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MINI-REVIEW ARTICLE **OPEN ACCESS**

The Progress and Future of Artificial Intelligence in Nursing Care: A Review

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Abstract:

Introduction: The utilization of novel technologies in contemporary times not only reduces the cost associated with healthcare but also improves the efficiency of hospital resources and elevates the standard of medical assistance. One of the new technologies used in the field of health is Artificial Intelligence (AI). The purpose of this study is to investigate the application of AI in the field of nursing.

Materials and Methods : The present investigation was conducted in the year 2023 utilizing a review methodology and an innovative scientific inquiry. Comprehensive research was performed in reliable databases such as PubMed, Scopus, Google Scholar, Science Direct, and Springer, using the keywords AI, smart hospital, nursing, and health care to accomplish the intended objectives. From 2016 to 2023,120 articles were chosen as the initial selection. Studies that were not related to the subject matter were excluded from the analysis afterward.

Results : After searching and eliminating duplicate articles through objective screening, a total of 98 articles were reviewed, with 63 ultimately selected for the study. Within the realm of nursing care, research has been conducted in various areas, such as electronic health records (13 studies), health information collection and analysis (27 studies), healthcare cost analysis (16 studies), and the implementation of smart technology and hospitals (7 studies). The integration of AI technology has shown promise in enhancing nursing care by reducing diagnostic errors, improving emergency response times, improving patient care quality and psychological support, and enabling remote care for elderly patients through the use of smart technology.

Conclusion: AI is a significant technological advancement that can directly impact the operational effectiveness of healthcare organizations. This is achieved through the optimization of healthcare business processes and the enhancement of patient safety. However, limited research has been conducted regarding the affordability and economic aspects of AI implementation. Therefore, it is advisable for healthcare policymakers to establish the necessary infrastructure to leverage this technology, which will facilitate a more effective therapeutic and economic approach.

Keywords: Artificial intelligence, Nursing, Health care, Economic issues, Healthcare, Policymakers.

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1. INTRODUCTION

AI technology integration has demonstrated its potential to enhance nursing care by reducing 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 [1, 2]. The patient is continuously monitored by an AI-based monitoring device for any defects or medical emergencies. By analyzing patient data in anesthesia and ICU, AI can detect patterns of early changes in patient vital indicators and provide warnings to nurses. Establishing a robust and intimate bond between nurses, treatment staff, and patients engenders a heightened sense of assurance and ease within the patients, thereby expediting their recuperation and healing. AI's recommendations for timely measures can undoubtedly improve the treatment outcomes of patients. In this investigation, we explore the influence of AI on the field of nursing, elucidating its contribution towards enhancing the standard of healthcare. AI, a cutting-edge and prominent technology in recent times, has profoundly affected diverse industries and scientific domains. Nursing, being an indispensable sector within the medical sciences, has also reaped the advantages of these advancements and experienced substantial transformations due to AI. In recent decades, the fields of computer science and medicine have recognized AI as an advanced technology with the potential to enhance healthcare and streamline nursing processes. The collaboration between AI and nursing practices has shown to be significantly more effective. This investigation aims to analyze the beneficial impact of AI on disease diagnosis accuracy, prediction capabilities, and the mitigation of healthcare-related issues. Furthermore, it evaluates the outcomes derived from various studies and research endeavors [3, 4].

1.1. What is AI?

AI means computer intelligence. This technology employs techniques and algorithms that enable computers to perform tasks that typically require human intelligence and comprehension. These tasks encompass decision-making, learning, pattern recognition, and solving intricate problems. Data and diverse algorithms are key to enhancing AI capabilities (Table **1**) [4].

2. HISTORY

The concept of AI was initially introduced by John McCarthy in the 1950s-1960s. He conceived the notion of developing a machine capable of emulating human thinking. During this era, other notable researchers, such as Alan Turing and John Maxwell, proposed significant algorithms in the realm of AI. Subsequently, in the 1970s, there was a decline and waning interest in this technology, which was attributed to different factors. However, presently, AI has emerged as one of the foremost domains of research, technology, and industry. It has permeated diverse fields, including medicine, smart cars, and numerous others [11, 12].

3. AI IN NURSING

AI in nursing has the potential to enhance treatment, diagnosis, and care processes through the use of data-driven solutions and specialized algorithms. Table **2** lists some of the technological concepts, methods, and algorithms employed in this area:

Table 1. Terms related to AI.

Coming to Terms with AI	
Syntactic pattern recognition [5]	It provides a mechanism of analysis for the problem of pattern recognition, containing significant syntactic content.
Natural language processing [6]	A machine learning field in which a computer could understand, analyze, and manipulate data to possibly generate language.
Search engine [7]	Allows a search for information on the internet using keywords.
Computer vision [8]	A field of study to develop techniques for computers to visualize and understand digital content, such as images, photos, and videos.
Machine perception [9]	A concept in which computers have the ability to sense and act on their perceptions.
Data warehouse [7]	A technology in which databases are aggregated from multiple sources for reporting and analysis.
Data lake [10]	A storage repository that holds a vast amount of raw data in its native format until it is needed
Data estate [7]	Accumulation of all organizational data.

Table 2. Concepts, methods, and algorithms used in AI.

Technology/Method/Algorithm	Description
Deep Learning [13]	Deep Neural Networks improve disease diagnosis, medical imaging analysis such as X-rays and MRI scans, and prediction of treatment outcomes.
Natural Language Processing (NLP) [14]	NLP systems extract and analyze information from patient records, medical reports, and other sources to assist nurses in decision-making.

(Table 2) contd.....

Technology/Method/Algorithm	Description
Reinforcement Learning [15]	Reinforcement learning models can learn optimal strategies for disease detection and treatment, guiding nurses in complex and rapid decision-making.
Medical Imaging Processing [16]	Algorithms and techniques such as convolutional neural networks (CNNs) and hybrid networks are used for rapid medical image diagnosis.
Hospital Data Analytics [17]	Data mining and machine learning-based analytics identify new patterns in hospital data, enhancing healthcare quality and optimizing hospital processes.
Patient Monitoring [18]	Smart monitoring systems collect physiological data from patients using sensors and wearable devices, aiding nurses in better patient care.
Predictive Systems [19]	Using patient data, medical history, and other factors, predictive systems forecast the risk of new diseases or exacerbation of existing ones, assisting nurses in care planning.
Decision Support Systems [20]	These systems assist nurses in advanced and more effective decision-making by analyzing clinical data and information.

4. DIAGNOSIS AND EARLY DIAGNOSIS OF DISEASES

Undoubtedly, over time, the erosion of work among nurses and doctors due to long shifts and other factors reduces the possibility of human error in the diagnosis of diseases, and this can lead to a decrease in the accuracy of disease diagnosis. However, AI possesses traits such as precision, effectiveness, and minimal error rate, which are attributed to its machine-learning capabilities and prior knowledge. Early diagnosis of the disease begins the process of treatment faster and as soon as the diagnosis is done, the recovery and care process can be done better [12, 21].

4.1. Investigation and Prediction of Clinical Trends

The analysis and prediction of clinical patterns is another part of the effectiveness of AI. By examining the patient's data, AI can forecast health issues and complications arising from the disease. This awareness and prediction based on the individual's circumstances can greatly assist in the patient's care course. For instance, it can give insight into the likelihood of infection during hospital stay, complications caused by medication administration, the individual's response to treatment protocols, and even predict the recovery process [22].

4.2. Management and Optimization of Resources in Healthcare

With the system of categorizing and managing medical and nursing measures, we can carefully organize and manage the files, which reduces the need for paperwork. Moreover, AI carefully, with proper categorization and confidence in the registration of information, which is important, it is fully possible to put a special system for each patient in bed. Moreover, AI carefully categorizes the information and ensures that important information is registered can be done by placing an AI system next to the patient's bed [22].

4.3. Facilitating Communication between Nurses and Patients

AI can make it easier to exchange information between healthcare providers and their patients, especially in situations where language barriers exist [23].

4.4. Benefits of Integrating AI into Nursing

4.4.1. Increased Accuracy in the Diagnosis of Diseases

AI can assist physicians in the analysis of medical images such as X-rays, magnetic resonance imaging (MRI), and computed tomography (CT) scans, thereby enhancing the precision in disease diagnosis. AI can be a useful tool for minimizing medical errors because of its exceptional accuracy and absence of influences from emotional or workplace erosion. Furthermore, after diagnosis, AI can provide appropriate recommendations based on the type of disease and the patient's condition [22].

4.4.2. Reducing Fatigue and Job Burnout

AI-bots have the ability to facilitate patient transportation, deliver items next to the bed, assist with welfare services, and execute doctor's orders. Minimizing the nurse's mobility time during transfer allows her to focus on addressing various matters at the bedside. The primary emphasis lies on the nurse's bedside care [24].

4.4.3. Optimizing Resources and Reducing Waste

AI can be a better program for assigning nurses, reducing paper consumption and forgetting to write materials, appointment management, and scheduling so that patients' waiting time is reduced and leads to improved nurses' quality and health education and waste management [25].

4.4.4. Followingup and Adjusting the Meal Plan

AI can provide nutrition-related suggestions based on the patient's physiological needs. Undoubtedly, patients with high blood pressure need low-sodium foods. Low-sugar diabetic patients and other patients also need a special diet to reduce complications [26].

4.4.5. Improving the Quality of Healthcare

Through the use of data and preliminary sampling techniques, such as biopsy, AI is able to facilitate early detection and treatment of patients. Furthermore, it makes it possible to provide effective treatment methods. By analyzing data collected from individual patients, AI can tailor personalized programs and care for each person, resulting in a person-centered approach. In addition, the AI system can predict the patient's future

treatment and behavior through the use of predictive algorithms. This information is then utilized to provide recommendations to nurses, which aids in improving care processes. Finally, by leveraging data analysis, AI can continuously enhance care processes, thereby contributing to the overall improvement of patient care [27].

4.4.6. Helping Nurses to Prevent Certain Diseases

By utilizing AI and AI-Bot technology, patient information is categorized upon admission to the hospital and communicated to staff regarding their specific illnesses, including Human Immunodeficiency Virus (HIV), Hepatitis C&B, and Human Papillomavirus (HPV), *etc*. By tracking the treatment process of these patients, the AI-Bot effectively reduces the risk of needle stick injury for nurses and minimizes the likelihood of further illness [21].

4.4.7. Arrhythmias Diagnosis

The Deep Rhythm AI (DRAI) software is used to detect arrhythmias and automatically analyze Electro-cardiograms (ECG). DRAI is a cloud-based AI algorithm that analyzes all the heartbeats in the processed ECG signal and, based on that, classifies them as either correct or arrhythmic. Apple Watch Atrial Fibrillation (AF) feature analyzes pulse rate data from the Apple Watch to identify irregular heart rhythms suggestive of AF, and provides an estimate of the time spent in AF .Apple Irregular Rhythm Notification Feature (IRNF) app, which specializes in Irregular Rhythm Notification Feature, is a medical application that analyzes pulse rate data from the Apple Watch and notifies the wearer if AF is present. This system helps control patient care during post-discharge care, and recent news reports have reported that people have been saved in this way [28-31].

4.4.8. Administration of Medication

Such actions, based on the doctor's order, will not be without error, especially in developing or non-developed countries, due to the high number of patients relative to the treatment staff, which is uncontrollable. However, the integration of an AI system can validate medication dosage, particularly in cases of specialized ailments and pediatric care, identify potential side effects, and assess drug interactions, thus guaranteeing the administration of accurate drug dosages to patients [22].

4.4.9. Analyses Sleep Monitoring

Automatic sleep stage scoring based on deep neural networks has come into focus for sleep researchers and physicians. As a reliable method able to objectively classify sleep stages, it would save human resources and simplify clinical routines. In our claim, modern machine learning techniques are not just a tool to perform automatic sleep stage classification but are also a creative approach to find hidden properties of sleep physiology. We further analyze cortical activity during sleep by determining the probabilities of momentary sleep stages, represented as hypnodensity graphs, and then computing vectorial cross-correlations of different electroencephalogram EEG channels. We can show that this measure serves to estimate the period length of sleep cycles and thus can help to find disturbances due to pathological conditions. The patient's sleep cycle is a crucial aspect of nursing. The patient's sleep cycle is generally beneficial for nurses in providing better care and meeting their patients' needs more effectively [31, 32].

4.4.10. Controling and Monitoring Patients

The patient is continuously monitored by an AI-based monitoring device for any defects or medical emergencies. If there are any problems, the nurses are notified and they investigate and fix them. When there are shortages of staff in specialized departments, nurses may not be able to monitor patients simultaneously, but the AI system can address this limitation by alerting the nurse [27].

4.4.11. Assisting Teaching and Teaching in Teaching Hospitals for Nursing Students

AI-based programs have the potential to aid diverse students, particularly those in the nursing field, in examining intricate medical information, recognizing patterns related to health, and making informed decisions. It enhances the health of both the patient and the healthcare system [33].

4.4.12. Continuous Glucose Monitoring (Especially in Pregnant Women with Type 1 Diabetes)

During the nursing process, ensuring the care of both the mother and fetus is important for a safe delivery. Physiologic and psychological changes should be monitored for potential risks. The nurse assesses these changes by obtaining a detailed maternal history and conducting regular prenatal checks. Type 1 diabetes increases the risk of adverse pregnancy outcomes, including higher rates of pre-eclampsia and caesarean section in mothers, and of congenital anomaly, preterm delivery, perinatal mortality, large for gestational age, and neonatal intensive care admission in infants. The evidence that optimal glycaemic control early during the first trimester is associated with improved outcomes reduced congenital anomalies, and perinatal mortality is well established. Likewise, reduced exposure to maternal hyperglycemia during the second and third trimesters is associated with reduced pre-eclampsia, preterm delivery, large for gestational age, and neonatal intensive care admissions. As a result, the mother and fetus can be taken care of by continuous monitoring. The WellDoc BlueStar System securely captures and transmits blood glucose data to assist patients and their healthcare providers in diabetes management. It also provides motivational and educational coaching messages based on blood glucose values and trends to promote medication adherence. The d-Nav System is a software-based, prescription-only product designed to provide the next insulin dose recommendation as an aid for personal insulin management. Idx-DR is used with Topcon NW400 to automatically detect (more than mild) diabetic retinopathy in the eyes of adults with diabetes who have not been previously diagnosed with diabetic retinopathy [31, 34-38].

4.4.13. Wound Healing

The Spectral MD Deep View Wound Imaging System provides images of blood flow in the microcirculation and provides an assessment of perfusion of both healthy and injured skin (eg, skin flaps, chronic wounds, decubitus ulcers, diabetic ulcers, and burns). Artificial intelligence can play an important role in wound care in nursing. The MIMOSA Imager is used in the ambulatory care setting to estimate the spatial distribution of percent oxygen saturation in tissue during the examination of patients with suspected circulatory compromise. Among its applications are predicting wound risks, continuous monitoring of patients to identify changes in wounds and guidance for the development of appropriate care programs. This technology has the potential to enhance the quality of health care and reduce costs [1, 28, 31].

4.4.14. Development of Rehabilitation Programs

AI systems have the potential to assist in the development and assessment of rehabilitation programs for patients following specific medical procedures or therapies. It is evident that this precise algorithm has the ability to develop a more precise rehabilitation program, thus improving the effectiveness of the treatment process [25].

4.4.15. Urinalysis

The Minuteful - kidney test is a kit and smartphone application that measures and displays albumin and creatinine in urine, along with the albumin-creatinine ratio. The ACR | LAB Urine Analysis Test System is a kit (including a color board and reagent strips) along with a smartphone application that measures albumin and creatinine in urine and displays the results, along with the albumin-creatinine ratio. The DIP/U.S. Urine Analysis Test System is a kit (including a color board and reagent strips) along with a smartphone application that measures urine parameters, including pH, glucose, protein, specific gravity, blood, and nitrate and provides these results directly to the clinician to aid in the diagnosis and monitoring of kidney disease. By being aware of patient urine analysis, nurses can check the patient's health status and provide appropriate treatment. The analysis can provide useful information, including levels of salts, blood sugar, protein, and other elements in the urine that may indicate various diseases. According to the results of the analysis, nurses can determine whether the patient needs special treatment, whether his or her overall condition is stable, if he or she needs changes in treatment or whether kidney-related diseases, diabetes, *etc*. are developing. This information can help nurses better treat and maintain the patient and prevent the disease from worsening [2, 31, 39, 40].

4.4.16. Keeping the Patient Safe

The elderly are faced with many challenges, one of them being the risk of falling. An AI system is capable of effectively monitoring and detecting falls, which allows it to predict potential accidents. Moreover, this system provides valuable recommendations to nurses on the necessary precautions to take. Finally, it instructs patients on how to reduce risks and handle these situations with the utmost care [41].

4.4.17. Sleep Apnea

With the sleep apnea feature, Samsung is taking the next step in its ongoing commitment to provide users with the best possible sleep tools to improve their sleep health habits. The new feature will detect signs of moderate to severe obstructive sleep apnea (OSA) in adults 22 years of age and older, empowering people to seek medical care. The feature, a software-only mobile medical app, uses smartwatch built-in sensors to monitor the user's sleep for significant breathing disruptions associated with OSA. Users may track their sleep twice for more than four hours within a 10-day period to utilize the feature. According to Samsung, the feature is not intended to replace diagnosis and treatment by a clinician, nor is it intended to assist clinicians in diagnosing sleep disorders. It is also not intended for those who have previously been diagnosed with OSA. Snore detection is an AI software that diagnoses obstructive sleep apnea [31, 42].

4.4.18. Seizure Identification

The Embrace is a device that provides an adjunct to seizure monitoring in-home or healthcare facilities. The device senses electrodermal activity and motion data and detects patterns potentially associated with generalized tonic-clonic seizures. When a seizure event is identified, a paired wireless device will initiate an alert to a designated caregiver. The data is stored for subsequent review by the clinician [31, 43].

4.4.19. Estimation of Blood Loss

The Triton System is a software application used on an Apple iPad that captures images of used surgical sponges to estimate blood loss and assist operating room personnel in managing surgical sponges after surgical use. Nurses can provide the best possible care for their patients by using artificial intelligence to estimate the amount of blood lost in the operating room. Nurses can react more accurately and quickly when blood loss requires immediate intervention with this information. The level of safety in the operating room (OR) and postoperative (after the operation) is increased due to the reduction in the likelihood of serious problems for patients [31,44, 45].

4.4.20. Prevention of Complications

Through a meticulous analysis of patient history and medical data, AI is able to identify factors that can help identify potential complications or problems. Through this process, the use of AI can effectively prevent the emergence of unwanted complications, thereby improving the overall quality of healthcare provided [22].

4.4.21. Early Alarming of Deterioration of Patient Status

AI, by analyzing patient data in anesthesia and ICU, can detect patterns of early changes in patient vital

indicators and provide warnings to nurses. This accurate and early information will allow nurses to begin treatment or emergency procedures more quickly, prevent more serious problems, and help improve the patient's progress. Furthermore, it is possible to develop predictive algorithms and proper disease management that aid in improving overall care and reducing mortality rates [46, 47].

4.4.22. Diagnosis of Psychiatric Diseases

The AI application for diagnosing psychiatric diseases received the least positive evaluation among the different factors. The low rating of AI's potential for psychiatric diseases is remarkable as there are several AI applications for this medical field, as described in recent publications for machine learning. Despite the somewhat negative results, there is still hope that Artificial Intelligence will be utilized to diagnose psychiatric illnesses and aid nurses in caring for these patients. AI can play a role in improving the decision-making processes of physicians and nurses. In addition, for foreign data analysis, it has the potential to create new patterns in accessing medical information [47-49].

4.4.23. Robots in Patient Care

The application of AI in nursing through the use of robots is an attractive aspect. These robots can perform tasks such as distributing medications, performing basic tests, and even providing additional information to patients [50].

5. ETHICAL CONSIDERATIONS AND OBSTACLES (CHALLENGE)

5.1. Privacy and Data Security

The implementation of AI in the field of nursing has the potential to raise concerns regarding patient privacy. Consequently, it is essential to establish appropriate protocols and guidelines for the effective handling and protection of confidential information [33].

5.2. Interpersonal Communication in Healthcare

Human communication plays a crucial role in health care. This type of relationship directly affects the quality and effectiveness of the care provided. Establishing a robust and intimate bond between nurses, treatment staff, and patients engenders a heightened sense of assurance and ease within the patients, thereby expediting their recuperation and amelioration. Furthermore, this type of communication can be a source of motivation and optimism for patients, resulting in a deep sense of importance and attentiveness [51].

5.3. Addressing Bias in AI Algorithms

The importance of balancing AI with human experience in the nursing field cannot be underestimated. Although AI is undoubtedly helpful for nurses in providing better care, it's crucial to recognize that final decisions still require human knowledge and experience. Furthermore, it is crucial to address the potential biases pertaining to gender, ethnicity, color, and so on that may be present within the care plan, as this represents a formidable obstacle for AI in the realm of nursing [25].

5.4. Excessive Dependence on Technology

Nurses' human skills may suffer as a result of too much reliance on AI. The resolution of this matter necessitates the establishment of an appropriate balance between the utilization of AI and the application of human skills [52].

5.5. Ensuring Trust in the Results Produced by AI Systems

Although AI works based on algorithms, the results cannot be 100% again because there is still a possibility of error, although in a small amount. Therefore, the need to use this technology is behind the human frame and cannot be used directly and independently. Consequently, the utilization of this technology necessitates the presence and guidance of human personnel, as it cannot be used independently.

5.6. Professional Ethics

Human compassion is a vital component of this discourse. AI implementation has the ability to take arbitrary actions that could result in a patient's death, only to save money and other factors. Nurses' innate empathy and selflessness are contradicted by such actions. In other

Table 3. Summarizes the ethical considerations and obstacles of implementing AI in nursing.

Challengeq	Summaryq
Privacy and data security	Implementing AI in nursing raises concerns about patient privacy. Protocols and guidelines must be established to handle and protect confidential information effectively.
Interpersonal communication in healthcare	Human communication is crucial in healthcare, affecting the quality of care. Establishing strong bonds between nurses, staff, and patients accelerates recovery. Communication also motivates patients.
Addressing bias in AI algorithms	Balancing AI and human experience is essential. Final decisions require human input to address biases in care plans, such as gender or ethnicity biases.
Excessive dependence on technology	Overreliance on AI may compromise nurses' human skills. It's vital to strike a balance between AI utilization and the application of human skills.
Ensuring trust in AI results	Despite AI's algorithmic nature, results may not be 100% accurate. Human guidance is necessary to interpret and validate AI-produced results accurately.
Professional ethics	AI implementation may clash with professional ethics, as arbitrary actions could harm patients. Human compassion and ethical considerations must guide complex decisions in patient treatment.

words, in the face of complex decisions related to the treatment of patients, humanity, pity, and professional ethics must continue to be maintained. Thus, sensitive decisions still require human evaluation [51]. Table **3** summarizes the ethical considerations and obstacles of implementing AI in nursing.

6. THE FUTURE OF AI IN NURSING

The future of AI in nursing is promising because it is continuing to evolve and advance, as is the case with other domains. The future for this technology in nursing looks bright because of the advancement of robotics and the ability to improve care plans with individual data.

6.1. Development and Future Advancements in Technologies related to AI

The advancement of technology is a continuous process that we are facing day by day. Providing algorithms and AI analysis is getting better day by day and undoubtedly will help the care services and medical treatment sector in the (near future) not too distant future. Remember that we also require a nursing group for this development. To effectively develop an AI system to assist medical staff, the presence of experienced personnel is indispensable for organizing and managing this system [22].

6.2. Greater Impact on Improving Healthcare

AI has had a positive impact on improving health care by optimizing the treatment process, reducing unemployment, robotics care, continuous education, *etc*., with the help of the therapy community, especially nurses, who are more likely to be at the patient's bedside. The positive and significant impact that AI has on healthcare is largely due to the involvement of the medical community, which includes nurses who care for patients at their bedside [53].

6.3. Development of New Skills and Training for Nurses

AI is a system that is always up-to-date and can impart (teach) the latest care methods to anyone worldwide The integrated global education system in this sector requires the most up-to-date training, and this training will increase the skills of nurses [33].

6.4. Reduction of Workload

The future of AI technology will involve robotic care that is deeply intertwined with AI. Through the use of an artificial intelligence system, Chat-Bot has the potential to alleviate the burden on nurses' workload, allowing them to allocate additional time towards patient communication and the delivery of enhanced care [25].

7. VIRTUAL PATIENTS

By using an AI system, it is possible to simulate different patients during the treatment process, which enables the management of various diseases, hospital treatment procedures, and educational discussions about different patients for nursing students. Therefore, the health department will add experienced and expert staff in the future. Students can hone their clinical skills in a secure and regulated environment without incurring any manpower expenses through this approach [54].

7.1. AI-Bot

These robots are much more accurate in memory and data retrieval tasks than humans. Moreover, they ensure that the diagnoses are more precise and stable and simplify the provision of all necessary requirements for patients [50].

7.2. Improving the Treatment Outcomes of Patients

AI's recommendations for timely measures will undoubtedly improve patients' treatment outcomes. There is no doubt that taking timely action when needed and urgently will have a positive effect on the treatment, illness, and survival of the patient [53].

7.3. The Current State of AI Implementation in Healthcare (Real-life Examples of AI Implementation in Healthcare so Far)

7.3.1. AI for Early Diagnosis

The use of AI has significantly contributed to the timely detection of medical ailments, such as heart attacks. AI-based wearable gadgets have been created to monitor a person's health and alert them if they record unusual things or health risk factors. Notable examples of such wearable devices are Fitbit, Samsung Watch, and Apple Watch, among others [41, 55].

7.3.2. Virtual Reality (VR) System to Manage Pain

Virtual reality is employed in the field of nursing to address pain management. Through the immersion of patients in virtual environments, VR has the potential to divert their attention from pain and discomfort, consequently diminishing the need for excessive medication intake. By customizing virtual environments according to each patient's preferences, AI can enhance this experience and reduce pain [56, 57].

7.3.3. Language Translation Systems in Healthcare Centers

Certain healthcare facilities use language translation devices that rely on AI. The efficient communication between nurses and patients with different mother tongues is made possible by these advanced devices [23].

7.3.4. Fall Detection System

AI-based fall detection systems are crucial in nursing care, especially for elderly or vulnerable patients. These systems use advanced sensors and AI algorithms to detect abrupt movements or falls. Notifications are sent to the nursing staff promptly upon detection, which allows for immediate response and assistance. Currently, this technology is integrated into select smartwatches, which not only detect falls but also activate the SOS system and establish communication with medical centers [41, 58].

Table 4. The future of AI in nursing and the current state of AI.

Future of AI in Nursing	Current State of AI Implementation in Healthcare
Advancement of robotics and individualized care plans	Early diagnosis using AI-based wearable devices like Fitbit and Apple Watch
Impact on healthcare: optimization of treatment processes, workload reduction, continuous education	Virtual reality systems for pain management
Skills development and training for nurses	Language translation systems for efficient communication
Workload reduction through AI technology	AI-based fall detection systems for patient safety
Use of virtual patients for nursing student training	AI-powered medical image analysis for accurate diagnosis
AI-Bots improving data retrieval and patient care delivery	Telehealth services for remote medical consultations and follow-ups

Table 5. The utilization of AI in hospitals worldwide.

Hospital	Location	AI Application	Key Points
Aria Hospital [58]	Tehran	Fall detection system	Pioneering the use of AI for nursing care ensures patient safety, highlights commitment to cutting-edge healthcare services
CHI Health [61]	Omaha	Appointment no-show prediction, sepsis detection, stroke diagnosis	Uses AI for various medical tasks, including predicting no-shows and diagnosing diseases
Thomas Jefferson University Hospitals [61]	Philadelphia	Diagnosis and treatment improvement	Pioneers in AI integration in healthcare, focus on enhancing patient care through AI technology
Charité Hospital [62]	Berlin	Disease diagnosis and treatment improvement	Renowned for AI expertise, enhances the accuracy of diagnosis and treatment using advanced AI technologies
Johns Hopkins Hospital [63]	Baltimore	Medical research and disease diagnosis	Globally recognized for AI utilization in medical research, employs sophisticated AI algorithms for data analysis.

7.3.5. Medical Image Analysis through the Use of AI

Certain hospitals use AI to precisely analyze medical images, such as X-rays and ultrasound, which ensures accurate results [59].

7.3.6. Telehealth

Telehealth offers the potential to meet the needs of underserved populations in remote regions. This method is very effective, especially during the recent coronavirus epidemic. Many doctors visit and follow the treatment process for their patients in this way. As a result, it is a useful method for individuals who are far away and cannot access the centers or are unable to go due to an epidemic [60]. Tables **4** and **5** summarize the future of AI in nursing and the current state of AI implementation in healthcare.

CONCLUSION

AI has revolutionized nursing by enabling a new level of transformation and improvement. The effective use of this constantly developing technology has the potential to achieve optimal and higher-quality healthcare. Diagnostics and predictions can be significantly improved, while resource utilization can be optimized and waste can be reduced. AI is undoubtedly one of the most crucial factors in enhancing the level of healthcare worldwide.The advancement of AI technology in nursing is essential, and research and investment in this area can result in significant improvements in its performance and capabilities. However, establishing standards and guidelines is crucial for the effective use of this technology. Despite the fact that AI can simplify administrative interactions, maintaining emotional relationships that are based on human connections is still important, and professional nurses are crucial in this regard. Even though AI can simplify administrative interactions, maintaining emotional relationships that stem from human connections is still necessary, and professional nurses play a crucial role in this regard.

AUTHORS' CONTRIBUTIONS

H.M designed the topic and wrote the manuscript. H.M and M.H.M participated in the initial draft and revision of the manuscript. H.M revised the final version of the manuscript. All authors read and approved the final manuscript.

LIST OF ABBREVIATIONS

MRI = Magnetic Resonance Imaging

CT = Computed Tomography

HPV = Human Immunodeficiency Virus (HIV) human papillomavirus

HIV = Human Papillomavirus

CONSENT FOR PUBLICATION

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CONFLICT OF INTEREST

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