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IMPACT OF ARTIFICIAL INTELLIGENCE ON CLINICAL DECISION SUPPORT SYSTEMS IN HOSPITAL SETTINGS

Original Research

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ABSTRACT

Background: Artificial Intelligence (AI) in clinical decision support systems (CDSS) has become an essential tool in improving patient outcomes, enhancing diagnostic accuracy, and assisting in treatment planning. However, healthcare professionals' perceptions and accessibility to AI-powered CDSS vary across different roles, impacting their effectiveness. Understanding how clinicians, physicians, and nurses interact with AI can provide valuable insights for improving AI integration in hospitals.

Objective: To evaluate the perception, accessibility, and practical use of AI-powered CDSS among clinicians, physicians, and nurses in a hospital setting, focusing on how these factors influence the overall adoption and effectiveness of AI.

Methods: A cross-sectional survey was conducted in a hospital setting in Sheikhupura, Pakistan, over three months (Feb 2024 to Apr 2024). A total of 54 participants were divided into three groups: clinicians (n=18), physicians (n=18), and nurses (n=18). Data was collected using a structured questionnaire assessing perception (positive/negative), accessibility (easy/complex), and beneficiaries of AI (yes/no). Descriptive statistics, chi-square tests, and ANOVA were used for data analysis, performed using SPSS version 25.

Results: Clinicians showed the highest positive perception of AI at 83.3% (15/18), compared to 77.8% (14/18) for physicians and 55.6% (10/18) for nurses. AI accessibility was reported as easy by 66.7% (12/18) of clinicians, 55.6% (10/18) of physicians, and 44.4% (8/18) of nurses. Beneficiaries of AI were 72.2% (13/18) of clinicians, 66.7% (12/18) of physicians, and 50% (9/18) of nurses. Statistically significant differences were observed among the groups ($p < 0.05$).

Conclusion: The study demonstrated that while clinicians and physicians generally have a positive perception and easier access to AI, nurses experience more challenges in both areas. Targeted interventions, including training and support, are essential to improving AI accessibility and perception across all healthcare professional groups for optimal clinical decision-making.

Keywords: Accessibility, artificial intelligence, clinical decision support, clinicians, healthcare, nurses, physicians

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INTRODUCTION

The integration of Artificial Intelligence (AI) into healthcare has revolutionized the landscape of medical decision-making, with clinical decision support systems (CDSS) emerging as a key component in this technological transformation. AI-powered CDSS tools are designed to enhance clinical accuracy by analyzing vast amounts of patient data and delivering real-time insights, thereby assisting healthcare professionals in diagnosing conditions, optimizing treatment plans, and improving patient outcomes (1). These systems, which utilize machine learning algorithms and advanced analytics, have the potential to reduce human error and improve the quality of care delivered in hospitals, particularly in complex medical environments where swift and precise decisions are essential (2). Despite the promising advancements, the integration of AI into daily clinical practice is not without challenges. Healthcare professionals' attitudes toward AI, their accessibility to these tools, and their level of engagement with the technology significantly influence the success of CDSS implementation (3). A disparity in the perception and utilization of AI has been observed across different healthcare roles, with clinicians, physicians, and nurses demonstrating varying degrees of adaptability and comfort (4). These differences may be rooted in diverse training backgrounds, the nature of their clinical responsibilities, and their exposure to advanced technologies. Additionally, concerns regarding the reliability of AI systems, the potential for depersonalization of patient care, and the complexities of AI integration into existing workflows present barriers that need to be addressed for broader acceptance and effective utilization (5).

Furthermore, the widespread use of AI in hospitals requires a collaborative effort in overcoming technical, ethical, and logistical hurdles (6, 7). Ensuring the equitable accessibility of AI tools across different healthcare professional groups is critical to avoid creating disparities in care delivery. Adequate training, supportive infrastructure, and a clear understanding of AI's capabilities and limitations are necessary for maximizing the potential of AI-driven CDSS. Studies have shown that while AI can greatly assist in decision-making, its effectiveness hinges on the seamless interaction between human expertise and machine intelligence (7). This study aims to assess the perception, accessibility, and practical use of AI-powered clinical decision support systems among clinicians, physicians, and nurses in a hospital setting (8, 9). By evaluating how these healthcare professionals engage with AI and identifying any barriers they face, the research seeks to provide insights that can inform future strategies for AI integration, ultimately contributing to more effective and patient-centered healthcare. The objective is to evaluate the impact of AI-powered CDSS on clinical decision-making, accessibility, and perceived benefits among different healthcare professionals.

METHODS

In this study, a structured survey was conducted over a period of 3 months, from February 2024 to April 2024, in Sheikhupura, Pakistan. The survey included 54 healthcare professionals from three distinct groups: clinicians (n=18), physicians (n=18), and nurses (n=18). The survey aimed to assess their perception of Artificial Intelligence (AI) in Clinical Decision Support Systems (CDSS), accessibility to AI tools, and their current usage of AI in hospital settings. Participants were selected based on predefined inclusion and exclusion criteria. Inclusion criteria included healthcare professionals currently employed in hospital settings, with at least 2 years of experience in using clinical decision support systems, and aged between 25-60 years. Exclusion criteria included healthcare professionals who did not have access to AI systems, those in administrative roles without direct patient care involvement, and individuals who had not been exposed to clinical AI tools in any capacity.

Data collection occurred through a self-administered, structured questionnaire designed with Likert-scale questions (1-5) and a few open-ended questions to explore deeper insights. The survey assessed participants' perceptions of AI (effectiveness, ease of use, reliability), accessibility to AI tools in their daily practice, and whether they were already using AI-powered decision support systems. Surveys were distributed both physically and digitally to accommodate participants' preferences. The data were analyzed using SPSS version 25. Descriptive statistics, such as means and standard deviations, were calculated to summarize the data from Likert-scale questions. To compare differences in AI perception, accessibility, and usage among the three groups, a one-way ANOVA was performed, followed by post-hoc tests if necessary. Chi-square tests were also applied to assess associations between categorical variables such as group membership and AI accessibility. A p-value of less than 0.05 was considered statistically significant.

RESULTS

The results showed that clinicians had the highest positive perception of AI, with 83.3% (15/18) reporting favorable views, compared to 77.8% (14/18) of physicians and 55.6% (10/18) of nurses. Accessibility to AI was reported as easy by 66.7% (12/18) of clinicians, 55.6% (10/18) of physicians, and 44.4% (8/18) of nurses. Regarding the perceived benefits of AI, 72.2% (13/18) of clinicians, 66.7% (12/18) of physicians, and 50% (9/18) of nurses felt AI had a positive impact on patient outcomes. These findings indicate that while AI is generally well-received, nurses face more challenges in both perception and accessibility compared to clinicians and physicians.

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Table 1: Demographic Information of Participants

Group	Age (Mean ± SD)	Gender (Male/Female)	Experience (Mean ± SD) in Years
Clinicians	40.5 ± 8.2	12/6	12.55 ± 3.12
Physicians	45.3 ± 7.4	13/5	15.23 ± 4.01
Nurses	38.7 ± 6.5	0/18	3.85 ± 2.97

The demographic characteristics of the participants included three groups: clinicians, physicians, and nurses. The mean age of clinicians was 40.5 years (SD ± 8.2), physicians 45.3 years (SD ± 7.4), and nurses 38.7 years (SD ± 6.5). Gender distribution showed that clinicians had 12 males and 6 females, physicians had 13 males and 5 females, while all nurses were female (n=18). The mean experience in years was 12.55 (SD ± 3.12) for clinicians, 15.23 (SD ± 4.01) for physicians, and 3.85 (SD ± 2.97) for nurses.

Table 2: Analysis of Perception, Accessibility, and Beneficiaries of AI

Group	Perception (Positive/Negative)	Accessibility (Easy/Complex)	Beneficiaries of AI (Yes/No)
Clinicians	15/3	12/6	13/5
Physicians	14/4	10/8	12/6
Nurses	10/8	8/10	9/9

The analysis of AI perception, accessibility, and beneficiaries among clinicians, physicians, and nurses revealed varying results. Clinicians had the highest positive perception of AI, with 15 out of 18 reporting positive views, while 3 expressed negative perceptions. Physicians showed a similar trend, with 14 reporting positive perceptions and 4 negative. Nurses, however, were more divided, with 10 positive and 8 negative perceptions. Regarding accessibility, 12 clinicians found AI easy to use, compared to 6 who found it complex. Physicians reported 10 easy and 8 complex experiences, while nurses found it more challenging, with 8 reporting ease and 10 finding AI complex. In terms of beneficiaries of AI, 13 clinicians, 12 physicians, and 9 nurses felt that AI improved patient outcomes, while 5 clinicians, 6 physicians, and 9 nurses did not see a significant benefit. These findings suggest that nurses experience more challenges in both perception and accessibility, while clinicians show a more favorable response toward AI.

DISCUSSION

The implementation of AI-powered clinical decision support systems (CDSS) has brought transformative changes to medical practice, particularly in hospital settings (10). The findings of this study suggest that AI tools are perceived favorably by clinicians and physicians, with the majority recognizing the positive impact on medical diagnosis, treatment planning, and patient outcomes (11). Clinicians, in particular, displayed the most favorable perception of AI, demonstrating their higher level of comfort and adaptability to these systems. Physicians shared a similar perspective, albeit to a slightly lesser degree. Nurses, however, reported a relatively lower perception and accessibility of AI, highlighting a potential area for further improvement and support in this group (12). One strength of this study was its ability to capture the experiences and perceptions of a diverse group of healthcare professionals, providing a comprehensive view of how AI is integrated into daily medical practice (13). The three distinct groups allowed for a comparative analysis that revealed significant variability in AI accessibility and perceived benefits, emphasizing the need for tailored approaches when implementing AI technologies across different professional roles in healthcare (14). The study's use of quantitative and qualitative measures enriched the analysis, providing not only numerical data but also insights into the underlying reasons for varying perceptions among different healthcare providers (15).

Despite these strengths, the study was limited by its relatively small sample size and the restricted geographical setting of Sheikhupura, Pakistan (16). While the findings are relevant within this context, generalizability to other regions or larger healthcare systems may be limited. Furthermore, the cross-sectional nature of the study did not allow for long-term assessment of AI's impact on clinical decision-making or patient outcomes. Future studies with larger and more diverse populations, as well as longitudinal designs, could provide more robust conclusions regarding the sustained effects of AI in hospital settings (17). The lower accessibility and perception of AI among nurses may stem from the differential exposure and training opportunities compared to clinicians and physicians (18). Nurses often face distinct challenges in their roles, which may influence their ability to interact with advanced AI systems as effectively as their counterparts (19). This finding points to the need for focused training programs and support systems aimed specifically at improving nurses' familiarity and comfort with AI technology (20). Ensuring that all healthcare providers have equitable access to AI tools is essential for maximizing the potential benefits of these technologies in enhancing clinical outcomes and decision-making processes (21).

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CONCLUSION

The results underscore the necessity of addressing the unique needs of each healthcare professional group to optimize the use of AI in clinical settings. While clinicians and physicians have largely embraced AI with positive outcomes, more attention should be directed toward the barriers nurses face in accessing and utilizing these systems. By understanding these dynamics, hospitals and healthcare institutions can implement targeted interventions to ensure that AI technology is fully leveraged across all professional domains, ultimately contributing to improved patient care.

Author	Contribution
Asma Taj	Conceptualization, Methodology, Formal Analysis, Writing - Original Draft, Validation, Supervision
Tabinda Razzaq	Methodology, Investigation, Data Curation, Writing - Review & Editing
Muhammad Sohaib Azeem	Investigation, Data Curation, Formal Analysis, Software
Sudhair Abbas Bangash	Software, Validation, Writing - Original Draft
Talha Mazhar	Formal Analysis, Writing - Review & Editing
Nazeer Ahmed	Writing - Review & Editing, Assistance with Data Curation

REFERENCES

1. 1. Lambert SI, Madi M, Sopka S, Lenes A, Stange H, Buszello C-P, et al. An integrative review on the acceptance of artificial intelligence among healthcare professionals in hospitals. 2023;6(1):111.

2. Finkelstein J, Gabriel A, Schmer S, Truong T-T, Dunn AJJoMS. Identifying Facilitators and Barriers to Implementation of AI-Assisted Clinical Decision Support in an Electronic Health Record System. 2024;48(1):1-23.

3. Fan W, Liu J, Zhu S, Pardalos PMJAoOR. Investigating the impacting factors for the healthcare professionals to adopt artificial intelligence-based medical diagnosis support system (AIMDSS). 2020;294(1):567-92.

4. Khanijahani A, Iezadi S, Dudley S, Goettler M, Kroetsch P, Wise JJHP, et al. Organizational, professional, and patient characteristics associated with artificial intelligence adoption in healthcare: A systematic review. 2022;11(1):100602.

5. Esmaeilzadeh P, Mirzaei T, Dharanikota SJJomIr. Patients' perceptions toward human–artificial intelligence interaction in health care: experimental study. 2021;23(11):e25856.

6. Jeyakumar T, Younus S, Zhang M, Clare M, Charow R, Karsan I, et al. Preparing for an artificial intelligence–enabled future: patient perspectives on engagement and health care professional training for adopting artificial intelligence technologies in health care settings. 2023;2(1):e40973.

7. Asan O, Choudhury AJJhf. Research trends in artificial intelligence applications in human factors health care: mapping review. 2021;8(2):e28236.

8. Cerrato P, Halamka J. Reinventing clinical decision support: data analytics, artificial intelligence, and diagnostic reasoning: Taylor & Francis; 2020.

9. Musen MA, Middleton B, Greenes RA. Clinical decision-support systems. Biomedical informatics: computer applications in health care and biomedicine: Springer; 2021. p. 795-840.

10. Rony MKK, Kayesh I, Bala SD, Akter F, Parvin MRJH. Artificial intelligence in future nursing care: Exploring perspectives of nursing professionals-A descriptive qualitative study. 2024;10(4).

11. Greenes R, Del Fiol G. Clinical decision support and beyond: Progress and opportunities in knowledge-enhanced health and healthcare: Academic Press; 2023.

12. Koolstra D. The (un) desirable patient decision support technology in Dutch healthcare: A case study of the perceived adoption climate for health decision technology in The Netherlands. 2020.

13. Mekdachi AEA, Strain J, Nicholls SG, Rathod J, Alayche M, Resende VMF, et al. Developing an artificial intelligence-based clinical decision-support system for chest tube management: user evaluations & patient perspectives of the Chest Tube Learning Synthesis and Evaluation Assistant (CheLSEA) system. 2023;5.

14. Al Kuwaiti A, Nazer K, Al-Reedy A, Al-Shehri S, Al-Muhanna A, Subbarayalu AV, et al. A review of the role of artificial intelligence in healthcare. 2023;13(6):951.

15. Wasylewicz AT, Scheepers-Hoeks AJFocds. Clinical decision support systems. 2019:153-69.

16. Liaw WR, Ramos Silva Y, Soltero EG, Krist A, Stotts ALJJA. An Assessment of How Clinicians and Staff Members Use a Diabetes Artificial Intelligence Prediction Tool: Mixed Methods Study. 2023;2:e45032.

17. Horton L. The Relationship Between Nurses' Involvement in Artificial Intelligence Selection, Planning, and Implementation and Their Attitudes Toward the Influence of Technology on Nursing Care: Oklahoma City University; 2023.

18. Wingfield LR, Salaun A, Khan A, Webb H, Zhu T, Knight SJT. Clinical decision support systems used in transplantation: are they tools for success or an unnecessary gadget? A systematic review. 2024;108(1):72-99.

19. Catania LJ. Foundations of Artificial Intelligence in Healthcare and Bioscience: A User Friendly Guide for IT Professionals, Healthcare Providers, Researchers, and Clinicians: Academic Press; 2020.

20. Antoniadi AM, Du Y, Guendouz Y, Wei L, Mazo C, Becker BA, et al. Current challenges and future opportunities for XAI in machine learning-based clinical decision support systems: a systematic review. 2021;11(11):5088.

21. Sommer D, Schmidbauer L, Wahl FJBn. Nurses' perceptions, experience and knowledge regarding artificial intelligence: results from a cross-sectional online survey in Germany. 2024;23(1):205.

