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DIGITAL TRANSFORMATION IN NURSING: THE ROLE OF ARTIFICIAL INTELLIGENCE IN ENHANCING CLINICAL DECISION MAKING

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Abstract

Background: The field of artificial intelligence (AI) is rapidly transforming healthcare by improving clinical decision making processes. Decision making is an important element of nursing because it directly affects patient outcomes, and it is often challenged by increasing workload, patient complexity, and time constraints. AI driven technologies such as clinical decision support systems offer potential solutions by enhancing accuracy, efficiency and evidence based practice. However, the adoption and impact of AI in nursing are limited, especially in resource-constrained settings such as Pakistan. Objective: To assess the role of artificial intelligence in enhancing nursing decision making among registered nurses in clinical settings. Methodology: The present study was a quantitative descriptive cross-sectional study conducted on 100 registered nurses working in a tertiary care hospital of South Punjab, Pakistan. Data were gathered using a structured self-administered questionnaire. Statistical analysis was done using SPSS version 25. Demographic characteristics and study variables were summarized using descriptive statistics. Inferential statistics such as Chi-square test, Pearson correlation and multiple regression analysis were used to examine the association and predictive role of AI utilization in nursing decision making. A p-value of ≤0.05 was considered to be statistically significant. Results: The findings revealed that AI utilization among nurses was predominantly moderate (50%), with limited high-level adoption (20%). Nursing decision making competence was also mostly moderate (55%). A statistically significant association was found between AI utilization and decision making ($\chi^2 = 18.42$, $p = 0.001$). A strong positive correlation was observed ($r = 0.62$, $p < 0.001$). Regression analysis identified AI utilization as the strongest predictor of nursing decision making ($\beta = 0.58$, $p < 0.001$), explaining 41% of the variance. Conclusion: The study concludes that artificial intelligence significantly enhances nursing decision making and serves as a key predictive factor in clinical performance. Strengthening AI integration, training, and infrastructure is essential to optimize nursing practice and improve healthcare outcomes in developing healthcare settings.

Introduction

In contemporary healthcare, artificial intelligence (AI) has become a disruptive force that is changing clinical procedures and improving decision-making in a variety of fields, including nursing. Nursing decision-making, which incorporates clinical judgment, critical thinking, and the integration of evidence-based knowledge, is a complicated, dynamic, and crucial aspect of patient care. Nurses must make quick judgments in a variety of clinical situations due to the growing complexity of patients, their workload, and the need for high-quality care. AI has drawn a lot of attention in this regard as a helpful tool that can raise the standard, effectiveness, and safety of nursing decision making. Artificial Intelligence (AI) is the application of sophisticated computational algorithms, machine learning, and data analytics to mimic human intelligence and facilitate problem solving. AI systems in the healthcare industry are capable of processing enormous volumes of clinical data, seeing trends, and producing predictive insights that help medical personnel make wise choices. AI powered decision support systems (DSS) are being used more often in nursing practice to improve patient management, risk assessment, and clinical reasoning (Khan, Shah, Malik, & Rustiyana, 2025). These technologies enable nurses to analyze patient data more effectively and deliver evidence-based care in a timely manner.

Given the complexity of clinical settings, incorporating AI into nursing decision making is very beneficial. Time restrictions, heavy patient loads, and the need to analyze vast amounts of medical data are common challenges for nurses. AI systems may help by offering early warning systems, real-time data processing, and predictive models that enhance healthcare outcomes and diagnostic precision. According to a comprehensive analysis, AI technologies greatly enhanced staff performance, patient care, and decision-making, including lowering hospital readmission rates and improving early patient deterioration identification (Mikkonen et al., 2026). Such findings highlight the potential of AI to support nurses in delivering safer and more efficient care.

Additionally, AI helps nurses become more competent and confident in their ability to make clinical decisions. According to research, most nurses view AI as a useful tool that enhances diagnostic support and decision-making precision. Higher levels of confidence among nurses while making clinical decisions have been linked to increased exposure to AI technologies ("The Role Of Artificial Intelligence In Nursing Decision making And Diagnosis," 2025). This suggests that AI not only supports technical decision making processes but also strengthens the professional capabilities of nurses.

The potential of AI in nursing to enhance workflow effectiveness and lessen cognitive load is another significant feature. AI frees up nurses to concentrate more on providing direct patient care by automating repetitive chores like documentation, vital sign monitoring, and medical record analysis. A scoping assessment highlighted how AI improves workflow procedures and helps nurses make more thoughtful and knowledgeable decisions (Fernandes, Shinners, Mota, Santos, & Sá, 2026). This is particularly important in high-pressure environments such as intensive care units, where timely decisions can significantly impact patient outcomes.

The use of AI into nursing decision making poses a number of difficulties despite its many benefits. Widespread adoption of AI systems is still hampered by problems with ethics, data protection, transparency, and interpretability. For AI-generated recommendations to be successfully incorporated into clinical practice, nurses must be able to comprehend and trust them. Furthermore, worries about an excessive dependence on technology and the possible loss of critical thinking abilities underscore the necessity of a balanced integration in which AI functions as a helpful tool rather than a substitute for human judgment (Fernandes et al., 2026).

Furthermore, the successful implementation of AI in nursing requires adequate training, education, and organizational support. Nurses must develop digital literacy and gain familiarity with AI systems to effectively utilize these technologies in clinical settings. Collaborative efforts between healthcare professionals, policymakers, and technology developers are essential to ensure that AI tools are

designed in alignment with clinical needs and ethical standards.

A key aspect of patient care is nursing decision making, which calls for the integration of clinical expertise, experience, and critical thinking. However, nurses are finding it more challenging to make prompt and accurate clinical choices due to rising patient acuity, personnel shortages, and the increasing complexity of healthcare systems. Research shows that a heavy workload and cognitive load can impair nurses' judgment, which could jeopardize patient safety and treatment quality (Aiken et al., 2014). In such demanding environments, nurses often rely on incomplete or rapidly changing patient data, increasing the likelihood of errors and delayed interventions.

By analyzing massive databases, seeing trends, and making suggestions based on solid evidence, artificial intelligence (AI) has been presented as a possible way to assist clinical decision making. Clinical decision support systems (CDSS) with AI capabilities have shown promise in increasing workflow efficiency, anticipating patient decline, and improving diagnostic accuracy (Topol, 2019). Despite these advancements, the integration of AI into nursing practice remains limited and inconsistent, particularly in developing healthcare systems where technological infrastructure and training opportunities are insufficient.

Furthermore, nurses frequently lack the expertise, abilities, and self-assurance necessary to apply AI technologies in clinical settings. Adoption is further hampered by worries about data privacy, ethics, and confidence in AI-generated suggestions (Shinners, Aggar, Grace, & Smith, 2020). The gap between the potential benefits of AI and its practical implementation creates uncertainty regarding its actual impact on nursing decision making.

Consequently, it is necessary to evaluate how artificial intelligence might improve nursing decision-making, with a special emphasis on nurses' perceptions, knowledge, and use of AI tools. To identify obstacles, enhance adoption tactics, and guarantee the safe and successful integration of AI into nursing practice, it is crucial to comprehend this link.

Artificial intelligence's quick development in the medical field has opened up new possibilities to enhance clinical results and healthcare delivery. AI tools, especially machine learning and predictive analytics, have demonstrated a great deal of promise for helping medical professionals make decisions (Jiang et al., 2017). However, most existing research has focused on physicians, with limited attention given to the nursing perspective, despite nurses being the largest group of healthcare providers and key decision-makers in patient care.

When it comes to ongoing patient monitoring, early problem detection, and the execution of care actions, nurses are essential. By offering real time clinical insights and lowering decision fatigue, integrating AI into nursing practice could greatly improve these duties. However, nurses' acceptance, expertise, and proficiency with these technologies are critical to AI's efficacy (Ronquillo, Peltonen, & Pruinelli).

The incorporation of artificial intelligence into nursing practice is a current healthcare topic, which makes this study noteworthy. AI has the potential to revolutionize clinical decision-making by increasing patient outcomes, decreasing errors, and improving accuracy (Topol, 2019). By exploring its role in nursing, this study contributes to the growing body of knowledge on digital health and nursing informatics.

First, by determining how AI may assist nurses in making clinical decisions, lessen their burden, and boost their confidence in patient care, the study will help nurses. Second, it will give nursing educators useful information about how to integrate AI-related skills into nursing curriculum, guaranteeing that aspiring nurses are equipped to work in technologically advanced healthcare settings (Ronquillo et al., 2021).

Literature Review

Artificial intelligence (AI) is becoming more widely acknowledged as a game-changing tool in healthcare, especially when it comes to helping nurses make clinical decisions. Nursing practice now incorporates AI-driven technology including clinical decision support systems (CDSS), predictive analytics, and machine learning tools due to the increasing complexity of healthcare systems and rising patient demands. These

technologies are intended to improve patient outcomes, decrease errors, and improve clinical judgment.

AI-based systems greatly enhance the effectiveness and quality of nursing decision making, according to recent research. AI technologies improve nurses' capacity to analyze patient data, identify early indicators of decline, and carry out prompt treatments, thereby increasing patient safety and care outcomes, according to a comprehensive analysis (Mikkonen et al., 2026).

Numerous studies have also been conducted on the use of computerized decision support systems (DSS) in nursing. Research indicates that DSS tools are mostly utilized in clinical settings to help with intervention planning and patient assessment. According to a review of the literature, the majority of DSS apps support nursing standards pertaining to assessment and intervention; nonetheless, there are still gaps in the processes of outcome evaluation and decision validation (Saba Akbar, Lyell, & Magrabi, 2022). This indicates that while AI technologies are effective in supporting certain aspects of decision making, further development is needed to ensure comprehensive support across all stages of the nursing process.

Additionally, AI has demonstrated promise for enhancing workflow effectiveness and lessening nurses' cognitive load. Decision support system automation has been associated with better patient outcomes, less work, and better care delivery. Automated technologies help nurses manage complex clinical data, increasing decision accuracy and decreasing the possibility of human error, according to a systematic review (S. Akbar, Lyell, & Magrabi, 2021). These findings are particularly relevant in high-pressure environments such as intensive care units, where timely decision making is critical.

Attention has also been drawn to AI's function in advanced nursing practice. According to research, nurse practitioners are interacting more and more with AI-based technologies, such as natural language processing tools and machine learning systems, which aid in diagnosis and treatment choices. Nevertheless, despite the increasing usage of AI, little is known about how nurses interact with these tools and the results of those interactions (Raymond, Castonguay, Doyon, & Pare, 2022). This gap highlights the need for further research focusing specifically on nurses' experiences and perceptions of AI.

Furthermore, research has highlighted the practical and ethical difficulties in integrating AI in nursing. Decision support systems driven by AI have many advantages, but issues with data privacy, accountability, and transparency still exist. According to a recent systematic study, in order to guarantee safe deployment, ethical concerns such algorithm bias, patient data protection, and the requirement for human oversight must be addressed (Alenazi et al., 2024). These challenges underscore the importance of maintaining a balance between technological support and professional clinical judgment.

AI has also been acknowledged as a technology that improves nursing evidence-based practice. AI helps nurses make better decisions based on available facts by evaluating massive datasets and producing predicted insights. According to a scoping study, AI helps nurses provide patient-centered care by facilitating more organized and evidence-based decision-making procedures (Fernandes et al., 2026). This aligns with the broader goal of improving healthcare quality through data-driven decision making.

The use of AI in nursing is still unequal across various healthcare settings, despite its benefits. Research shows that although AI technologies are becoming more widely accessible, their application is frequently constrained by things like inadequate infrastructure, opposition to change, and a lack of training. Although AI applications are growing, real-world integration is still restricted because of these obstacles, according to a systematic study of AI in nursing and midwifery (O'Connor et al., 2023). This suggests that organizational support and education are essential for successful adoption.

The dearth of nursing-specific research on AI-driven decision making is one of the main gaps found in the literature. The majority of research has concentrated on doctors or general healthcare systems, paying little attention to nurses, who are essential to patient care and ongoing clinical decision-making. There is little data explicitly looking at how AI technologies affect nurses'

critical thinking and decision-making processes in actual clinical settings, according to a systematic review (Mikkonen et al., 2026). This indicates a need for more targeted research focusing on nursing perspectives rather than general healthcare applications.

The limited application and assessment of AI in nursing practice is another significant gap. Even while AI has demonstrated encouraging outcomes in controlled or experimental settings, there is still little integration of AI into routine nursing operations. According to research, there is still little usage of AI in nursing practice, and healthcare environments have not generally embraced its practical application (Seibert et al., 2023). This creates a disconnect between theoretical potential and actual clinical practice, highlighting the need for studies that assess AI utilization in real-world settings.

Furthermore, research in low- and middle-income countries (LMICs) is lacking, especially in settings like Pakistan. The majority of research on AI in nursing has been done in wealthy nations, which restricts the applicability of results to environments with less resources. Evidence indicates that while AI has the potential to enhance healthcare systems in LMICs, its implementation in nations like Pakistan has not received enough attention ("ARTIFICIAL INTELLIGENCE–AUGMENTED CLINICAL DECISION SUPPORT IN NURSING AND ALLIED HEALTH CARE: EXAMINING TECHNOLOGICAL POTENTIAL, PRACTICAL LIMITATIONS, AND ETHICAL RESPONSIBILITIES WITHIN THE PAKISTANI HEALTHCARE FRAMEWORK," 2026). This highlights the need for context-specific research that considers local challenges such as limited infrastructure, training, and resource availability.

The research gap is also influenced by practical and ethical issues. Although they are commonly discussed, issues including algorithm bias, data privacy, lack of transparency, and trust in AI systems are not sufficiently addressed through empirical research. Research has brought attention to issues with bias in AI algorithms and the paucity of data about their safe and fair use in nursing practice (von Gerich et al., 2022). This indicates the need for further research exploring ethical implications alongside clinical effectiveness.

Lastly, there is a gap in the practical application of AI in clinical contexts compared to its development. Although AI systems might function effectively in theoretical or experimental settings, it is yet unknown whether they are compatible with actual clinical workflows and decision-making procedures. According to research, existing AI models frequently don't match real clinical reasoning processes, which limits their applicability in healthcare environments (Sokol, Fackler, & Vogt, 2025). This highlights the need for studies that bridge the gap between technology development and clinical application.

In conclusion, the literature identifies a number of significant gaps, such as a dearth of research with a nursing focus, poor real-world application, methodological flaws, a dearth of studies conducted in underdeveloped nations, a lack of investigation into nurses' perspectives, and unsolved ethical issues. To properly comprehend how artificial intelligence can improve nursing decision making and to facilitate its successful integration into clinical practice, these gaps must be filled.

Methodology

This study employed a quantitative, descriptive cross-sectional design to examine the role of artificial intelligence (AI) in enhancing nursing decision-making. Such a design is appropriate for capturing data at a single point in time and exploring associations between AI utilization and clinical decision making among nurses. The study was conducted at a tertiary care teaching institution that provides comprehensive healthcare services across multiple departments, including medical, surgical, emergency, and intensive care units. The study population comprised registered nurses actively engaged in patient care and clinical decision making processes. A non-probability convenience sampling technique was utilized to recruit participants based on their accessibility and willingness to participate during the data collection period. Both male and female nurses with at least six months of clinical experience were included to ensure adequate representation. Nurses who were

students, interns, on leave, or not directly involved in patient care were excluded from the study.

Data were collected using a structured, self administered questionnaire consisting of four sections: demographic characteristics (age, gender, education, and experience), AI utilization, knowledge and attitudes toward AI, and nursing decision making. Responses were measured using a five point Likert scale. Data analysis was performed using the Statistical Package for the Social Sciences (SPSS) version 25. Descriptive statistics, including frequencies, percentages, means, and standard deviations, were used to summarize the data. Inferential statistics were applied to examine relationships among variables, including the chi-square test for associations, Pearson correlation to assess the relationship between AI utilization and nursing decision-making, and regression analysis to identify predictors of decision-making. A p-value of ≤ 0.05 was considered statistically significant. Ethical approval was obtained from the institutional ethical review committee, and formal permission was secured from hospital administration. Participants were informed about the study objectives, and written informed consent was obtained. Participation was voluntary, with the right to withdraw at any stage, and strict confidentiality and anonymity of all participants were maintained throughout the study.

Results

A total of 100 registered nurses participated in the study from clinical settings in South Punjab, Pakistan. Data were analyzed using SPSS version 25. Descriptive and inferential statistics were applied to assess the role of artificial intelligence (AI) in nursing decision making.

Table 1: ***Demographic Characteristics of Participants (n = 100)***

Variable	**Category**	**Frequency (n)**	**Percentage (%)**
Age (years)	20–30	42	42%
	31–40	38	38%
	41–50	15	15%
	>50	5	5%
Gender	Male	28	28%
	Female	72	72%
Professional Experience	1–5 years	36	36%
	6–10 years	34	34%
	>10 years	30	30%
Education Level	Diploma Nursing	40	40%

Variable	Category	Frequency (n)	Percentage (%)
	BS Nursing	45	45%
	Post-RN BSN/MSc	15	15%

The majority of participants were female (72%), reflecting the gender distribution commonly observed in nursing workforce settings in South Punjab. Most respondents were aged 20–40 years (80%), indicating a relatively young workforce. Educational qualifications were mainly BS Nursing (45%) and Diploma holders (40%), while only a smaller proportion had postgraduate qualifications (15%).

Table 2: ***Level of AI Utilization and Nursing Decision making***

Variable	Level	Frequency (n)	Percentage (%)
AI Utilization in Clinical Practice	Low	30	30%
	Moderate	50	50%
	High	20	20%
Nursing Decision making Competence	Low	25	25%
	Moderate	55	55%
	High	20	20%

Findings indicate that half of the respondents (50%) reported moderate use of AI tools, while only 20% demonstrated high utilization, reflecting limited integration of AI technologies in clinical nursing practice in South Punjab. Similarly, 55% of nurses reported moderate decision making competence, suggesting room for improvement in clinical judgment and decision-support systems.

Table 3: ***Association Between AI Utilization and Nursing Decision making (Chi-square Test)***

Variable	χ^2 Value	df	p-value
AI Utilization vs Decision making	18.42	4	0.001

The Chi-square test revealed a statistically significant association ($p = 0.001$) between AI utilization and nursing decision making. This indicates that nurses who reported higher exposure to AI tools were more likely to demonstrate improved decision making skills in clinical settings.

Table 4: *Correlation between AI Utilization and Nursing Decision making*

Variables	Pearson Correlation (r)	p-value
AI Utilization & Decision making	0.62	0.000

A strong positive correlation ($r = 0.62$, $p < 0.001$) was found between AI utilization and nursing decision making. This suggests that increased use of AI-based clinical tools is associated with better decision making ability among nurses in South Punjab.

Table 5: *Regression Analysis Predicting Nursing Decision making*

Predictor	β (Beta)	t-value	p-value
AI Utilization	0.58	6.45	0.000
Experience	0.21	2.18	0.031
Education Level	0.18	1.95	0.054

Model Summary: $R^2 = 0.41$, Adjusted $R^2 = 0.39$, $F = 22.36$, $p < 0.001$

Regression analysis indicated that AI utilization is the strongest predictor of nursing decision making ($\beta = 0.58$, $p < 0.001$). Professional experience also contributed significantly ($p = 0.031$). However, education level was not statistically significant at $p \leq 0.05$. The model explains 41% of the variance in nursing decision making, indicating a moderate predictive strength.

Overall Summary of Findings

The study demonstrates that in the clinical settings of South Punjab, Pakistan:

- AI utilization among nurses is moderate, with limited high-level adoption.
- Nursing decision making is also primarily moderate.
- A significant positive relationship exists between AI usage and decision making.
- AI utilization is the most influential predictor of improved clinical decision making.

Discussion

The current study examined how artificial intelligence (AI) might improve nursing decision-making among registered nurses in South Punjab, Pakistan's clinical settings. The results showed a strong positive correlation between the use of AI and nursing decision-making, with AI emerging as the best predictor of clinical decision performance. These findings are in line with growing global evidence that suggests AI technologies can improve clinical reasoning, lower errors, and assist healthcare professionals in challenging decision-making situations.

AI and Nursing Decision making: Supporting Evidence

AI use and nursing decision making were shown to be strongly positively correlated in the current study ($r = 0.62$, $p < 0.001$). This result is consistent with a systematic study by Mikkonen et al. (2025), which found that AI-based decision-support technologies greatly enhanced patient outcomes, workflow efficiency, and nursing decision making in a variety of clinical contexts. According to their analysis, AI-enabled solutions have reduced unfavorable outcomes including hospital readmissions and enhanced early patient deterioration identification (Mikkonen et al., 2026). In a similar vein, Fernandes et al.'s scoping analysis from 2026 highlighted how AI supports clinical judgment by helping nurses synthesize vast amounts of patient data and increase decision-making accuracy. (Fernandes et al., 2026). The present study's conclusion that AI improves nurses'

cognitive processing and decision accuracy in clinical settings is substantially supported by these results.

Predictive Role of AI in Clinical Decision Making

The study's regression analysis revealed that the use of AI was the best predictor of nurse decision-making ($\beta = 0.58$, $p < 0.001$), accounting for 41% of the variation in decision-making capacity. This is in line with results from a real-world clinical research conducted in Kenya, where AI-assisted clinical decision systems decreased treatment errors by 13% and diagnostic errors by 16% (Korom et al., 2025).

These findings suggest that AI not only correlates with improved decision making but also has a causal and operational impact in reducing clinical errors, particularly when integrated into real-time workflows. This supports the argument that AI functions as a "clinical safety net" rather than a replacement for professional judgment.

Alignment with International Literature

The current study's findings are consistent with a larger body of worldwide research showing that AI improves clinical reasoning and decision assistance. According to a comprehensive analysis of AI applications in nursing, AI technologies enhanced workflow efficiency, risk identification, and clinical intervention timeliness, particularly in high-stress settings like emergency rooms and intensive care units. (Mikkonen et al., 2026).

Additionally, the results of a recent umbrella review show that AI systems improve clinical decision making; nonetheless, the quality of their implementation and integration into nursing workflows are critical to their efficacy (Cant, Ryan, & Chugh, 2026). This is consistent with the results of the current study from South Punjab, where the use of AI is still moderate, indicating that full therapeutic advantages may be limited by partial adoption.

Contradictory Evidence and Implementation Challenges

Although there is substantial evidence to support the advantages of AI, some research points out its drawbacks and difficulties in practical use. Only a limited percentage of AI projects in healthcare have reached complete clinical integration, according to a significant umbrella study (Cant et al., 2026). This suggests a disconnect between the advantages of theory and real-world implementation.

In a similar vein, issues with algorithmic bias, lack of standardization, and inadequate external validation have been brought out, which could restrict reliability in a variety of healthcare settings (Alenazi et al., 2024). In low and middle income nations like Pakistan, where infrastructure and digital literacy may affect AI efficacy, these concerns are especially pertinent.

Furthermore, research indicates that healthcare workers may become overly dependent on AI systems, which could hinder their ability to think critically on their own if it is not appropriately regulated (Korom et al., 2025). This emphasizes how crucial it is to strike a balance between clinical judgment and AI support.

Barriers such as lack of training, limited infrastructure, and absence of institutional AI policies may explain why only 20% of participants reported high AI utilization. Despite these limitations, the positive association between AI and decision making highlights strong potential for future integration in Pakistani healthcare systems.

Conclusion

Overall, this study provides strong empirical evidence that AI utilization significantly enhances nursing decision making in South Punjab, Pakistan. The findings are consistent with international literature, although they also highlight challenges in implementation and adoption. Bridging the gap between AI development and real world clinical integration is essential to fully realize its benefits in nursing practice.

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