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# Challenges to The Adoption of Artificial Intelligence in Nursing Clinical Practice: A Cross- Sectional Study

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***Abstract***

***Background:*** *The integration of artificial intelligence into nursing clinical practice is increasing globally. However, several challenges may hinder its adoption. This study aimed to examine the challenges graduate nursing students anticipate facing when adopting artificial intelligence in clinical practice.*

***Methods:*** *A descriptive cross-sectional study was conducted at the Graduate College of Al-Neelain University, Sudan. A total of 101 graduate nursing students were engaged using a systematic sampling method. Data was collected through a structured, self-administered questionnaire.*

***Results:*** *The majority of participants (70.2%) did not receive formal training. Patient data privacy was identified as the most significant ethical concern (82.2%), followed by accountability for errors (50.5%).*

***Conclusion:*** *Significant challenges remain in the adoption of artificial intelligence in nursing practice, particularly inadequate training, accountability in errors, and ethical concerns related to privacy and accountability. Strengthening artificial intelligence education and regulatory policies is essential for responsible integration.*

**Keywords:** Artificial Intelligence, Nursing, Clinical Practice and Adoption.

## Abbreviations

**AI** : Artificial intelligence
**IRB :** Institutional Review Board

## Introduction

Artificial intelligence (AI) is a domain of computer science focused on creating intelligent machines that can replicate human cognitive processes and behaviors [1].

The use of AI into nursing information technology is poised to revolutionize healthcare by enhancing patient outcomes via individualized care, improved decision-making, and streamlined processes. Nevertheless, data privacy, ethical considerations, and sufficient training remain challenges to be addressed. Nurses may influence the future of healthcare by assuring the ethical and effective utilization of AI technologies to improve patient outcomes while solving existing issues and harnessing AI's potential [2]. The future of nursing includes increased use of technology and digital tools, integration of AI, and robotics in patient care, necessitating nurses to stay updated on developments while maintaining a commitment to quality care for patients and the healthcare system [3].

In scoping study elucidates the present status of artificial intelligence in nurse administration, pinpointing notable applications, problems, and ethical dilemmas. Artificial intelligence possesses transformational capabilities in enhancing managerial processes. AI deployment relies on employee preparedness, technological infrastructure, ethical guidelines, and interdisciplinary cooperation. Healthcare businesses must engage in extensive training programs to guarantee nurse managers attain AI literacy while maintaining a human-centered approach to care, hence facilitating the responsible deployment of AI. Moreover, researchers ought to investigate the enduring effects of AI on management

decision-making, nursing autonomy, and workforce dynamics [4]. While AI provides considerable advantages for nursing practice, it also presents dilemmas that require meticulous management [5].

Studies highlight the necessity for extensive training programs to prepare nursing personnel with the skills required for effective AI integration [6]. This study investigated challenges facing nurses in integrating artificial intelligence into clinical practice.

## Method

A descriptive cross-sectional study design was utilized. Participants were selected through simple random sampling, and the questionnaire link was distributed via WhatsApp. In total, 101 nurses completed the survey.

Data was collected using a structured questionnaire developed by researchers. The questionnaire shared with graduate nursing students via their WhatsApp to ensure convenient access. Participants answered the questions using a combination of response formats, including yes/no questions, multiple-choice questions, and Likert scale items to indicate the extent of their frequency of use. As the principal investigator, I distributed the link, monitored responses, and collected the complete questionnaires for analysis.

A pilot study conducted with 10 % of nurses to assess the clarity of the questionnaire and estimate the time required to complete it.

The data were entered, cleaned, managed, and analyzed using Microsoft Excel. A pre-entry quality check was conducted to ensure the accuracy and completeness of the data collected. Descriptive statistics, including frequencies and percentages, were calculated.

Ethical approval for the study was obtained from the university's Institutional Review Board (IRB), and consent was obtained from all participants. The aim of the study was explained to participants and informed them that information will be used solely for the purpose of the study. The consent process conducted online prior to accessing the questionnaire. Participants received detailed information about the study, including its title, objectives, purpose, confidentiality measures, voluntary participation, and their right to withdraw at any time without penalty. Those who agree to participate indicated their consent by clicking the 'Agree' button provided in the link. Only after providing electronic consent will, they be able to proceed to complete the questionnaire.

## Results

**Table 1:** Participant demographic characteristics

| Nursing experience. (n=101) | | |
|---|---|---|
| **Experience** | **Frequency** | **Percentage %** |
| Less than 5 years | 19 | 18.8% |
| 5–9 years. | 18 | 17.8% |
| 10–14 years | 40 | 39.6% |
| 15 years and above | 24 | 23.8% |
| Total | 101 | 100% |
| **Receiving formal training in Artificial Intelligence** | | |
| **Training courses in AI** | **Frequency** | **Percentage** |
| Yes | 30 | 29.7% |
| No | 71 | 70.2% |
| Total | 101 | 100% |

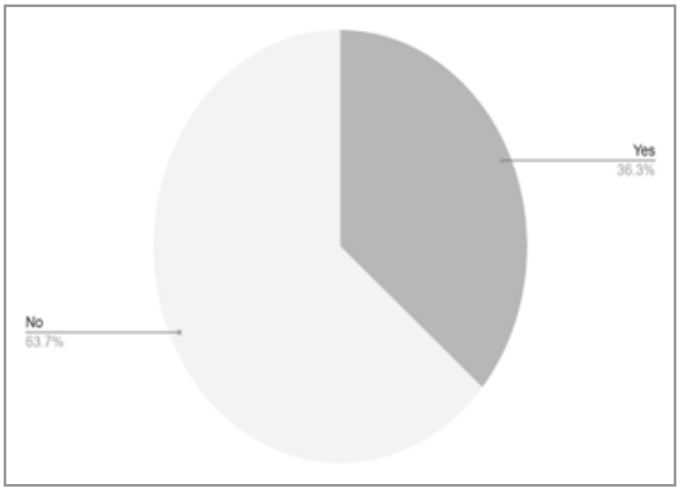


**Figure 1:** Nurses awareness about WHO guidelines for AI use in healthcare in 2021. (n=101)

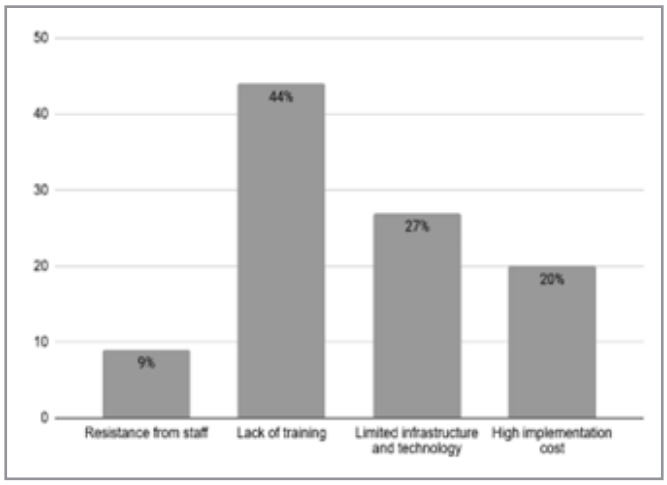


**Figure 2:** The main barrier to AI adoption in workplace. (n=101)

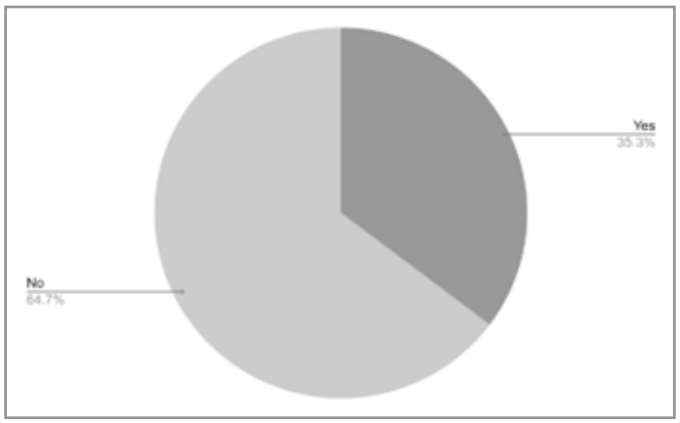


**Figure 3:** AI may threaten nursing job stability. (n=101)

**Table 2:** Ethical concerns regarding adoption of AI in nursing practice. (n=101)

| Ethical Concerns | Frequency | Percentage % |
|---|---|---|
| Patient data privacy | 83 | 82.2% |
| Bias in algorithms | 45 | 44.6% |
| Accountability in errors | 51 | 50.5% |
| Ensure transparency, explainability | 16 | 15.8% |
| Total | 101 | 100% |

**Table 3:** Ethics and governance of artificial intelligence for health. (n=101)

| Ethics and Governance Principles | Frequency | Percentage |
|---|---|---|
| Protect human autonomy | 87 | 86.1% |
| Foster responsibility and accountability | 76 | 75.2% |
| Ensure inclusiveness and equity | 72 | 71.3% |
| Promote AI that is responsive and sustainable | 70 | 69.3% |
| Total | 101 | 100% |

## Discussion

Approximately two-thirds of the nurses have more than 10 years of practical experience. This substantial experience enables them to assess the practicality of innovations and their application in real-world settings. However, 70.2% report that they are not receiving training in artificial intelligence (Table1), and 44% identify inadequate training as a major barrier to AI adoption (Figure II). Similar findings have been reported in previous studies, highlighting the need for structured AI education within nursing curricula. In addition, limited awareness of international AI governance guidelines represents a significant challenge to ensuring safe and standardized practice. These concerns align with global discussions on AI governance in healthcare, particularly those outlined by the World Health Organization in its 2021 guidance on AI ethics and governance [7].

The loss of employment is not the primary challenge confronting graduating nurses. Nurses believe AI will not threaten job stability (Figure III) and seeing AI as complementary rather than substitutive this finding contrasts with a cross-sectional study

conducted in Saudi Arabia, in which 76.8% of nurses expressed concern about job loss due to AI [8].

The primary challenge identified by nursing is patient data privacy (Table 2), Nurses address a critical issue regarding patient data privacy and accountability for errors. Nurses are aware of the risks of data breaches, misdiagnosis, and unclear responsibility when AI makes or influences clinical decisions. Such concerns align with international debates on AI governance in healthcare. In Qatar, nursing informatics see AI as promising developments, promoting more effective patient care and improved decision-making. However, for deployment to be successful, ethical issues must be addressed and nurses' AI literacy must be raised [9].

It found out in previous systematic review application of AI in nursing practice raised several ethical concerns, so it needs to formulate ethical guidelines to govern the uses of AI to safe patients and do not lose client confidence on health care providers [10].

Nurses share responsibility in shaping decisions related to the integration of AI into healthcare systems. They must ensure that its implementation is ethical and consistent with core nursing values, particularly compassionate care. This commitment is reflected in the present study, where 69.3% (Table3) of participants supported promoting AI systems that are responsive and sustainable. Furthermore, nurses must advocate for patient and nursing involvement in all aspects of the design, implementation, and evaluation of these technologies [11].

A total of 86.1% of nurses identified the protection of human autonomy as a key ethical and governance principle in the use of AI in nursing practice. Safeguarding human autonomy is a fundamental objective of nursing. Evidence suggests that AI-based systems can enhance the autonomy of both patients and healthcare professionals in care processes such as wound management by providing guided instructions, improving workflows, and increasing efficiency in the use of time, materials, and human resources [12].

## Limitations

This study has several limitations. The use of WhatsApp for questionnaire distribution may have excluded individuals with limited internet access or lower digital literacy. The study relied on self-reported data, which may introduce response bias. Additionally, the cross-sectional design limits causal inference. Finally, the relatively small sample size and single-institution setting may limit generalizability.

## Conclusion

Nurses perceive significant challenges in the adoption of artificial intelligence in clinical practice. The most critical barriers include lack of formal training, limited awareness of international governance guidelines, and ethical concerns related to patient data privacy and accountability. Nurses must play an active role in guiding AI implementation to ensure that technological advancements align with professional standards and patient-centered care

## Implication of the Study

Concerns around privacy and accountability indicate need for policies clarifying data protection and liability frameworks. AI could still be leveraged to optimize workflows, allowing nurses to focus on direct care.

## Authors' Contributions

All authors participated in the project development, data collection, and manuscript writing. All authors read and approved of the final manuscript.


## Funding

All budgetary expenses are covered by the author.


## Data Availability

The data of this study will be made available upon request.

## Declarations Conflict of Interest

All authors declare that they have no conflicts of interest.


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