

Artificial Intelligence in Medical-Surgical Nursing Practice

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Abstract

By boosting clinical judgment, increasing patient safety, streamlining workflow, and bolstering evidence-based nursing practice, artificial intelligence (AI) is revolutionizing the healthcare industry. Artificial intelligence (AI) tools including machine learning, predictive analytics, clinical decision support systems, natural language processing, and smart monitoring devices are being incorporated into patient care in medical-surgical nursing more and more. These tools help nurses with clinical recording, medication safety, risk assessment, wound evaluation, infection surveillance, and early patient deterioration identification. Research indicates that AI lowers healthcare expenditures, improves patient outcomes, lowers medical errors, and improves treatment quality. However, there are still a lot of issues with labor readiness, algorithm bias, data privacy, and ethical considerations.

Keywords: Artificial intelligence, Medical-surgical nursing, Clinical decision support, Machine learning, Nursing informatics, Patient safety, Evidence-based nursing.

Introduction

Artificial Intelligence (AI) has emerged as one of the most influential technological innovations in modern healthcare. AI refers to computer systems capable of performing tasks that normally require human intelligence, including learning, reasoning, decision-making, pattern recognition, and predictive analysis. Recent advances in machine learning, deep learning, natural language processing, robotics, and big data analytics have expanded AI applications across multiple healthcare settings.¹⁻³

Medical-surgical nursing involves the comprehensive care of adult patients with acute and chronic illnesses, requiring continuous assessment, monitoring, clinical judgment, and

evidence-based interventions. AI technologies are increasingly supporting nurses by improving diagnostic accuracy, predicting patient deterioration, automating routine tasks, and facilitating timely clinical decision-making.²⁻⁴

The integration of AI into medical-surgical nursing enhances patient safety by reducing medication errors, improving early recognition of sepsis and clinical deterioration, optimizing resource utilization, and supporting individualized patient care. AI-powered electronic health records, smart monitoring systems, predictive algorithms, and virtual assistants are becoming valuable tools in contemporary nursing practice.³⁻⁵

Despite these advancements, successful implementation of AI requires adequate training,

ethical governance, data security, interdisciplinary collaboration, and continued evaluation of its impact on patient care. Nurses must develop competencies in digital health and nursing informatics to effectively integrate AI into routine clinical practice.⁴⁻⁶

This review discusses current evidence regarding the applications, benefits, challenges, and future directions of artificial intelligence in medical-surgical nursing practice.

Artificial Intelligence Applications in Medical-Surgical Nursing

1. Clinical Decision Support Systems (CDSS):

Clinical Decision Support Systems are among the most widely used AI applications in hospitals. These systems analyze patient information and provide evidence-based recommendations to healthcare professionals.⁷

Evidence indicates that AI-assisted decision support improves clinical accuracy and reduces preventable adverse events.

2. Early Detection of Patient Deterioration: AI algorithms continuously analyze physiological parameters such as heart rate, blood pressure, respiratory rate, oxygen saturation, temperature, and laboratory findings to identify early signs of deterioration.⁸

Benefits include:

- Early recognition of sepsis.
 - Prediction of cardiac arrest.
 - Detection of respiratory failure.
 - Identification of acute kidney injury.
 - Recognition of clinical instability before obvious symptoms develop. Timely nursing interventions based on AI alerts improve patient survival and reduce intensive care admissions.
- #### **3. Smart Patient Monitoring Systems:** Artificial intelligence has enhanced continuous patient monitoring through intelligent wearable devices and bedside monitoring systems.⁹

These systems monitor:

- Heart rate.

- Respiratory rate.
 - Oxygen saturation.
 - Blood pressure.
 - Electrocardiography.
 - Body temperature.
 - Mobility and fall risk. Real-time alerts enable nurses to respond rapidly to abnormal physiological changes and improve patient safety.
- #### **4. Medication Safety:** Medication errors remain a significant cause of preventable patient harm. AI-supported medication management systems improve medication safety by identifying potential prescribing errors, drug interactions, allergies, duplicate medications, and inappropriate dosages.

Nursing responsibilities include:

- Verification of AI-generated alerts.
 - Safe medication administration.
 - Monitoring adverse drug reactions.¹⁰
 - Documentation.
 - Patient education. AI complements, rather than replaces, nursing judgment in medication management.
- #### **5. Artificial Intelligence in Wound Care:** AI-assisted wound assessment systems use digital imaging and machine learning algorithms to evaluate wound characteristics.¹¹

Applications include:

- Measurement of wound dimensions.
- Identification of infection.
- Tissue classification.
- Healing prediction.
- Pressure injury monitoring.
- Documentation of wound progression.

These technologies improve assessment accuracy and support evidence-based wound management.

6. Infection Surveillance: Hospital-acquired infections continue to challenge healthcare systems. AI systems analyze microbiological reports, laboratory data, vital signs, and patient records to identify patients at increased risk of infection.¹²

AI supports nurses by:

- Early detection of sepsis.
- Monitoring infection trends.
- Identifying multidrug-resistant organisms.
- Predicting outbreaks.
- Supporting infection prevention strategies.

7. Fall Risk Prediction: Falls are common adverse events among hospitalized medical-surgical patients. AI-based predictive models evaluate multiple patient characteristics including age, mobility, medications, cognitive status, previous falls, and vital signs.

Evidence-based nursing interventions include:

- Individualized fall prevention plans.
 - Environmental safety measures.
 - Increased observation for high-risk patients.
 - Patient and family education.
 - Use of assistive devices.
- 8. Clinical Documentation:** Artificial intelligence significantly improves nursing documentation by reducing repetitive administrative tasks.

AI-assisted documentation includes:

- Voice recognition.
 - Automated clinical notes.
 - Electronic charting.
 - Natural language processing.
 - Data extraction from electronic health records.
 - Standardized nursing documentation.
- 9. Predictive Analytics:** Predictive analytics uses machine learning algorithms to identify patients at risk of adverse clinical outcomes.

Common predictions include:

- Hospital readmission.

- Pressure injuries.
- Delirium.
- Sepsis.
- Clinical deterioration.
- Length of hospital stay.

10. Artificial Intelligence in Pain Assessment: Pain assessment remains challenging among critically ill, unconscious, pediatric, and elderly patients. AI technologies analyze facial expressions, speech characteristics, physiological signals, and behavioral patterns to estimate pain intensity.

These systems assist nurses by:

- Improving pain assessment accuracy.
- Monitoring analgesic effectiveness.
- Supporting individualized pain management.
- Enhancing patient comfort.

11. Artificial Intelligence in Robotic Nursing Assistance: Robotic technologies integrated with Artificial Intelligence are increasingly supporting nurses in medical-surgical units. Although robots cannot replace nurses, they assist with repetitive and physically demanding tasks, allowing nurses to devote more time to direct patient care.

Applications include:

- Delivery of medications and supplies.
- Transportation of laboratory specimens.
- Patient lifting and transfer assistance.
- Environmental disinfection using ultraviolet (UV) technology.
- Monitoring patient activity.
- Assistance with rehabilitation exercises.

The use of AI-enabled robots reduces nurses' workload, minimizes occupational injuries, and improves workflow efficiency.

12. AI in Patient Education: Artificial intelligence enhances patient education by providing personalized and interactive learning experiences. AI-powered virtual

assistants and chatbots offer continuous access to health information and self-care guidance.

Applications include:

- Disease-specific education.
- Medication reminders.
- Postoperative care instructions.
- Dietary recommendations.
- Exercise guidance.
- Frequently asked questions.
- Follow-up reminders.

13. AI in Telehealth and Remote Patient Monitoring: Telehealth combined with AI has expanded healthcare access beyond hospital settings. AI-enabled remote monitoring devices continuously assess patient health and notify healthcare professionals when abnormalities occur.

Nursing applications include:

- Remote monitoring of vital signs.
- Blood glucose monitoring.
- Blood pressure surveillance.
- Cardiac rhythm monitoring.
- Postoperative follow-up.
- Chronic disease management.
- Early identification of complications.

14. Artificial Intelligence in Surgical Care: Medical-surgical nurses increasingly collaborate with AI-assisted surgical systems throughout the perioperative period.

AI contributes to:

- Preoperative risk assessment.
- Prediction of postoperative complications.
- Surgical workflow optimization.
- Postoperative recovery monitoring.
- Early detection of infections.
- Prediction of intensive care needs.
- Personalized postoperative care planning.

Benefits of Artificial Intelligence in Medical-Surgical Nursing

Evidence indicates numerous advantages associated with AI implementation in nursing practice:

- Early detection of patient deterioration.
- Improved clinical decision-making.
- Enhanced medication safety.
- Reduced documentation workload.
- Better patient monitoring.
- Increased efficiency in nursing care.
- Reduced medical errors.
- Improved patient outcomes.
- Faster clinical response.
- Better resource utilization.
- Enhanced interdisciplinary communication.
- Improved patient satisfaction

Ethical and Legal Considerations

Despite its advantages, AI raises important ethical and legal concerns in nursing practice.

Major considerations include:

- Protection of patient privacy and confidentiality.
- Data security and cybersecurity.
- Informed consent for AI-supported healthcare.
- Algorithm bias and fairness.
- Transparency of AI decision-making.
- Professional accountability.
- Clinical responsibility for AI-generated recommendations.

Future Perspectives

Artificial intelligence is expected to become an integral component of nursing practice. Future developments may include:

- AI-assisted clinical decision-making.
- Predictive precision nursing.

- Personalized patient care plans.
- Advanced robotic nursing assistants.
- Smart hospital environments.
- Wearable biosensors.
- Artificial intelligence–assisted electronic health records.
- Virtual reality and augmented reality for nursing education.
- AI-supported simulation training.
- Precision medicine integrated with nursing care.

Role of Medical-Surgical Nurses in AI-Enabled Healthcare

Medical-surgical nurses remain central to patient care despite technological advances. Their responsibilities include:

- Comprehensive patient assessment.
- Interpretation of AI-generated clinical alerts.
- Clinical decision-making.
- Safe medication administration.
- Patient education.
- Ethical use of AI technologies.
- Monitoring treatment effectiveness.
- Documentation.
- Communication with multidisciplinary teams.
- Advocacy for patient safety.
- Participation in quality improvement initiatives.
- Lifelong learning regarding digital health technologies.

Conclusion

Through the improvement of clinical decision-making, patient safety, early problem detection, workflow efficiency, and evidence-based care, artificial intelligence is revolutionizing medical-surgical nursing. Clinical decision support systems, telehealth, robotic assistance, smart monitoring devices, predictive analytics, and AI-assisted

documentation are just a few of the applications that have shown significant promise for enhancing patient outcomes and healthcare quality. However, there are still significant issues with algorithm transparency, cybersecurity, data privacy, ethics, and worker readiness. Medical-surgical nurses are essential in incorporating AI into clinical practice while upholding patient-centered decision-making, professional accountability, and compassionate care. Future developments in AI are anticipated to transform healthcare delivery and significantly enhance patient outcomes when paired with ongoing nurse education and evidence-based practice.

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