI's ethical application, it is essential to weigh the dangers to confidentiality against the technology's potential to improve therapeutic outcomes. With the processing and management of health-related data by AI technologies, new threats to confidentiality

arise that call for new criteria and measures. The potential of AI to deduce and make conclusions based on sensitive data raises questions about invasive patient profiling, the loss of human control over data, and decisions made by AI.

There is a general feeling of mistrust and anxiety around the storage and use of personal data because patient data is extremely sensitive and breaches are common. Therefore, before AI is widely adopted, it is necessary to thoroughly analyze and solve the ethical challenges and risks involved with its deployment in the healthcare industry.

5.1. Security and Privacy Issues

According to a 2018 study on public opinions about artificial intelligence in healthcare, people would rather use AI for low-contact tasks like processing medical photos than for sensitive patient data management. When creating AI solutions, public opinion must be taken into consideration.

Articles emphasize the need to maintain the human element in caregiving by highlighting AI's tendency to make nursing impersonal, especially in elder care. While this isn't a privacy issue per se, it is related to maintaining patients' autonomy and dignity.

Patient unease with AI data handling surfaced in research on the use of AI in breast cancer treatment, highlighting the need for explicit, consent-based data regulations. These results highlight how important it is to incorporate patient viewpoints on data security as artificial intelligence in nursing advances.

The introduction of AI technology inevitably brings up privacy and security concerns. Concerns about AI's capacity to protect healthcare data are growing, particularly in the context of predictive modeling and patient data gathering. When interacting with other healthcare informatics tools, AI systems are also susceptible to security lapses and data corruption threats, which could jeopardize patient safety.

5.2. Inequality and Prejudice in AI Applications

AI bias is akin to human prejudice and results from intricate encodings of social, political, and cultural biases in AI systems due to a variety of variables, including theoretical presumptions

and data selection. Because bias can lead to unfair treatment, bias detection and rectification must be given top priority in the development processes of AI makers. Experts in law and public policy are becoming more concerned about the social implications of AI prejudice.

The complexity and implicit nature of biases make them difficult to identify and characterize. Subtle prejudices necessitate a sophisticated comprehension of the social environment around the AI system's actions, whereas blatant biases—those impacting financial or judicial decisions, for example—are easier to spot.

Establishing norms and procedures for prejudice identification and correction that adhere to moral and legal requirements is crucial given the variety of biases. This can be achieved by promoting interdisciplinary collaboration with ethicists, social scientists, and policymakers.

5.3. Nursing Human-AI Collaboration

AI integration in healthcare is changing human-centered care to include AI interactions as well. Watson from IBM is a prime example of an AI system built for collaboration that aids in clinical decision-making. Whether AI-facilitated work performance is superior to entirely human or AI-led alternatives, and how well these synthetic agents interact with people, are the important questions.

Artificial intelligence (AI) may be better used for autonomous AI jobs like monitoring since it can work nonstop, identify problems, and efficiently notify human equivalents. Conversely, it can be less advantageous if an AI agent notices a problem but has to report it to another that carries out comparable monitoring duties.

6. Conclusion

As the population gets older and the demand for healthcare increases, artificial intelligence (AI) becomes a valuable tool for relieving the strain on nursing staff and improving patient outcomes. It's critical to recognize that artificial intelligence (AI) will not replace nurses; rather, it will enhance their abilities and allow them to make the most of their vast training. AI has the potential to significantly increase productivity

and efficiency in the nursing industry by automating repetitive jobs, analyzing patient data, and improving clinical decision-making procedures. As a result, this creates opportunities for nurses to spend meaningful time providing direct patient care, which promotes the best possible health outcomes. Artificial Intelligence has enormous potential in the health sector, and its use is only getting started. Even while seasoned nurses might be reluctant to use this new technology at first, it soon becomes clear that AI can be a powerful addition to patient care once they receive the right training and understand its benefits. Being a crucial addition to the nursing industry, nurses must take the initiative to learn about AI developments in order to improve the quality of care they provide and stay up to date professionally. To effectively utilize these state-of-the-art technology, the nursing profession will soon undergo a metamorphosis and enlargement. However, this should be done in a planned and thoughtful manner rather than by abruptly abandoning their current roles.

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