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SOCIAL SERVICES, HEALTH AND SPORTS

ARTIFICIAL INTELLIGENCE IN NURSING: CURRENT USES, ETHICAL CONSIDERATIONS, AND FUTURE PROSPECTS

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Abstract

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The purpose of this thesis is to describe the current state of AI in nursing and its implications for nursing practice. In this thesis, a comprehensive literature review of the current state of artificial intelligence is conducted, by examining its use and benefits, ethical considerations, and the future implementation of AI in the field of nursing. The aim of the thesis is to provide nurses with an understandable overview of AI and its potential applications in nursing; in other words, to increase knowledge about the use, implications, and ethical problems of AI in nursing.

A thematic analysis and inductive content analysis were employed to analyze the selected articles. Themes and categories were generated to answer the research questions, providing a structured understanding of AI applications, ethical considerations and future prospects in nursing.

The findings reveal a diverse range of AI applications in use within nursing, including AI-powered diagnostics, personalized treatment plans, and robotic assistance in routine tasks. In addition, the study highlights the importance of addressing ethical considerations, such as mitigating biases in algorithms, safeguarding patient privacy, and ensuring accountability in AI decision-making processes. The thesis also discusses future trends in AI development, emphasizing the need to integrate AI innovations into a human-centered healthcare framework to promote fairness and compassion.

Keywords: artificial intelligence, healthcare, nursing practice, current applications, future applications

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1 INTRODUCTION

Artificial intelligence (AI) can be defined as computer systems that are engineered to complete human-like intelligence, which can be problem solving, decision making, and analyzing data or inputs. The types of AI that are most associated with nursing are machine learning, natural language processing, robotics and deep learning (Sommer, Schmidbauer, and Wahl 2024).

There has been a rapid development of new AI technologies which are beginning to revolutionize healthcare systems around the world and therefore necessitates a need for research to examine the scope and implications of such an expansion of technologies. For example, AI-powered tech is being used to analyze medical images and patient histories to bring attention to any diseases or abnormalities. Virtual nursing assistants are used by patients to provide basic health advice, and predictive analytics systems are in development to help identify future medical complications. (Watson 2024.) There are even AI-driven robots that help with patient care, such as monitoring vitals and delivering medicine (Ibuki, Ibuki and Nakazawa 2024).

This study was undertaken to investigate the developments within the field of AI as they apply to nursing. Savonia University of Applied Sciences was my working life partner during the development of my thesis. I also had conversations with several classmates to discuss my analyses and findings. The benefit to me and other classmates in the program as well as to the nursing faculty at Savonia is to bring awareness of the issues of using AI in nursing programs and in practice.

The integration of AI in nursing has many benefits to the wider nursing community, e.g., the potential to improve efficiency by cutting down on the time needed to analyze information. With the proper training of staff on how to use these AI systems, patient outcomes can be improved by providing more personalized care, and more can be done with fewer staff (Watson 2024). However, there are many concerns and ethical considerations that surround the use of AI in the nursing profession.

The purpose of this thesis is to describe the current state of AI in nursing and its implications for nursing practice. In this thesis, a comprehensive literature review of the current state of artificial intelligence is conducted, by examining its use and benefits, ethical considerations, and the future implementation of AI in the field of nursing. The aim of the thesis is to provide nurses with an understandable overview of AI and its potential applications in nursing; in other words, to increase knowledge about the use, implications, and ethical problems of AI in nursing.

2 CURRENT USES OF AI IN NURSING

Artificial intelligence is quickly being implemented throughout most sectors of the world. Healthcare, particularly nursing, is seeing some rapid developments. By using human-like intelligence in AI-powered diagnostics, problem-solving, decision making, and data analysis, AI is increasingly being used by nurses and healthcare providers all over the world (Ahmed 2023; Ghane et al. 2024; Gonzalez-Garcia 2024; Rhone et al. 2023; Sommer et al. 2024).

The algorithms used by large language models (e.g.,ChatGPT) have the ability to analyze massive datasets by identifying patterns. In healthcare this allows the practitioner to predict health risks, identify potential findings missed in x-rays, and other diagnostics. They are also capable of processing information from various sources, such as health records, medical images, dietary logs etc. (Ahmed, 2023).

AI tools can help caregivers track patient progress, identify potential complications early, detect potential dangers and make informed decisions about the care patients receive. These tools are capable of analyzing patient data from all sorts of devices, such as wearables, smart watches, health records, and home monitoring systems, to provide valuable data for the healthcare professionals (O'Connor, Devane and Rose 2024). Some specific examples of the AI applications found in the literature mentioned fall prediction, enhanced knowledge of urinary tract infections (UTIs) risk assessment of ischemic stroke, pressure ulcers, and the ability to classify patients according to their needs (Gonzalez-Garcia et al. 2024; Ibuki et al. 2024).

AI has the potential to transform personalized healthcare plans, by analyzing patient data and identifying patient needs and preferences. With the support of remote monitoring, AI could be a powerful tool to deliver more accurate efficient, individualized patient care (Lora and Foran 2024).

AI systems can support nurses with their decision making by offering evidence-based suggestions, evaluating complex data, and suggesting potential treatment approaches for the patients (Ghane et al. 2024). AI tools are also able to analyze patient datasets, research findings and medical literature through machine learning and natural language processing. This allows the nurse to make better, more accurate evidence-based decisions (Rony et al. 2023).

The research shows that AI systems can automate many administrative tasks for the nursing staff, such as documentation, scheduling, medication management, and charting (Watson 2024). It has been shown that automating these systems frees up a lot of time for nurses to focus on direct patient care and interactions that can only be provided by a human (Woodnutt et al. 2023).

AI powered communication platforms can be leveraged to efficiently share and collaborate among all kinds of healthcare professionals. Nurses will have the ability to communicate more easily with doctors, pharmacists, and other types of healthcare professionals. This in turn can help improve coordinating care and reduce risks of communication errors, as well as reduce redundancy and save time. (Ghane et al. 2024; Sommer et al. 2024.)

There is plenty of support from the literature about the idea that AI can reduce the workload of mundane administrative tasks, such as charting, and inputting data, which positively affects job satisfaction. In the article "Optimizing Nursing Productivity: Exploring the Role of Artificial Intelligence, Technology Integration, Competencies, and Leadership," the integration of technology, including the use

of AI, significantly enhances the productivity of nurses. (Alenezi et al. 2024.) Although the initial introduction of this technology might disrupt existing ways of doing things, because of the training needed and to overcome any learning curve of the new tech, in the long term it can lead to productivity gains.

A study conducted by Pavan Amara suggested that AI can aid nurses in managing patient caseloads, speeding up decision making and accomplishing boring repetitive tasks. This frees up the amount of time that the nurses can have with direct patient care, leading to increased job satisfaction. (Amara 2024.) In the article, “Impact of Artificial Intelligence–Based Technology on Nurse Management,” the researchers found that AI can reduce administrative work, improve ongoing care, and optimize and manage resources more effectively. This enhances operational efficiency but also allows nurses to spend more time directly with the patients (Gonzalez-Garcia et al. 2024).

In the research article “Virtual Reality with Artificial Intelligence-led Scenarios in Nursing Education,” the project evaluated the experiences of nursing students using two VR scenarios: one with a menu-based interface and the other using AI voice-controlled technology. The students ended up choosing the voice-controlled method, because they found it to be more natural. (Texeira et al. 2024.)

Although AI has the potential to greatly improve the lives of nurses, there is also the concern that AI will change the role nurses play in a negative fashion, as well as the fear that they might be replaced entirely one day (Cahill 2024). However, the literature generally supports the idea that AI will augment nursing skills, rather than replace nurses entirely (Amara 2023) Most likely what will end up happening is AI will handle the repetitive data-driven tasks, freeing up nurses to concentrate on direct patient care, where humans excel the best at being empathetic, caring, and are able to use their critical thinking to achieve the best results (Ibuki et al. 2024; Amara 2023).

With the integration of AI systems to solve many of the nursing needs, the industry must be careful not to lose sight of the human-centered nature of nursing care. AI should be used to support nurses in providing compassionate, empathetic care. It is important that the human connection that is one of the fundamental aspects of nursing care is not replaced. (Gallagher 2024.)

3 ETHICAL CONSIDERATIONS USING AI IN NURSING CARE

With the rapid advancement and integration of artificial intelligence into healthcare, specifically nursing, a host of ethical considerations have been discussed in the research literature that need to be carefully examined. This was an extremely important consideration that appeared in many of the articles. While AI offers numerous benefits that can potentially enhance patient care, streamline workflows, and optimize resource allocation and increase efficiency, it also presents unique challenges. The sources highlight a range of ethical considerations, focusing on privacy, confidentiality, bias, transparency, accountability, and preserving the human element in caregiving.

Several studies discussed that safeguarding patient privacy and data security is of the most important considerations when using AI in nursing. AI systems in healthcare generally rely on vast amounts of sensitive patient data, including medical records, personal information, and even real-time monitoring data (Lora and Foran 2024). This data is essential for training AI algorithms and enabling them to provide insights and recommendations for patient care. However, the sensitive nature of this information creates significant ethical challenges and risks. It is important that healthcare providers are aware of these.

Making sure the data is anonymous and secure when using AI systems is a complex task indeed. While some AI algorithms like those used for analyzing mammograms, can function using images alone, thereby protecting patient privacy, other applications require access to more detailed patient information. (Cahill 2024.)

Nurses need to be aware of the potential risks and limitations of using AI in a healthcare setting, when serious decisions could have serious consequences. Nurses should not rely solely on AI tech to make clinical decisions. They should view the AI system as a tool that can help streamline and identify potential solutions or problems. AI should never replace human judgement and critical thinking. Therefore, nurses should be trained in how to use the AI systems effectively and how to critically evaluate the results and recommendations made by these systems. (Ibuki et al. 2024; Amara 2024.)

AI systems are only as good as the data they have been trained on. Therefore, if AI is trained on biased data, it may produce biased recommendations (Rony et al 2023). Nurses must be aware of the potential for bias in AI systems and use critical thinking to evaluate these recommendations (Lora and Foran 2024).

Researchers point out that it is important to mitigate the risks to patient data and security, and this can be done by implementing strong data encryption and access controls, to limit access to sensitive information to authorized personnel only. These measures could include multi-factor authentication, role-based access control and regular audits to ensure compliance (Rony et al. 2023). By developing clear guidelines and regulations, issues such as informed consent and the misuse of patient data can be better addressed. These guidelines illustrate the proper use of AI systems in healthcare, ensuring compliance with privacy laws and ethical principles. (Gallagher 2024.)

Including ethicists and legal experts in the design and implementation of AI systems will ensure compliance with privacy regulations. Ethicists are professionals that can help identify and address potential biases in AI algorithms and therefore contribute to the development of ethical AI guidelines.

Legal experts can ensure AI systems are following privacy laws and regulations, such as HIPAA in the United States and GDPR in Europe (Rony et al. 2023; Texeira et al. 2024).

AI algorithms have the potential to transform healthcare in a positive way, but they also have the potential to be biased, which could lead to unfair or discriminatory treatment of certain ethnic groups, genders, weight, height, etc. These biases can come from the use of biased training datasets or the design of algorithms that end up favoring certain characteristics (Amara 2023). Addressing algorithmic bias is important to ensure that AI systems in healthcare are fair, transparent, and favor all the patients the same.

Pavan Amara concluded in her study that when an AI system is trained on a dataset that primarily includes data from white patients, it may not perform as well when analyzing data from patients of other races. This is because the AI system has learned to associate certain characteristics with "normal" based on its biased training data. More specifically AI used for skin-based diagnoses has been shown to be biased towards white skin, because the majority of data samples come from white patients. (Amara 2023.)

The literature highlights the changing nature of AI in healthcare and the lack of laws and regulations to address these challenges. When an AI system makes an incorrect or harmful recommendation or hallucinates, determining who is ultimately responsible is super difficult. Is it the nurse who relied on the AI's guidance, is it the healthcare provider who oversaw the care, the AI developer who created the algorithm, or the healthcare facility that decided to use the technology?

There is the potential for AI systems to make errors which can potentially lead to negative patient outcomes. However, it is difficult to pinpoint who is responsible due to the "black box" nature of many AI algorithms, where the decision-making process is not always transparent. (Ibuki et al. 2024.) This lack of transparency makes it challenging to determine whether an error originated from the AI system itself, the data it was trained on, or how it was implemented in the clinical setting. It is also suggested that these problems will be further exacerbated by the rapid change in AI, which will make it difficult for legal and ethical guidelines to keep up to speed (Ghane et al. 2024; Gallagher 2024). It is important to maintain a balanced approach to human-AI collaboration, recognizing both the capabilities of AI and the essential role that humans provide with direct nursing care and empathy (Gonzalez-Garcia et al. 2024). Pavan Amara acknowledges the potential of AI to revolutionize healthcare, but she also cautions against over-reliance on AI, stressing the need to preserve the human touch in nursing and ensure that AI augments, rather than replaces, human skills and judgment (Amara 2023).

Atallah Alenezi and his co-authors believe that AI can free up nurses' time by taking over repetitive, mundane tasks, which would allow nurses to dedicate more time to things requiring uniquely human skills like emotional support, complex decision-making, and relationship building with patients (Alenezi et al. 2024). For example, AI-powered tools can assist with documentation, data entry, medication management, and patient monitoring (Gonzalez-Garcia et al. 2024). This has the potential to reduce nursing workload and stress, enhance patient safety, and improve the overall quality of care (Sommer et al. 2024).

On the other hand, Liam Cahill expressed concern that over-reliance on AI could lead to a decline in critical thinking skills among nurses (Cahill 2024). If nurses become too dependent on AI-generated

recommendations, they may become less capable at assessing patients on their own, analyzing data, and making informed clinical judgments (Ibuki et al. 2024). This could have the negative effect of depersonalization of care, as the focus shifts from human interaction and empathy to technology-driven solutions (Wangi et al. 2024).

It is therefore important to have a balanced view which acknowledges both the potential benefits and risks of AI in nursing. AI should be viewed as a powerful tool that can enhance the nursing profession, not as a replacement for human nurses (Gallagher 2024). The literature stresses the importance of using AI to augment human capabilities, not to replace the essential aspects of nursing that require human judgment, compassion, and critical thinking (Lora and Foran 2024).

4 FUTURE PROSPECTS FOR USING AI IN NURSING CARE

The future of nursing will have more and more uses of artificial intelligence (AI) in healthcare, and this was an important topic within the articles in this literature review. While there are still concerns about the potential for AI to replace nurses, the literature suggests there will be more of a trend towards human-AI collaboration. Emerging trends such as sophisticated robotics, and robots, advanced natural language processing, and powerful machine learning algorithms are expected to further improve patient care, nursing roles, and healthcare delivery. These trends will lead to more personalized and patient-centered experiences, where the machines will have a greater role in analytics and the nurses will have a greater role in direct patient care. (Watson 2024.)

AI has the potential to help with nursing staff shortages and burnout. This can be done by taking on tasks that don't require direct human interaction and optimizing workflows as well as providing recommendations to support the nurses' clinical decisions (Cheng 2024). This can free up time for the nurses to focus on in-person, human, care. This has the potential to lead l to a more satisfying work environment with higher nurse staff retention (Amara 2023). Moustaq Karim Khan Rony and colleagues point to AI's ability to automate administrative tasks, enhance patient monitoring, and support clinical decision-making (Rony et al. 2023).

On the other hand, it is important to present a realistic view and understand that AI is not a fix-all solution to the many challenges facing the nursing workforce. The literature recommends that AI should be seen as a tool to augment human capabilities, not as a replacement for nurses (Amara 2023; Cahill 2024). It is more important than ever that human touch, including empathy, critical thinking, and the ability to build healing relationships is not lost in nursing care.

AI has the potential to create more individualized care experiences with the patient at the center. This can be done by tailoring treatment plans, providing real-time feedback, and offering continuous monitoring and support. This can lead to better health outcomes and improve patient satisfaction overall. (Rony et al. 2023.)

The nursing staff will need to develop new skills to keep ahead of the game. These new skills will be in data analysis, AI interpretation and human-AI collaboration (O'Connor et al. 2023). Also includes understanding how AI systems work, how they interpret AI-generated insights and recommendations, as well as making informed decisions based on a combination, of AI data and their own clinical judgment and gut feelings (Woodnutt et al. 2023).The literature stresses the importance that AI should augment human expertise, not replace the essential aspects, human aspects of nursing that require human interaction, empathy, and critical thinking to care for the patients (Alenezi et al. 2024; Cahill 2024).

Siobhan O'Connor, a senior lecturer at King's College London, emphasizes the importance of responsible AI development and its implementation to ensure patient safety, fairness, and transparency (O'Connor 2024). There are many discussions around the ethical implications of AI in nursing. These highlight the need for ongoing dialogue and the development of clear guidelines which should ensure that AI is used ethically and effectively and is a tool rather than a crutch.

5 RESEARCH PURPOSE AND AIM/OBJECTIVE

The purpose of this thesis is to describe the current state of AI in nursing and its implications for nursing practice. In this thesis, a comprehensive literature review of the current state of artificial intelligence is conducted, by examining its use and benefits, ethical considerations, and the future implementation of AI in the field of nursing. The aim of the thesis is to provide nurses with an understandable overview of AI and its potential applications in nursing; in other words, to increase knowledge about the use, implications, and ethical problems of AI in nursing.

The research questions I addressed to better understand the purpose of the thesis are as follows:

(1) What are the current uses of AI in nursing?

(2) What are the ethical considerations of using AI in nursing?

(3) What are the future prospects for AI in nursing?

6 RESEARCH IMPLEMENTATION

6.1 Introduction of the Research Method and Data Collection

A narrative, or thematic, literature review was used for the basis of this thesis in addition to coding (see below). The most common way to start a literature review is to start out broad and then become more specific (University of Reading 2024). It is helpful to think of it as an inverted triangle.

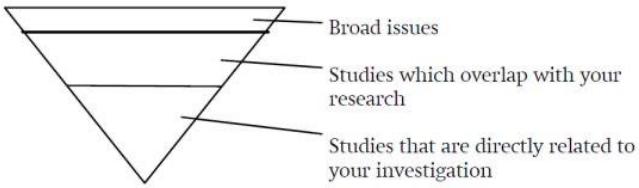

Figure 1. Triangle diagram that illustrates the process of narrowing focus in a literature review (University of Reading 2024).

Although I used a traditional approach, I became much more narrowly focused. Instead of using broad issues and studies that overlap, I focused on studies that are directly related to my investigation. This was much more efficient and concise.

6.2 Research Environment

The setting for this study involved searching for research articles online using the university databases. To identify articles, specific keywords and phrases were employed to search reputable databases, such as PubMed, CINAHL, and Google Scholar. Boolean operators (AND, OR, NOT) were used to refine the search, such as (“advantages” OR “disadvantages”) AND (“artificial intelligence” OR “AI” OR “current applications”). These keywords make up a large finding of AI integration in healthcare, from its applications in diagnostics to its role in improving patient care outcomes.

6.3 Data Collection

The searches for relevant research literature included academic sources, mainly peer-reviewed articles. The searches were restricted to including publications up to the present date, the majority of which were published in the last two years. This ensured that the review was up to date with the latest developments and insights in the rapidly changing field of artificial intelligence.

6.4 Data Analysis

In this thesis, an inductive content analysis was utilized by which categories are created through an examination of the data, i.e., the research literature, to address the research questions of this thesis (Kyngäs 2020). The process of content analysis paralleled the literature review in that it started with broad topics and became ever more specific. At first, in content analysis, open codes are created, which are sub-categories that are contained within the articles, and then these codes are combined across articles to concepts, themes, and categories across the articles (See Appendix 1).

The process of coding is an iterative process, in that the codes are reviewed several times throughout the process of creating and refining categories (Kyngäs 2020). Three broad categories were dis-

cerned through the research literature: (1) the current uses of AI in nursing, with sub-categories including AI-powered diagnostics, personalized care plans and treatments, AI-powered tools, etc.; (2) ethical consideration using AI in nursing care, including patient privacy and data security, AI algorithm bias, accounting and responsibility, etc. and (3) future prospects for AI in nursing. These categories and subcategories are described in detail in Section 7. A sample of how the initial coding, subcategory, and overarching themes were derived from the inductive content analysis is presented below in Table 1. A complete table of coding is presented in Appendix 1.

Table 1 Sample Coding

Reference	**Initial Coding**	**Sub-category (or Subtheme)**	**Category**	**Overarching Theme**
Rony et al. 2023	AI tech	Patient monitoring	AI-powered diagnostics	Current uses of AI in nursing
Ghane et al. 2024	Leads to earlier intervention	Patient monitoring	AI-powered diagnostics	Current uses of AI in nursing
Sommer et al. 2024	Leads to improving intervention	Patient monitoring	AI-powered diagnostics	Current uses of AI in nursing
Rony et al. 2023	Support analysis systems	Clinical Decision support systems	AI-powered diagnostics	Current uses of AI in nursing
Sommer et al. 2024	Automate routine administrative tasks	Streamlining administrative tasks	AI-powered diagnostics	Current uses of AI in nursing
Gonzalez-Garcia et al. 2024	Automation improves efficiency	Streamlining administrative tasks	AI-powered diagnostics	Current use of AI in nursing

7 RESULTS

7.1 Current Uses of AI in Nursing

Throughout and across the research literature, the following categories arose which were then subsumed under the overarching theme of “Current Use of AI in Nursing.” The categories were: AI-powered diagnostics, benefits of AI in healthcare, patient datasets and patient monitoring, AI powered tools in healthcare, AI and clinical decision making, automating and streamlining administrative tasks, impact of nursing job security, and AI in advanced nursing education.

7.1.1 AI-powered diagnostics

The category for AI-powered diagnostics encompasses three sub-categories: patient monitoring, clinical decision support systems, and streamlining administrative tasks. AI tech is used to monitor patients by continuously tracking and interpreting the patient’s vitals, looking for patterns, and alerting nurses to the potential decompensation of the patient (Rony, Parvin, and Ferdousi 2023). The literature also suggests that AI leads to increased patient safety and improved outcomes by helping the nurses intervene earlier (Ghane, Ghiyasvandian, Chekeni and Karimi 2024). According to a survey of nurses in Bavaria, familiarity with AI also improves patient monitoring in turn improving early intervention (Sommer et al. 2024).

Clinical decision support systems can help nurses make more accurate decisions, diagnoses and personalized treatment plans which in turn help improve patient outcomes. AI can analyze patient data and history, research articles, literature and so forth which can provide evidence-based recommendations to the healthcare team. (Rony et al. 2023). The ability to analyze large amounts of data provides the caregiver with a useful tool to improve nursing care and decision making.

Streamlining administrative tasks through AI tech can automate routine administrative tasks, such as documentation, data entry, scheduling, and other parts of charting the nurse might have to do. This streamlining helps free up time for the caregiver to spend more time at the bedside with the patient (Sommer et al. 2024). Sources have shown that this helps staffing shortages and reduce the workload burden on caregivers (Gonzalez-Garcia et al. 2024). Automating these routine processes improves efficiency and allows nurses to focus on more in-depth nursing caregiving roles for patients.

7.1.2 Benefits of AI in healthcare

The subcategories of “reduction and medical errors” and “improved diagnostic accuracy and speed” arose in analyzing ways in which AI could be of benefit to healthcare. AI is able to assist the caregiver in reducing the number and frequency of medical errors by giving evidence-based recommendations and alerts for possible counter indicated drugs and possible dangers when giving medicine to a patient (Rony et al. 2023).

The amount of data that AI can process and analyze improves diagnostic accuracy and speed and leads to faster and more accurate diagnoses, especially by x-ray technicians, fluoroscopy, MRIs, and CT scans. AI can help eliminate errors, missed interpretations by the technicians and the medical team as well as help with detailed diagnoses (Rony et al. 2023).

7.1.3 Patient datasets and patient monitoring

The two subcategories of patient datasets and patient monitoring constitute this category. In the research literature, it was shown that AI can analyze multiple patient datasets such as medical history, life-style data, genetic information and other types of health data. These AI analyses can help identify individual needs and preferences, which in turn can help the healthcare professional make better recommendations (Cahill 2024). By using this data driven approach nurses can make more precise decisions and customize their treatment strategies, which could lead to enhanced individual health outcomes (Rony et al. 2023).

AI is also able to support remote patient monitoring by continuously analyzing data from smart watches, wearables, and other home-based monitoring systems (Cahill 2024). This tech allows for healthcare providers to continuously monitor and track patient data in real time, which could identify potential problems, complications and help them make more informed decisions (Lora and Foran, 2024).

7.1.4 AI powered tools in healthcare

In the research literature, it was shown across multiple articles that AI powered tools assist with patient care, such as following treatment regimens, engaging with patients, providing basic medical information, offering emotional support, tracking patients, among other tools (Ghane et al. 2024). There are two subcategories: medication adherence and chatbots.

Medication adherence, encouraging patients to take medication when needed, can be facilitated by tools such as smartphone apps. Another tool in medication compliance is reminder systems that send SMS messages to patients when it is time to take their medication (Ghane et al. 2024).

The use of AI-powered chatbots in healthcare has been increasing (Lora and Foran 2024). Chatbots can be used to engage with patients, answer common questions they might have, and provide the basics of medical information, they are also able to offer emotional support. This can be particularly helpful for patients who need ongoing support or who have trouble accessing healthcare support, possible due distance issues. AI Chatbots are excellent ways to help patients get educated and learn how to cope with their ailments, by answering questions and soothing worries. Some of the chatbots and portals mentioned in my sources are MyChart, GetWellLoop, Aethna communicator, STREAMD, and Conversa (Ghane et al. 2024).

7.1.5 AI and clinical decision making

The evidence suggests that AI in clinical decision making can be of great benefit to the caregivers in several ways, especially when quick decisions need to be made. AI and clinical decision making consists of two subcategories. The subcategories are: reduced cognitive overload and faster and more informed decision-making.

Reducing cognitive load for nurses is an important outcome when AI systems synthesize large amounts of data and provide the nurse with the most relevant information. By allowing AI to handle routine tasks such as analyzing vital signs and lab results, nurse’s workload and mental stress can be lowered to focus on direct patient care at the bedside. This can be especially valuable in critical care or emergency settings where the nurse needs to make quick judgements with limited information. (Rony et al. 2023.)

Faster and more important decision making is made possible by the real time insights and evidence-based recommendation that AI provides. Nurses can be alerted to potential drug interactions, receive recommendations for appropriate tests and treatment options based on the latest medical guidelines. These guidelines and recommendations help nurses make more informed decisions quickly and efficiently, especially in emergency situations where every second counts (Rony et al. 2023).

7.1.6 Automating and streamlining administrative tasks

There are three subcategories that emerged from an analysis of the literature of how AI can be used to automate and streamline administrative tasks in nursing and healthcare: AI-powered voice recognition systems, AI generated scheduling systems, and AI assisted tools.

AI-powered voice recognition systems can document nurse-patient interactions and assessments. They can also transcribe the conversations between nurses and patients as well as record vital signs and patient data. Nurses gain valuable time where they would be otherwise charting and manually inputting the data. (Texeira, Mitchell, Carlos Martinez and Salim 2024.)

AI generated scheduling systems can help optimize nurse roles and reduce workload imbalances. “Another AI tool aims to optimize clinic scheduling and staff resourcing to ensure breast cancer screening services are planned and delivered efficiently and effectively” (O’Connor et al. 2023). These systems can consider patient acuity, nurse experience, and hospital policies to create fair and efficient schedules. This in turn helps reduce nurse burnout and improve patient safety.

AI assisted tools can be used to help with managing medication, ensure accurate drug calculations, and have the patients get their medicine on time. Such tools integrate with electronic health logs and charting systems to alert nurses to potential contraindicated drugs. These systems can also track medication administration as well as generate digital reports. This in turn helps reduce medication errors and improve patient outcomes (Ghane et al. 2024).

7.1.7 Impact of AI on nursing job security

The literature highlights several key findings regarding job security and the ever-changing role of nurses in a world with rapidly advancing AI technology. The subcategories of retraining programs and collaboration emerged from the data analysis. These two subcategories constitute the category of impact of AI on nursing job security.

Retraining programs will be necessary for nurses to be able to adapt to the ever-evolving healthcare landscape. These programs should focus on developing nurses’ abilities to analyze data, effective use of AI systems, and how to best collaborate between human-AI interfaces (Ghane et al. 2024).

Collaboration between nursing staff and AI developers is needed to ensure that the AI systems are designed to support nurses’ work and enhance patient care and outcomes. Because nurses will be using these technologies, input in the design and research process will ensure effective products that can help solve various issues in the healthcare field. (Sommer et al. 2024; Lora and Foran 2024.)

7.1.8 AI in advanced nursing education

A category that arose across research articles is the role of AI in advanced nursing education. AI is already changing nursing education through the creation of AI-powered learning platforms, realistic VR simulations for clinical training and use of ChatGPT-4. The sub-categories of AI-powered learning platforms, virtual reality simulations, and ChatGPT-4 constitute this category.

AI-powered learning platforms have the ability to analyze student performance to identify individual strengths and weaknesses, allowing students to focus on areas needing improvement. Based on the identified strengths and weaknesses, the platforms tailor educational content to the individual student's needs. These AI-powered platforms enable the students to progress at their own pace, offering flexibility and personalized support throughout their learning journey. (Ghane et al. 2024.)

AI-powered virtual reality simulations give students the chance to practice patient assessments, interventions, and communication skills in scenarios that closely replicate real-life clinical situations. These simulations use feedback systems that analyze student performance and provide personalized guidance and recommendations for improvement. (Texeira et al. 2024.)

ChatGPT-4 is being used to analyze medical notes from intensive care units. While the model provided concise summaries and answered questions, it also produced some false information, highlighting the potential for errors and the potential danger of making clinical decisions based on incorrect answers also known as hallucinations (O'Connor et al. 2023).

7.2 Ethical Considerations Using AI in Nursing Care

There are many challenges facing patient privacy and data security. A content analysis of the literature revealed the categories of patient privacy and data security, AI algorithmic bias, and accountability and responsibility. These categories can be subsumed under the overarching theme "Ethical Considerations Using AI in Nursing Care."

7.2.1 Data security and patient privacy

The main challenges in AI data security and patient privacy are data breaches and informed consent. Data breaches occur within tech systems, and AI is vulnerable to unauthorized access and hacking which can expose sensitive patient information to bad actors. Cyberattacks are the main reason that can compromise patient data. This data can be protected with strong safeguards and encryption protocols. (Lora and Foran 2024.)

Obtaining informed consent from the patients for the use of their data is definitely challenging. Patients may not fully understand the implications of their data being used to train AI algorithms, the potential risks that are involved, or how it might be used in the future. Ensuring the patients are fully informed about the use of their data is important for maintaining trust and being ethical. (Ghane et al. 2024.)

7.2.2 AI algorithmic bias

Several strategies can help mitigate AI algorithmic bias by using AI algorithms trained on datasets that more accurately reflect a diverse patient population. The subcategories of methods of data collection and multiple perspectives constitute this category.

The methods of collecting data from a wide range of individuals, demographics, socioeconomic backgrounds and health conditions can help to mitigate bias. It is also important to continuously monitor and audit AI systems to ensure the fairness and accuracy of their predictions. (Gonzalez-Garcia et al. 2024.)

Data collected from multiple perspectives is another strategy to mitigate risk. This kind of data collection includes patients, healthcare providers, ethicists, data scientists, and community members in the design, testing, and implementation of AI systems, to get their unique perspectives (Sommer et al. 2024).

7.2.3 Accountability and responsibility

Ensuring the safe and ethical use of AI in nursing requires the nurses to have a strong understanding of AI, its capabilities, and its limitations to effectively use these systems (O'Connor et al. 2023). Successful implementation and overseeing of the use of AI in the workplace is an important responsibility of healthcare professionals. The subcategories of ongoing training and successful implementation constitute this category.

Ongoing training is vital for nurses to stay up to date on the advancements of AI and to understand how to critically evaluate AI-generated insights and recommendations (Rony et al. 2023). However, the literature also emphasizes that nurses should not be the only ones to bear responsibility for the outcomes of AI-driven decisions (Ghane et al. 2024; Gonzalez-Garcia et al. 2024). It is important that healthcare professionals are actively evaluating and monitoring the AI systems before using them in clinical charting and decision making (O'Connor et al. 2023). It is also important that AI systems are not used to replace human judgment or compassion (Gallagher 2024).

7.3 Future Prospects of AI in Nursing

An inductive content analysis and coding revealed two main subcategories: emerging AI trends and their impacts addressing systemic healthcare challenges. These subcategories can be subsumed under the heading of "Future Prospects of AI in Nursing.

7.3.1 Emerging AI trends and their impacts

The research literature highlighted several emerging trends in AI for nursing. These have the potential to significantly impact patient care, nursing roles, and healthcare delivery across the board. The subcategories that comprise the category of "Emerging AI trends and their impacts" are: robots, natural language processing (NLP), documentation software, and deep learning (DL).

Robots to assist with patient care tasks have been developed and their use has significantly increased. They provide tasks such as lifting and transferring the patients and administering medications and providing companionship. Sophisticated robots can help reduce the physical toll on nurses and have the potential to improve patient safety by reducing errors. (Amara 2023.) Some specific examples of robots being used are, HOSPI, developed by Panasonic, which autonomously transports drugs and specimens and samples within a hospital. Another example is Deligent Robotics, which assists in COVID-19 wards or isolation rooms, by delivering and retrieving medical instruments and other supplies. (Ibuki et al. 2024.)

Natural language processing (NLP) and its use in applications are leading to more sophisticated AI-powered chatbots and virtual assistants that can understand and respond to human speech and communication (Cahill 2024). These technologies have the potential to play a larger role in patient communication, education and support. AI chatbots can be used to personalize patient education, reduce pre-operative anxiety, and provide round-the-clock support, potentially increasing patient engagement and satisfaction (Lora and Foran 2024).

Documentation software is an exciting new field for nurses. This software can record and transcribe patient consultations, generate electronic health records, and even filter out background noise and small talk. This can free up nurses' time for direct patient care, where they can empathize and provide the type of care machines cannot (Ghane et al. 2024).

Deep learning (DL) is being developed for use with powerful AI algorithms to analyze vast datasets which can improve disease prediction, diagnosis, and personalized treatment recommendations (Ghane et al. 2024). AI imaging technology can assist clinicians in identifying conditions like stroke and Alzheimer's from brain scans, enabling faster treatment referrals (Cahill 2024). Machine learning (ML) algorithms are also used to predict patient outcomes, such as falls in older hospitalized patients (Ibuki et al. 2024).

7.3.2 Addressing systemic healthcare challenges

There are several challenges that must be addressed as AI becomes increasingly integrated into nursing. The subcategories of automating tasks and improving efficiency, ethical considerations, secure systems, data infrastructure, and build public trust constitute the category of “Addressing systemic healthcare challenges”.

By automating tasks and improving efficiency, AI has the potential to help reduce the cost of healthcare for the patients and healthcare providers. However, the cost of developing and implementing these AI systems also needs to be considered. (Ghane et al. 2024.)

In addition, there are various ethical considerations that need to be examined when AI is implemented, such as data privacy, bias in algorithms, and the potential for nurses to lose their jobs. These need to be addressed as AI becomes more and more a part of healthcare systems. (Rony et al. 2023.)

AI systems must be secure, accurate, and reliable to be effectively used in healthcare settings (O’Connor et al. 2023). Therefore, malfunctions or inaccuracies could have serious consequences for patient safety. It is important to regularly test the AI systems to ensure they perform as intended. (Rony et al. 2023.)

Investing in high-quality data infrastructure is very important to support effective AI implementation. AI applications require massive data systems. This can also be a problem if there are incomplete or biased datasets which unfortunately can lead to inaccurate or unfair outcomes. (O’Connor et al. 2023.)

To build public trust in the expanding use of AI technology, it is important to address any concerns patients may have about the role of technology in sensitive healthcare decisions. This can be done with open communication and transparency about how AI is being used as well as involving patients in the development of AI. (Sommer et al. 2024.)

8 DISCUSSION AND CONCLUSION

8.1 Review of the Results

In conclusion, this thesis has looked at the potential of AI in nursing, examining both the enhancements it offers and the challenges it presents. AI is poised to revolutionize healthcare and greatly improve patient outcomes and care in the upcoming years. This technological advancement is rapidly changing nursing, which will also require us to change the way we think about the skills, and education that will be needed.

As mentioned, a diverse range of AI applications are already being used in nursing, from AI-powered diagnostics, streamlined recommendations, personalized treatment plans as well as robotic assistance in routine tasks. As AI algorithms continue to evolve, they have the potential of reducing administrative burdens on nurses, freeing them to focus on providing more direct and personalized patient care, using human touch and empathy.

However, besides the possibility of AI helping and improving nursing care, it is important to remember how critical humans need to be in the middle of the care process. While AI can augment nursing care, it should never be a replacement for the essential human qualities of compassion, empathy, critical thinking, as well as human touch. The integration of AI systems must keep this in mind, and always ensure that that AI is designed to support nurses, not replace them.

It is also important to recognize the ethical considerations in the development and implementation of AI in nursing and making sure of potential biases in algorithms, safeguarding patient privacy, and ensuring accountability and responsibility in AI decision-making. This is crucial for responsible, fair and equitable use of AI in the healthcare field for nurses.

8.2 Ethics and Reliability

There are two issues of ethics at work in this thesis: the ethical consideration of using AI in nursing care, and the ethics involved in using AI as a tool for data analysis. First, the ethical considerations of using AI in nursing was a major category found in the coding process of creating sub-categories and categories (themes) within the research literature. The ethical considerations were enumerated in the results sections and included the potential of an AI algorithm bias, accountability and responsibility of using AI in the workplace and the delicate balance between AI and human collaboration.

In using AI as a tool of analysis, AI algorithms rely on huge quantities of patient data, which raise concerns about data privacy and confidentiality. Strong data protection measures must be implemented to ensure patient data is used responsibly and securely (Rony et al. 2024). In addition, AI algorithms are susceptible to bias if trained on incomplete or biased datasets. Making sure bias is addressed is essential to ensure fair and equal treatment of patients (Ahmed, 2023). As AI systems increasingly contribute to decision-making, establishing clear lines of accountability is crucial. Nurses must understand their role in overseeing AI decisions and ensuring patient safety (O'Connor, 2024). It is important to remember that respect for human dignity, and basic rights is central to all healthcare practices including the integration of new technologies like AI, which must prioritize the best interests of patients and ensure their right to autonomy (ETENE 2012).

Ethical considerations in assessing qualitative research, such as the narrative analysis and coding process of generating categories (themes) and sub-categories are important to consider. One consideration is to assess whether a study is valid. Qualitative studies differ from quantitative studies, and four criteria are used to assess the quality of such a study: “credibility, dependability, conformability, and transferability (Stenfors 2020). For credibility, all the elements of the study are explained clearly, and the choices are justified. For dependability, the study can be replicated by following the steps outlined in the study. The researcher meets the confirmability criteria by providing descriptions that are detailed. Transferability applies to how the research could be applied to other settings and reflexivity involves the iterative process, such as the researcher going back over categories and criteria as the research progresses. This study and research methodology can be a valid study based on those criteria.

8.3 Professional Growth

Writing my first thesis was a major undertaking for me, that resulted in considerable professional growth. Upon reflection, I have enhanced my field competencies in several key areas. I successfully conducted a comprehensive literature review, analyzed complex information, synthesized research findings, and developed well-supported arguments to help state the aim of the research. The research and writing process involved in completing this thesis challenged me to think critically and develop an understanding of the rapidly evolving landscape of AI in nursing. The experience has not only deepened my understanding of the subject matter but has also equipped me with valuable research and analytical skills that are directly applicable to future career prospects. I demonstrated self-awareness, self-reflection and a desire to constantly learn and improve. I was also able to identify the need for nurses to adapt and acquire new skills to prepare them for using AI in healthcare settings. Furthermore, my thesis provides a usable resource guide to the nursing profession by offering insights into the current uses, ethical considerations, and future prospects of AI in nursing. This thesis reflects my dedication and passion for improving patient care through the responsible and ethical use of AI in nursing.

8.4 Usability and Development: Future Trends

As shown in this study, AI affects all aspects of nursing. It is important for nurses to actively engage in shaping the future of AI in healthcare. This could be done by participating in research and development, supporting and advocating for ethical guidelines, as well as continuous study about how to most effectively use the new AI systems. By actively being a part of the AI revolution, nurses can ensure that AI will be used in the correct manner, which can lead to a more humane, fair, effective, human centered healthcare system, which can provide increased care and improved patient outcomes.

Several research studies posit that it is critical to incorporate AI literacy into nursing education. This will help prepare future nurses with the knowledge and skills to effectively use and evaluate AI in their place of work. There are specific strategies and resources that should be considered, such as incorporating courses that cover core AI concepts, applications in healthcare, and ethical considerations (Cheng 2024; Rony et al. 2023).

By finding the right balance between human expertise and AI capabilities, nursing can evolve to provide even more effective and compassionate care. Ethical guidelines and regulations are crucial to

ensure responsible AI development and implementation, addressing issues such as data security, bias mitigation, transparency, and accountability. (O'Connor et al. 2023.) At the end of the day, the key lies in using AI to enhance the human touch, not to replace it.

The results and findings from this thesis can be used to help nurses understand AI in the workplace and where AI can have the greatest impact to minimize errors and improve patient care. These findings can be used to augment the training of nursing staff about the potential and downfalls of this newly emerging technology. Other uses of these findings could help policy makers in hospitals to better understand the ethical implications and to better steer their decision making.

Partnerships with experts and industry leaders should be arranged for the students which can provide valuable insights and resources to build up relationships and get them excited about future prospects. These partnerships also encourage participation in ongoing education opportunities, AI-related conferences, and workshops to promote continuous learning for the students. (Cheng 2024; Rony et al. 2023.)

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APPENDIX 1: INDUCTIVE CONTENT ANALYSIS AND CODING THEMES

Reference	**Initial Coding**	**Sub-category (or Sub-theme)**	**Category**	**Overarching Theme**
Rony et al. 2023	AI tech	Patient monitoring	AI-powered diagnostics	Current uses of AI in nursing
Ghane et al. 2024	Leads to earlier intervention	Patient monitoring	AI-powered diagnostics	Current uses of AI in nursing
Sommer et al. 2024	Leads to improving intervention	Patient monitoring	AI-powered diagnostics	Current uses of AI in nursing
Rony et al. 2023	Support analysis systems	Clinical decision support systems	AI-powered diagnostics	Current uses of AI in nursing
Sommer et al. 2024	Automate routine administrative tasks	Streamlining administrative tasks	AI-powered diagnostics	Current uses of AI in nursing
Gonzalez-Garcia et al. 2024	Automation improves efficiency	Streamlining administrative tasks	AI-powered diagnostics	Current uses of AI in nursing
Rony et al. 2023	Reduce number and frequency of errors	Reduction in medical errors	Benefits of AI in healthcare	Current uses of AI in nursing
Rony et al. 2023	Amount of data/fast processing	Improved diagnostic accuracy and speed	Benefits of AI in healthcare	Current uses of AI in nursing
Cahill 2024	AI can analyze multiple datasets	Patient datasets	Patient datasets and patient monitoring	Current uses of AI in nursing

Rony et al. 2023	Nurses make precise decisions	Patient datasets	Patient datasets and patient monitoring	Current uses of AI in nursing
Cahill 2024	AI supports remote patient monitoring	Patient monitoring	Patient datasets and patient monitoring	Current uses of AI in nursing
Lora and Foran 2024	Monitor patients in real time/identify problems	Patient monitoring	Patient datasets and patient monitoring	Current uses of AI in nursing
Lora and Foran 2024	Increased use of chatbots	Patient monitoring	Patient datasets and patient monitoring	Current uses of AI in nursing
Ghane et al. 2024	Smartphone apps help patients follow treatment regime	Medication adherence	AI powered tools in healthcare	Current uses of AI in nursing
Ghane et al. 2024	Engage with patients, answer questions, provide basics of medical information	Chatbots	AI powered tools in healthcare	Current uses of AI in nursing
Rony et al. 2023	Nurses are provided with the most relevant information	Reduced cognitive overload	AI and clinical decision making	Current uses of AI in nursing
Rony et al. 2023	AI handles routine tasks	Reduced cognitive overload	AI and clinical decision making	Current uses of AI in nursing
Rony et al. 2023	Nurses alerted to evidence-based recommendations	Faster and more informed decision making	AI and clinical decision making	Current uses of AI in nursing
Texeira et al. 2024	Voice recognition systems document nurse-patient interactions	AI powered voice recognition systems	Automating and streamlining administrative tasks	Current uses of AI in nursing

Texeira et al. 2024	AI transcribes conversations between patients and nurses	AI powered voice recognition systems	Automating and streamlining administrative tasks	Current uses of AI in nursing
O'Connor et al. 2023	Scheduling systems reduce workload imbalances/optimize clinical scheduling	AI generated scheduling systems	Automating and streamlining administrative tasks	Current uses of AI in nursing
Ghane et al. 2024	AI tools help with managing medications, e.g., health logs and charting systems	AI assisted tools	Automating and streamlining administrative tasks	Current uses of AI in nursing
Ghane et al. 2024	Nurses need retraining programs to learn AI skills	Retraining programs	Impact of AI on nursing job security	Current uses of AI in nursing
Sommer et al. 2024	Nurses and AI developers collaborate to enhance patient care and outcomes	Collaboration	Impact of AI on nursing job security	Current uses of AI in nursing
Lora and Foran 2024	Nurses use AI technologies in design and research process	Collaboration	Impact of AI on nursing job security	Current uses of AI in nursing
Ghane et al. 2024	AI learning platforms analyze student performance	AI-powered learning platforms	AI in advanced nursing education	Current uses of AI in nursing
Ghane et. Al. 2024	AI learning platforms tailor education content to student needs	AI-powered learning platforms	AI in advanced nursing education	Current uses of AI in nursing
Texeira et al. 2024	AI simulations give students chances to practice assessment, interventions, and communication skills	Virtual reality simulations	AI in advanced nursing education	Current uses of AI in nursing
O'Connor et al. 2023	ChatGPT-4 can analyze medical notes and provide summaries	ChatGPT-4	AI in advanced nursing education	Current uses of AI in nursing

Lora and Foran 2024	AI systems vulnerable to data breaches and cyberattacks	Data breaches	Data security and patient privacy	Ethical considerations using AI in nursing care
Ghane et al. 2024	Importance of ensuring that patients are fully informed about the use of their date	Informed consent	Data security and patient privacy	Ethical considerations using AI in nursing care
Gonzalez-Garcia et al. 2024	Mitigate bias by collecting data from a wide range of individuals and background	Methods of data collection	AI algorithmic bias	Ethical considerations using AI in nursing care
Sommer et al. 2024	Include perspectives from patients, healthcare providers etc.	Multiple perspectives	AI algorithmic bias	Ethical considerations in using AI in nursing
Rony et al. 2023	Nurses need to stay up to date and understand how to critically evaluate AI recommendations	Ongoing training	Accountability and responsibility	Ethical considerations in using AI in nursing
Ghane et al. 2024; Gonzalez-Garcia et al. 2024	Nurses should not be the only ones to bear responsibility for outcomes of AI driven decisions	Ongoing training	Accountability and responsibility	Ethical considerations in using AI in nursing
O'Connor et al. 2023	Healthcare professionals oversee successful implementation and use of IU	Successful implementation	Accountability and responsibility	Ethical considerations in using AI in nursing
Gallagher 2024	AI systems do not replace human judgment or compassion	Successful implementation	Accountability and responsibility	Ethical considerations in using AI in nursing
Amara 2023	Use of robots can reduce physical toll on nurses	Robots	Emerging AI trends and their impacts	Future prospects of AI in nursing
Ibuki et al. 2024	Robots carry out a variety of functions, such as	Robots	Emerging AI trends and their impacts	Future prospects of AI in nursing

	transporting drugs and samples			
Cahill 2024	Natural language processing (NLP) leads to more sophisticated AI-powered chatbots and virtual assistants	NLP	Emerging trends and their impacts	Future prospects of AI in nursing
Lora and Foran (2024)	NLP personalizes patient education and treatment	NLP	Emerging trends and their impacts	Future prospects of AI in nursing
Ghane et al. 2024	Documentation software can record and transcribe records	Documentation software	Emerging trends and their impacts	Future prospects of AI in nursing
Ghane et al. 2024	Deep learning used to analyze vast datasets	Deep learning	Emerging trends and their impacts	Future prospects of AI in nursing
Cahill 2024	AI imaging technology can help clinicians identify medical conditions	Deep learning	Emerging trends and their impacts	Future prospects of AI in nursing
Ibuki et al. 2024	Machine learning algorithms are used to predict patient outcomes	Deep learning	Emerging trends and their impacts	Future prospects of AI in nursing
Ghane et al. 2024	Automating tasks and improving efficiency can help reduce the cost of healthcare	Automating tasks and improving efficiency	Addressing systemic healthcare challenges	Future prospects of AI in nursing
Rhony et al. 2023	Ethical consideration such as data privacy and bias in algorithms need to be addressed	Ethical considerations	Addressing systemic healthcare challenges	Future prospects of AI in nursing
O'Connor et al. 2023	AI systems must be accurate, reliable, and secure	Secure systems	Addressing systemic healthcare challenges	Future prospects of AI in nursing
Rony et al. 2023	Malfunctions or inaccuracies of AI system could have serious safety consequences	Secure systems	Addressing systemic healthcare challenges	Future prospects of AI in nursing

O'Connor et al. 2024	Incomplete or biased datasets can lead to inaccurate or unfair outcomes	Data infrastructure	Addressing systemic healthcare challenges	Future prospects of AI in nursing
Sommer et al. 2024	Open communication and transparency about how AI is being used is important	Build public trust	Addressing systemic healthcare challenges	Future prospects of AI in nursing