Advancing Nursing Practice Through Artificial Intelligence: Unlocking Its Transformative Impact

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Article

Abstract

Artificial intelligence in healthcare settings is set to change the nursing profession and offer opportunities to address contemporary problems facing the profession, such as the shortage of nurses, access to care, and patient complexity. The use of AI has the potential to improve nursing practice; however, success depends on user-centered design, openness, and fitting in with the core values of nurses. Challenges may include integration barriers, readiness of the workforce, regulatory risks, and implementation strategies that seem to focus more on the use of technology than on benefits of the application. Our review of the literature found examples of AI tools in healthcare settings and features of both effective and poor implementation of technology in practice. It is important for professional nurses to stay current and take every opportunity to shape the incorporation of this technology into nursing practice. This article discusses the impact of AI on nurses and the nursing profession, the issues that arise from its use, and future directions within this emerging field. The content within offers a general overview for nurses about AI technologies, including descriptions and examples of current applications; considerations for AI in education settings; rules for expanding scope of practice; and ethical, legal, and social implications. Although AI can help improve nursing practice and subsequently widen the scope of nurses, integration can only be done effectively if nurses are actively involved in discussions about the development and execution of the process.

Key Words: Artificial intelligence, AI, nursing ethics, nursing practice, nursing roles, clinical decision support, healthcare technology, nursing education, workflow, nursing workforce, scope of practice, innovation

The application of artificial intelligence (AI) in the field of medicine is also impacting the nursing profession, but differently. The current healthcare environment features complex patients with unique challenges, a lack of adequate workforce, and growing administrative tasks. While AI offers the chance to improve the delivery of care and assist nurses (von Gerich et al., 2022), its integration offers both problems and possibilities.

AI is utilized by nurses in many settings for clinical decision support, patient monitoring, workflow management, and education (Shi et al., 2023). The initial findings of its implementation are encouraging in areas such as nurse scheduling, diagnoses, and risk assessment. Nevertheless, most of these applications are still under development and have not been fully tested in real-world settings (Ng et al., 2021).

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Several criteria must be met to successfully implement AI applications in nursing practice. First, the AI solutions must be useful and contribute to the improvement of patient care and workflows. Nurses must also be actively engaged in the design and application of AI systems to ensure that these technologies add value to, and do not compromise, their work. It is imperative to preserve the autonomy of nursing, decision-making, and the human aspect of the care (Wieben et al., 2024). Other issues such as privacy, data security, and the bias of algorithms are also concerns that must be addressed (Al Khalib & Ndiaye, 2025).

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This article discusses the impact of AI on nurses and the nursing profession, issues that arise from its use, and future directions within this emerging field. AI is gradually integrating into so many aspects of the healthcare sector; it is essential for professional nurses to stay current and take every opportunity to shape the incorporation of this technology into nursing practice. The content within offers a general overview for nurses about AI technologies, including descriptions and examples of current applications; considerations for AI in education settings; rules for expanding scope of practice; and ethical, legal, and social implications.

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Overview of AI Healthcare Technologies

AI is transforming the way that clinical data is evaluated, utilized and applied in patient care. To better understand how AI applications apply to nursing, it is necessary to define the basic concepts and how they are used in healthcare organizations. Table 1 offers a brief description of basic concepts related to artificial intelligence.

Table 1. *Basic Concepts related to Artificial Intelligence*

Machine Learning (ML)	ML algorithms use large datasets to look for patterns and make predictions in nursing risk assessment, patient monitoring, and outcome (Shi et al., 2023).
Natural Language Processing (NLP)	NLP allows computers to interpret clinical documents, patient communication, and medical papers, improving documentation in nursing and interactions with patients (Buchanan et al., 2020).
Computer Vision	Computer vision analyzes medical images and monitors a patient's condition visually, detecting changes in symptoms and thus enhancing the patient's safety (Keim-Malpass & Moorman, 2021).
Robotic Process Automation (RPA)	RPA performs routine clerical functions, which lessen documentation concerns. This enables nurses to spend more time providing direct care. (Martinez-Ortigosa et al., 2023).
Clinical Decision Support (CDS)	CDS systems analyze patient information and suggest possible solutions which can help improve nursing assessment, reasoning, and treatment (Seda & Sevilay, 2024).
Predictive Analytics	Predictive analytics use historical and real-time patient data to predict the likely occurrence of clinical events to support early identification of deterioration; prevent adverse events; and enhance resource management (Carrasco Ramírez, 2024).
Virtual Health Assistants	These tools support patient education, appointment scheduling, remote patient care, and health monitoring. This expands the scope of nursing beyond the traditional clinical environment (Buchanan et al., 2020).
Personalized Medicine	AI driven treatment plans are based on patient data, thus helping nurses to provide better patient specific care (Sirwan, 2024).

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When AI technologies are integrated, nursing practice has the potential to demonstrate increased productivity, accuracy, and patient focused care. This then can increase the effectiveness of processes and practices (Buchanan, et al., 2020). Figure 1 further describes core AI technologies that are driving changes in healthcare settings.

Figure 1. *Core AI Technologies and Their Applications in Healthcare*

Technology	Description	Key Applications in Nursing Practice
Machine Learning	Systems that learn from large datasets to identify patterns and make predictions	• Risk assessment • Patient monitoring • Outcome prediction
Natural Language Processing (NLP)	Technology for understanding, interpreting, and generating human language	• Analysis of clinical notes • Patient communications • Documentation efficiency
Computer Vision	Applications focused on interpreting visual data	• Medical imaging interpretation • Visual patient monitoring • Early detection of clinical changes
Robotic Process Automation (RPA)	Technology for streamlining repetitive tasks	• Administrative task automation • Documentation management • Workflow optimization
Clinical Decision Support	Systems that analyze patient data for evidence-based recommendations	• Risk identification • Intervention suggestions • Clinical change alerts
Predictive Analytics	Tools that forecast clinical events using historical and real-time data	• Early warning detection • Adverse event prevention • Resource allocation • Population health management
Virtual Health Assistants	AI-powered tools for patient support	• Patient education • Appointment scheduling • Remote health monitoring
Personalized Medicine	Algorithms analyzing patient-specific data	• Individualized treatment planning • Targeted interventions • Treatment response monitoring

(Buchanan et al., 2020; Dixon et al., 2024; Keim-Malpass & Moorman, 2021; Martinez-Ortigosa et al., 2023; O'Connor et al., 2022; Peltonen & Topaz, 2022; Seibert et al., 2021; Shi et al., 2023; Tam et al., 2023; von Gerich et al., 2022)

Considerations for AI In Nursing Practice

There are several unique considerations related to the implementation of artificial intelligence in the practice of nursing. This section will briefly consider the difference between physical and technological space, and the role of nursing in technology versus the rule of technology in nursing.

Defining Nursing in the Physical and Technological Space

At its core, nursing is the practice of providing holistic, compassionate, quality care to individuals, families, and society (Watson, 2024). This care involves direct contact with the patient, conducting assessments, administering treatments, and providing emotional support. Nurses are advocates, educators, and caregivers in physical environments that include hospitals, clinics, homes, and communities. However, the technological environment broadens the practice of nursing beyond physical settings to include digital, virtual and data spaces. In this environment, nurses apply sophisticated resources including AI, virtual care, and robotics to expand the capacity of nursing practice and decision making (Weston 2020). These spaces are connected to create a hybrid nursing environment where technology is used, but does not replace, the physical and human elements of care.

The Role of Nursing in Technology

Including nurses is key to integrating technology into healthcare, serving in roles as both consumer and innovator. Nurses apply the use of electronic health records (eHRs), wearables, and telemedicine to enhance the quality of patient care and to improve work performance and precision (Al Khalib & Ndiaye, 2025). Thus, as technology is developing, they must develop their technical skills together with their clinical skills.

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Nurses are the link between technology producers and clinical applications to ensure

Nurses are the link between technology producers and clinical applications to ensure that technologies are appropriate, safe, and patient friendly. Ideally, they participate in the creation and testing of novel interventions such as clinical decision support and predictive analysis; they

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prefer and require evidence-based and user-friendly designs. Thus, as nurses incorporate technology into their practice, they help to define the future of health care.

The Role of Technology in Nursing

Clinical Decision Support Systems (CDSS). CDSS are intended to enhance the decision-making process, improve patient safety, and decrease the likelihood of errors by utilizing current information and suggesting best practices (Aloufi, 2020). These systems can assist nurses to assess risks and to act on them in a timely manner (Sutton et al., 2020). However, research findings on CDSS effectiveness remain mixed. For example, external validation studies have shown that some widely implemented sepsis prediction models demonstrate poor discrimination and calibration, with performance metrics falling short of developer claims (Wong et al., 2021). Additionally, systematic reviews indicate that approximately half of CDSS evaluations report negative or inconclusive findings (Aloufi, 2020). These conflicting results highlight ongoing challenges with prediction accuracy, implementation barriers, and the need for rigorous validation before widespread adoption. With further development and validation, AI-driven CDSS has the potential to assist in early sepsis identification and improve chronic disease management, but current evidence suggests cautious optimism is warranted.

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Patient Monitoring and Predictive Analytics. *Predictive Monitoring* is one type of analytic. This type of AI driven monitoring can help clinicians detect high risk patients who are likely to develop problems and thus require closer observation to avoid complications (Fleuren et al., 2020). Research has demonstrated that AI assisted *Remote Monitoring* was more effective in post-operative and chronic care, promoting early intervention and demonstrating lower rates of hospital readmission (Po et al., 2024). These tools can enlarge the scope of nursing telemetry, thereby allowing patient monitoring by nurses even when the patient is outside of the hospital.

Workflow Optimization

The application of AI in nursing has the potential to enhance work performance, decreasing time spent on documentation and other administrative work; this allows nurses to spend more time with patients (Martinez-Ortigosa et al., 2023). This section will identify some areas in which AI can improve nursing practice from the workflow perspective.

AI-Driven Workflow Tools

AI applications include ambient listening technology that automates documentation of clinical encounters, enabling nurses to spend more time with patients rather than performing computer tasks (Martinez-Ortigosa et al., 2023). AI can also improve other aspects of the nursing process such as answering patient calls and care planning (Nashwan & Abujaber, 2023).

The effectiveness of AI in improving workflow management depends on several factors that can be challenging in the healthcare setting.

Impact on Nursing Efficiency

AI-based workflow tools are evolving with the potential to address shortages and burnout by handling repetitive tasks. Implementation of AI applications in nursing practice can hopefully both enhance the performance of nurses while concurrently ensuring quality and safety standards. For nurse managers, AI workflow tools can support documentation, reporting of incidents, compliance with various regulatory standards, and performance management (Nashwan & Abujaber, 2023).

Systems Challenges and Considerations

The effectiveness of AI in improving workflow management depends on several factors that can be challenging in the healthcare setting. Examples of some important considerations at the systems level include proper integration with current systems and processes, user education, and user acceptance to avoid increased cognitive load and workarounds (Mahmoudi & Moradi, 2024; Martinez-Ortigosa et al., 2023; Shi et al., 2023).

AI in Education and Training

Artificial intelligence has applications related to education in many settings. This section briefly discusses possibilities related to simulation for new learners and continuing education, professional development, implications for curriculum reform, and applications for patient education and health coaching.

Simulation-Based Learning

Incorporating AI in nursing education to provide individualized learning experiences using virtual simulation laboratories is increasing within academia and other educational environments. With the help of AI, students can practice high risk

procedures and enhance critical thinking and decision-making skills in controlled environments (Hua-Shan, 2024). Machine learning may also help in the evaluation of student performance by identifying students who require extra support (Hua-Shan, 2024).

AI in Continuing Education

AI is not limited to initial training. It can support continuous professional development through intelligent tutoring systems and virtual tutors (Shepherd, 2024). Large language models (LLMs) come with generative AI tools which are evolving to help in clinical reasoning practice and academic writing (Srinivasan et al., 2024).

Curriculum and Training Considerations

Curriculum reform is needed to prepare nurses to practice safe use of AI. This includes education about the use of AI and its evaluation (Buchanan et al., 2020). Nurse educators should include AI literacy in teaching activities to help students gain knowledge and prepare for future challenges in the healthcare field (Shepherd, 2023). Successful integration of AI in the curriculum must address ethical concerns such as privacy and bias as well as the need for more research on the impact of AI on learning outcomes and clinical competence (O'Connor et al., 2022; Srinivasan et al., 2024). One challenge for nurse educators is to find the balance between using AI to support learning and continuing to identify and develop those skills that are exclusive to human thinking. As such, educators must also acknowledge that overreliance on AI may compromise critical thinking skills are required in learning.

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Patient Education and Health Coaching

LLMs that power AI-based virtual health assistants can automate the work of patient education by providing basic information about general conditions, treatments, and lifestyle changes. When implemented properly, this potenitally allows nurses to concentrate on the more demanding and individual approaches when working with patients who have more complex diseases (Martinez-Ortigosa et al., 2023). These models can also monitor patient adherence to the care plan and notify the nurse whenever there is a change; this would enable nurses to proactively reach out to patients to provide support.

Expanded Scope of Practice

Increased Autonomy

AI in the field of nursing can expand the scope of practice by enhancing decision-making and complex patient management, enabling nurses to assume higher-level responsibilities with greater autonomy (O'Connor et. al., 2022). As previously explained, nurses have traditionally focused heavily on hands-on care but now must operate in both physical and digital environments. This evolving dual focus will increase both scope and impact across healthcare systems. The challenge for nurses is to adapt their practice to integrate technology while simultaneously preserving the focus on human-centered care.

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Advanced Practice Roles in Primary and Specialty Care

AI applications are developing to enable Advanced Practice Registered Nurses (APRNs) to manage complicated cases; perform sophisticated assessments and diagnostics; and create individual treatment plans. For example, AI tools such as radiological image detection can assist APRNs to interpret imaging findings, reducing direct physician involvement and improving the time of intervention (O'Connor et al., 2022).

Additional Scope of Practice Considerations

Telehealth and remote monitoring-based AI tools enlarge the scope of nursing practice by enabling nurses to monitor vital signs and intervene early in the event of patient deterioration (Keim-Malpass & Moorman, 2021). Dixon et al. (2024) stated the AI tool of predictive analytics can support individualized care and prevent complications (e.g., falls, pressure ulcers), improve discharge planning, and decrease readmission rates. These advancements can empower nurses to assume leadership roles in the management of patient care and thus form a more collaborative, interdisciplinary, and integrated approach to healthcare (Shi, et al., 2023). As primary stewards of ethical AI usage, nurses ensure that these technologies serve the best interest of patients (Al Khalib & Ndiaye, 2025). Nevertheless, even with the use of AI applications, it is always important to maintain the core of nursing practice: compassionate, human centered care (Watson, 2024).

As primary stewards of ethical AI usage, nurses ensure that these technologies serve the best interest of patients

Ethical, Legal, and Social Implications of AI in Nursing

Ethical Considerations

Bias and Fairness. AI integration within the profession of nursing raises concerns about algorithmic bias that can potentially result in unequal care recommendations for different patient populations. Many biases are from historical disparities in training data that continue to create healthcare inequalities (Hanna et al., 2024). Biases can be prevented, and underserved populations can be best served through inclusive data collection methods (Mohammad Amini et al., 2023).

Transparency and Explainability. Healthcare professionals, especially nurses, must be able to understand AI-driven recommendations that they receive to maintain both clinical autonomy and trust in patient care. Clear reasoning behind AI recommendations is essential for professional judgment (Almazrouie, 2023).

Patient Privacy and Data Security. Nursing-related AI tools must adhere to the Health Insurance Portability and Accountability Act (HIPAA) to protect patient privacy while using data effectively to improve care (Sirwan, 2024). Secure transmission and data access control are crucial to protect the privacy of sensitive health information (Mohammad Amini et al., 2023).

Role of Nurses in Ethical AI Oversight. Nurses play a significant role in protecting the rights of the patient and in ensuring that AI systems deliver patient-centered care. Involvement of nurses in the design of AI-based tools ensures that such technologies enhance the delivery of quality, compassionate care (Peltonen & Topaz, 2022; Wieben et al., 2024).

In sum, the integration of AI into nursing practice must be balanced with the core nursing values to bring about the much-needed change in healthcare (Watson, 2024). To implement successful AI integration, there is a need to engage healthcare professionals, technology developers, and policymakers to manage the ethical, legal, and social aspects of AI (Seibert et al., 2021).

Challenges to AI Adoption in Nursing

The potential for AI as a positive force in healthcare systems also includes some challenges. Table 2 briefly lists several of these AI related considerations.

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Table 2. *Potential Challenges to Adopt AI in Nursing*

Technological Barriers
Interoperability Issues The implementation of AI in healthcare systems is challenging, especially with current EHR systems. Poor integration may lead to workflow interruption and time consumption (O'Connor et al., 2022). It is important to design AI integrations to be seamless, without introducing additional technical complexities.
Data Quality and Availability
The effectiveness of AI depends on the quality and relevance of the data used. Data poverty in low-income countries and biases in healthcare data can restrict the effectiveness and fairness of AI applications in healthcare (Hanna et al., 2024; Mohammad Amini et al., 2023).
Workforce Readiness
Skills Gap in AI Literacy Nurses are generally unprepared to work with AI due to gaps in training and education, as nursing curricula rarely focus on AI-specific skills (Buchanan et al., 2020). As previously discussed, nurses must be educated to effectively incorporate and navigate AI into their practice (Hua-Shan, 2024). **Acceptance and Resistance** Anxiety regarding job loss and autonomy are some of the barriers to the adoption of AI. Nurses' perception towards technology influences their uptake of AI; therefore, there is a need for increased awareness that AI is a tool to support nursing expertise and decision making, not to replace it (Wieben et al., 2024).
Regulatory and Policy Constraints
Healthcare Policies on AI Current policies mainly address issues of privacy and accountability, with limited attention to the actual practice in the clinical setting (Al Khalib & Ndiaye, 2025). Such regulatory ambiguity may slow the implementation of AI. **Global Standards** The absence of universal international standards for AI development and deployment poses a challenge to consistent implementation across various healthcare contexts (Sirwan, 2024). This can also hinder collaboration.

Addressing these challenges requires a comprehensive approach involving healthcare institutions, educational programs, technology developers, and regulatory bodies to support effective AI integration while maintaining high standards of care.

Effective Versus Problematic AI Implementation in Nursing Practice

Effective AI integration in nursing requires careful planning and attention to how solutions either potentially enhance or disrupt care delivery (Matheny et al., 2019). Successful implementations are user-centered and require continuous nurse involvement to ensure that AI tools improve workflows (American Nurses Association, 2022). Transparency and explanation of AI capabilities, and their limitations, is important to support nursing judgment and nurse buy-in.

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The process of implementation usually begins with pilot testing of the product in the real world before moving to the next stage of implementation (He et al., 2019). It is important that the AI tools are used correctly, and for that reason, it is critical that staff are adequately trained to avoid compromising patient care. Pitfalls may include focusing attention on the technical aspects of the project as opposed to the practical aspects and proceeding without a well-defined clinical goal. If there is insufficient support in place and/or if the workflow is not well incorporated, the use of AI can be more stressful than productive (He et al., 2019). Poor AI implementation can disrupt nurse-patient communication, while successful operations enhance care delivery (Topaz & Pruinelli, 2017).

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There must be clear structure for the implementation process. A structured approach to implementation includes assessment, planning, deployment, and maintenance, each of which is key to success. Successful systems have well-defined data management and protection, privacy, and bias control while unsuccessful systems lack these attributes (Sutton et al., 2020). Figure 2 describes additional information about successful and less successful applications of AI.

Figure 2. ***Comparison of Effective versus Problematic AI Implementation in Nursing Practice***

Domain	AI Done Right	AI Done Wrong
Clinical Decision Support	• AI recommendations presented as supporting evidence for nurse judgment • Clear explanation of AI reasoning provided • Nurses maintain autonomy in final decisions • System designed with nurse input	• AI decisions presented as mandatory directives • "Black box" recommendations without explanation • Override capabilities limited or discouraged • System designed without nursing perspective
Workflow Integration	• Seamless integration with existing EHR systems • Reduces documentation burden • Adapts to different nursing workflows • Built-in feedback mechanisms	• Requires duplicate data entry • Adds steps to existing processes • Rigid, one-size-fits-all approach • Limited ability to modify based on user feedback
Patient Monitoring	• Customizable alert thresholds • Prioritized alerting to reduce alarm fatigue • Integration of multiple data sources • Clear escalation protocols	• Fixed alert parameters • Excessive non-actionable alerts • Siloed monitoring systems • Unclear response protocols
Education and Training	• Progressive skill development approach • Practice-based learning scenarios • Regular competency assessment • Ongoing support resources	• One-time training sessions • Generic tutorials not specific to nursing • Limited assessment of competency • Minimal ongoing support
Data Management	• Transparent data collection processes • Clear privacy protections • Regular data quality audits • Bias monitoring and mitigation	• Opaque data handling • Inadequate privacy controls • Inconsistent data validation • Unaddressed algorithmic bias
Patient Engagement	• Enhanced nurse-patient communication • Patient education support • Shared decision-making tools • Cultural competency features	• Reduced face-to-face interaction • Generic patient information • Limited patient input • Cultural insensitivity

(Aloufi, 2020; Mohammad Amini et al., 2023; O'Connor et al., 2022; Peltonen & Topaz, 2022; Seibert et al., 2021; Sirwan, 2024; Sutton et al., 2020; Tam et al., 2023; Watson, 2024; Wieben et al., 2024).

Future Roles, Directions, and Recommendations

The integration of AI in nursing is creating new roles and opportunities as the profession leans in to incorporate technology into practice (Langenstueck, 2023). Potential roles for nurses may include:

- **AI Integration Specialist:** Nurses responsible for implementing AI tools in the clinical environment and ensuring that they are useful for the patient and user-friendly.
- **Clinical AI Educator:** Nurses responsible for educating and ensuring that staff understand the purpose and correct use of various AI tools.
- **AI Nurse Researcher:** Nurses who conduct research about use of AI to improve patient outcomes and streamline workflows, thus improving the decision making in the clinical area.
- **AI System Quality Assurance/Compliance Officer:** Nurses with the responsibility to ensure that AI tools comply with regulatory standards and patient safety measures.
- **Telehealth and Remote Monitoring Nurse:** Nurses with expertise in telehealth and remote monitoring; translating data into patient education and care suggestions.
- **Nurse Data Analyst:** Nurses who use tools created by AI to analyze healthcare data and present the possibilities to improve patient care.
- **AI Nursing Informatics Specialist:** Nurses who manage AI driven data systems to improve the delivery of care and enhance patient results.
- **Clinical Decision Support Specialist:** Nurses using AI driven systems to support clinical decision making.
- **AI Ethics and Policy Advisor:** Nurses with the responsibility to define AI policy in healthcare, focusing especially on issues of privacy, bias, and regulation.
- **Patient Advocate for AI-Enabled Care:** Nurses who protect the interests of patients and their rights in the context of AI assisted treatment.
- **AI-Enhanced Simulation Instructor:** Nurses who develop and/or include AI-reality based simulation classes to learn and apply critical clinical competencies.
- **Healthcare AI Project Manager:** Nurses who steer implementation and evaluation (and other similar projects) of AI in healthcare.
- **Predictive Analytics Nurse Specialist:** These nurses work with AI predictions to guide interventions and enhance patient outcomes.
- **AI-Assisted Workflow Coordinator:** Nurses who manage AI generated changes in clinical and administrative workflows.
- **Nurse Entrepreneur (AI Solutions):** Nurses who develop AI applications that improve the quality of care for patients and nursing practice.
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Conclusion

AI is changing the practice of nursing and defining new perspectives and approaches within all settings of healthcare. AI is not only automation of work; it changes the way that care is provided, reduces costs, improves work performance, supports effective decision making, and enhances learning processes. These tools support the profession of nursing in its evolution to more autonomous, data-based, and patient-centered models of care.

The integration of AI applications brings ethical concerns, workforce issues, and the need for continuous learning. AI also provides a way to create new nursing roles, such as integration specialists, decision support specialists, and telehealth coordinators. Exciting AI technology offers opportunities to implement new informatics, education, and nursing research projects that require data analysis, technology integration, and patient advocacy skills.

Nurses must actively shape AI implementation to enhance patient care and support

Nurses must actively shape AI implementation to enhance patient care and support essential aspects of nursing. The profession of nursing and its members face a pivotal moment; proactive engagement with AI will ensure that these technologies enhance care and create new opportunities for nurses in the evolving healthcare landscape. These emerging innovative roles will ensure that nurses are part of the implementation process and ensure that the human aspect of care is maintained in an AI-based healthcare system.

essential aspects of nursing.

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