DOI: 10.6977/IJoSI.202506_9(3).0006
R.A. Awashreh/Int. J. Systematic Innovation, 9(3), 96-108 (2025)

Enhancing healthcare efficiency with artificial intelligence: Benefits, challenges, and the future of clinical practice

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(Received 06 January 2025; Final version received 21 February 2025; Accepted 10 March 2025)

Abstract

This study explores the integration of artificial intelligence (AI) tools in healthcare, focusing on their impact on cognitive workload, decision-making, and professional development. The findings indicate that AI tools significantly reduce cognitive load, enabling healthcare professionals to focus on higher-order tasks such as critical thinking and complex problem-solving. A majority of participants reported that AI positively influences their professional development, enhancing cognitive functions and empowering them in clinical decision-making. However, concerns were raised about AI's potential negative effects on hands-on clinical skills, particularly in areas such as physical examinations and surgeries, which require manual expertise. These concerns align with the theory of "skill degradation," where over-reliance on AI may hinder the development of essential practical skills. In addition, the study revealed that healthcare workers feared AI could reduce their autonomy in decision-making, emphasizing the need for maintaining human oversight in AI-driven processes. The findings suggest that a balanced approach to AI adoption is essential, where AI complements human expertise rather than replacing it. Training programs should be developed to ensure that healthcare professionals retain core competencies while utilizing AI effectively. Overall, while AI has the potential to improve healthcare delivery by enhancing efficiency and supporting decision-making, its integration must be managed carefully to preserve the essential role of healthcare professionals in providing high-quality care.

Keywords: Artificial Intelligence, Clinical Skills, Cognitive Load, Decision-Making, Healthcare, Professional Development

1. Introduction

The integration of artificial intelligence (AI) tools into healthcare has sparked a transformative shift, driving significant advancements in clinical decision-making, data analysis, and the overall efficiency of medical processes. AI's capacity to process vast amounts of data, detect patterns, and provide predictive insights holds the promise of improving diagnostic accuracy, personalizing treatment plans, and enhancing patient outcomes. In addition, AI tools can support healthcare professionals in high-pressure environments, reducing the burden of routine tasks and allowing them to focus more on complex patient care. However, as the adoption of AI continues to expand within healthcare settings, questions arise regarding its potential consequences on healthcare workers' professional practices, cognitive functions, and skill retention (Bekbolatova et al., 2024; Karalis, 2024).

Despite the numerous benefits AI offers, there is growing concern about its impact on the decision-making autonomy of healthcare professionals and their ability to maintain essential hands-on clinical skills. With the increased reliance on AI systems for diagnosing diseases, recommending treatment plans, and managing patient care, some worry that healthcare workers may gradually lose their ability to think critically and make independent decisions (Adegbesan et al., 2024). Furthermore, the reduction of direct involvement in routine procedures due to automation may lead to skill degradation, particularly in areas requiring manual dexterity or clinical judgment. This issue is especially pertinent given the fast-paced, high-stakes nature of healthcare, where the ability to

respond quickly and accurately is crucial (Rashid & Rötting, 2021).

The potential erosion of healthcare professionals' cognitive engagement, alongside the possible decline in manual skills, raises concerns about the future of clinical practice (Lovett et al., 2023). This study aims to address these concerns by exploring the broader implications of AI integration on healthcare practice. Specifically, it focuses on how AI tools might reduce cognitive load, enabling more focused and effective decision-making. At the same time, it considers the risks of over-reliance on technology, including the potential for healthcare professionals to become less engaged in active problem-solving, leading to a gradual erosion of critical thinking and independent judgment.

In examining the role of AI in clinical settings, this research also investigates how these tools influence professional development (Fazakarley et al., 2023). While AI offers opportunities for healthcare workers to acquire new competencies, such as data interpretation and technology management, there is a need to ensure that the human element of care remains intact (Hazarika, 2020). Maintaining professional skills, including communication, empathy, and technical expertise, is fundamental to providing quality healthcare. Therefore, this study aims to strike a balance between leveraging AI's capabilities to augment medical practice and safeguarding the essential skills that healthcare professionals rely on (Pavuluri et al., 2024).

Ultimately, the research seeks to uncover the delicate balance between the benefits of AI tools and the potential risks they pose to healthcare workers' cognitive and professional growth. By understanding how AI affects cognitive load, decision-making autonomy, and skill retention, healthcare institutions can develop strategies that enhance the use of AI without compromising the essential elements of professional practice that is critical to delivering high-quality patient care. The research addresses the following questions:

(i) How does exposure to AI tools influence healthcare professionals' ability to make clinical decisions and retain key clinical skills?
(ii) What are healthcare professionals' perceptions of the impact of AI tools on their professional development and mental capabilities?
(iii) To what extent do healthcare professionals rely on AI tools for critical decisions and data processing?
(iv) What concerns exist regarding the long-term effects of AI tools on healthcare staff's autonomy and practical skills?
(v) Are there significant differences in the perceptions of AI tools based on gender, years of experience, or frequency of exposure?

In addition, the research aims to accomplish the following objectives:

(i) To assess the frequency of exposure to AI tools in healthcare settings and its correlation with professionals' clinical decision-making and cognitive workload.
(ii) To evaluate the impact of AI tools on healthcare staff's ability to process medical data efficiently and their perceived empowerment in clinical decision-making.
(iii) To explore concerns about the reduction of hands-on clinical skills and the potential negative impacts of AI on healthcare practice.
(iv) To identify demographic and experiential factors (e.g., gender, years of experience, exposure frequency) that influence healthcare professionals' perceptions of AI tools in clinical practice.
(v) To contribute to the understanding of AI's role in enhancing or limiting healthcare staff's professional development and the implications for the future of clinical practice.

This research aims to provide insights into the impact of AI on healthcare professionals' cognitive functions, decision-making skills, and professional autonomy. It also seeks to explore how AI can be integrated into healthcare without undermining the essential skills and judgment that are critical to the profession. In light of this, the research problem revolves around the increasing prevalence of AI tools in healthcare and the questions they raise about their impact on healthcare professionals' mental and professional abilities. As AI becomes more widespread, concerns have emerged regarding the potential for healthcare workers to become dependent on these technologies, which could diminish their cognitive involvement in decision-making and erode their hands-on skills. Despite the known benefits of AI, such as reducing human error and improving efficiency, it is crucial to further investigate its potential negative effects on professional autonomy and cognitive sharpness.

To address these concerns, this study aims to fill a critical gap in understanding the effects of AI tools on healthcare professionals. It is essential to examine how AI can complement, rather than replace, the expertise and judgment of medical professionals. By exploring the relationship between AI and healthcare workers' cognitive and professional abilities, the study seeks to inform policies and strategies that ensure AI enhances healthcare practices while safeguarding the skills and autonomy of medical staff. Therefore, this research not only contributes to understanding AI's role in healthcare but also helps guide its responsible implementation in clinical settings.

2. Theoretical Framework and Literature Review

The integration of AI into healthcare is reshaping the profession by offering potential advancements in diagnostics, decision support, and automation of routine tasks. However, its increasing prevalence raises significant questions about its impact on the cognitive and professional development of healthcare workers, particularly doctors and nurses (Khan Rony et al., 2024). While AI tools are praised for enhancing efficiency and improving clinical outcomes, concerns exist regarding their potential influence on cognitive load, professional autonomy, and skill retention. This literature review aims to examine the theoretical frameworks that address these complex dynamics between AI applications and healthcare professionals' abilities (Ahmad et al., 2023).

Cognitive load theory (CLT) is central to understanding the mental effort involved when healthcare workers engage with AI tools. AI systems, designed to automate tasks such as diagnostic imaging and data analysis, have the potential to reduce cognitive load by enabling professionals to focus on more complex clinical decisions (Fox & Rey, 2024). However, over-reliance on AI could result in diminished cognitive engagement, leading to a decline in critical thinking and problem-solving skills. This interplay between cognitive load and AI's influence on mental effort is crucial for understanding its impact on healthcare professionals' cognitive functions (Zhai et al., 2024). In the context of the study results, many healthcare professionals reported feeling more confident in their decision-making, suggesting that AI tools can indeed alleviate cognitive load. However, the long-term consequences of reduced engagement with critical thinking warrant further exploration (Çela et al., 2024).

The theory of professional autonomy provides insight into the potential impact of AI tools on healthcare workers' independence and judgment (Salvatore et al., 2018; Mrayyan et al., 2024). While AI systems offer efficiency and accuracy, they may inadvertently undermine professionals' sense of autonomy. By offering tailored recommendations and solutions, AI tools could reduce the space for independent decision-making, thus diminishing healthcare workers' confidence in their judgment. The results of this study echo this concern, as some participants expressed unease about the potential erosion of autonomy due to AI's growing influence on clinical decision-making (Zhai et al., 2024).

The integration of AI into healthcare influences healthcare workers' professional practices, with theories like human–technology interaction exploring how AI tools shape workflows and decision-making (Masudin et al., 2024). Healthcare workers show mixed reactions, appreciating AI's assistance with data while fearing the loss of hands-on skills (Fritsch et al., 2024). Skill acquisition theory suggests that while AI automates routine tasks, it also creates opportunities for developing new competencies in technology management and data interpretation (Taie, 2014; Mikalef et al., 2023).

The technology acceptance model and self-determination theory assess healthcare workers' engagement with AI, emphasizing factors such as ease of use, usefulness, and intrinsic motivation (Tao et al., 2023; Williamson & Prybutok, 2024). While AI can streamline administrative tasks, it must preserve professional autonomy and decision-making capabilities. AI's impact on decision-making and patient outcomes is mostly positive, but concerns about reduced cognitive engagement and skill erosion persist (Khalifa & Albadawy, 2024; Bekbolatova et al., 2024).

In Oman, AI integration in healthcare and medical education is in its early stages but shows great potential. Al Hadithy et al. (2023) found that although medical students supported AI in curricula, most had limited exposure and expressed concerns about ethics and employment impacts. Al Riyami (2024) highlighted barriers such as high costs and infrastructure gaps in Omani institutions, although AI tools such as DataRobot improved research efficiency. Varnosfaderani and Forouzanfar (2024) emphasized AI's role in clinical decision-making, medical imaging, and patient monitoring while addressing ethical issues like data privacy.

Ariffin et al. (2024) identified key areas for sustainable healthcare management in Oman, such as waste management and public health initiatives, which align with the country's Health Vision 2050. In parallel, El-Khoury & Albarashdi (2024) examined data protection laws in Oman and its neighboring countries, highlighting the strong privacy frameworks in place and the growing need for anonymization technologies. The successful integration of AI into Oman's healthcare system will rely on strengthening curricula, investing in infrastructure, and fostering interdisciplinary collaboration. As AI continues to advance healthcare by enhancing efficiency, it is crucial to address its impact on cognitive load, professional autonomy, and skill development (Pavuluri et al., 2024). Table 1 illustrates the relationship between AI applications and healthcare professionals' cognitive and professional abilities. The integration of theoretical frameworks helps provide a comprehensive understanding of how AI influences cognitive and professional capabilities, underscoring the importance of maintaining a balance between preserving skills and autonomy while embracing technological progress (Mashabab et al., 2024).

Table 1. Relationship between artificial intelligence (AI) applications and healthcare professionals' cognitive and professional abilities

Independent variable (AI applications/tools)	Dependent variable (cognitive and professional abilities)
AI tools for diagnostics: The use of AI applications in diagnostic processes, such as analyzing medical images, interpreting laboratory results, or predicting patient outcomes, which can assist or replace traditional diagnostic methods	Cognitive function and critical thinking: The ability of healthcare professionals (doctors and nurses) to engage in critical thinking, problem-solving, and independent judgment, particularly in complex or emergency situations. The potential reduction in cognitive engagement due to over-reliance on AI tools is a concern
AI-powered decision support systems: Systems that provide recommendations or support for decision-making in clinical settings, such as treatment plans, medication suggestions, or patient management strategies, based on AI algorithms	Professional autonomy: The extent to which healthcare professionals feel empowered to make decisions independently, without heavy reliance on AI tools. This includes confidence in decision-making and the freedom to practice autonomously. The integration of AI tools may reduce autonomy by providing pre-determined solutions, leading to concerns about diminished independence
Automation of routine tasks: The use of AI for automating repetitive tasks such as patient record management, scheduling, or routine medical procedures, which reduces the cognitive load on healthcare professionals	Skill retention and development: The maintenance and enhancement of professional skills, such as medical knowledge, manual dexterity, and patient interaction skills. While AI can reduce cognitive load, it may also lead to skill degradation if healthcare professionals become overly reliant on automation for routine tasks. In addition, AI could foster new competencies in technology management and data interpretation

Source: Developed by the author.

3. Methodology

3.1. Research Design

The study employed a descriptive-analytical methodology with a quantitative approach, utilizing a survey-based strategy to gather primary data from healthcare professionals, specifically doctors and nurses (Smith & Hasan, 2020). The survey incorporated closed-ended questions, Likert-scale items, and open-ended questions to capture diverse perspectives. The questionnaire, developed in consultation with experts in healthcare, AI, and research methodology, was divided into four sections: demographic information, AI exposure frequency, clinical decision-making impact, and professional development (Baburajan et al., 2022).

To investigate the effects of AI tools on clinical decision-making, skills retention, and professional development (Khosravi et al., 2024), the survey presented participants with a series of statements about their experiences with AI tools. Respondents rated their level of agreement on a five-point Likert scale, ranging from "Strongly disagree" to "Strongly agree," allowing for a comprehensive assessment of their interactions with AI in clinical contexts.

The survey was distributed through Google Forms and shared through the Ministry of Health networks on WhatsApp. Participation was voluntary, with no personal information requested. Participants provided informed consent and could withdraw at any time.

3.2. Sample Population

Given the unknown population in Oman, the district of North A'Sharqiyah and Muscat, the researchers opted to distribute the survey electronically. The sample comprised healthcare professionals with varying levels of experience and exposure to AI tools in clinical settings, including doctors, nurses, and medical technicians. Demographic data such as gender, years of experience, and the frequency of AI exposure were collected to facilitate a deeper analysis of how these factors influence perceptions of AI's role in healthcare. Among the 164 respondents, 27% were male, and 73% were female. All participants worked in the governmental healthcare sector. Regarding professional experience, 13% had 1–5 years of experience, 13.6% had 6–10 years, and the majority (63%) had over 10 years. The sample distribution by profession included 32.1% doctors, 58% nurses, and 9.9% medical technicians.

3.3. Data Analysis

Data were analyzed using both descriptive and inferential statistics. Descriptive statistics provided a summary of the frequency of responses for each question, such as the percentage of respondents in each category for the Likert scale items. Inferential statistics, including independent samples *t*-tests and Levene's test for homogeneity of variances, were employed to assess differences in responses based on factors such as sex, years of experience, and frequency of exposure to AI tools. The independent samples *t*-tests were used to compare perceptions of AI tools between different groups, identifying significant differences in areas such as confidence in clinical decision-making, AI's impact on clinical skills, and the role of AI in professional development. Levene's test

for homogeneity of variances was conducted to check for equal variances across groups. A significant result ($p \leq 0.05$) indicated unequal variances, suggesting that different groups had inconsistent views on specific aspects of AI in healthcare.

3.4. Voluntary Participation

Participation in the study was voluntary, with the option to withdraw at any time without penalty. Participants were informed about the study's nature, the anonymity of their responses, and their right to withdraw. The research aims to explore the impact of AI tools on healthcare professionals' cognitive functions, decision-making, professional autonomy, and skill retention. Using a literature review and survey methodology, the study examined the relationship between AI tool exposure and professional development outcomes in healthcare.

4. Results

This section presents the results through findings from descriptive analysis and several major statistical tests. Table 2 demonstrates that the frequency of exposure to AI tools among healthcare staff varies, with a significant portion using them daily (49.4%). Smaller percentages reported using AI tools weekly (14.8%) or rarely (18.5%), while 9.9% had never used them. This variation in exposure reflects differing levels of engagement with AI in clinical practice. In terms of impact, most respondents agreed that AI tools reduce cognitive load in decision-making (59.2% agree or strongly agree), and 59.3% believed that AI enhances their ability to think critically and solve problems in complex situations. In addition, a substantial number of healthcare workers (58.6%) reported that they or their colleagues rely on AI tools for important clinical decisions.

AI tools were perceived as valuable in helping healthcare staff process and interpret medical data more efficiently. Table 3 shows a significant portion of respondents (67.9%) either agreed or strongly agreed that AI tools enhance their ability to analyze medical data. However, 8.7% strongly disagreed or disagreed with this statement, indicating that some healthcare workers may not fully experience the advantages of AI in data processing. When it came to clinical decision-making, 19.8% of respondents agreed that AI empowers them to make better decisions, while a notable 45.7% remained neutral, suggesting that many healthcare professionals may be unsure of AI's impact on their decision-making.

Regarding clinical skills retention, 61.8% of respondents agreed or strongly agreed that AI tools support the retention of key clinical skills, such as diagnostic ability and patient management. However, 14.8% of healthcare workers felt neutral or disagreed with this statement, reflecting some skepticism about AI's role in preserving essential skills. On the other hand, 49.2% of healthcare workers believed that AI tools reduce hands-on clinical skills, such as performing physical examinations and surgeries. While 16.0% strongly agreed, 51.3% remained neutral or disagreed, highlighting the complexity of balancing AI use with maintaining practical clinical capabilities.

AI tools were noted as regarded as helping healthcare staff process and interpret medical data more efficiently. As shown in Table 3, a significant portion of respondents (67.9%) either agreed or strongly agreed that AI enhances their ability to analyze medical data. However, 8.7% strongly disagreed or disagreed with this statement, indicating that some healthcare workers may not fully experience the advantages of AI in data processing. When it came to clinical decision-making, 19.8% of respondents agreed that AI empowers them to make better decisions, while a notable 45.7% remained neutral, suggesting that many healthcare

Table 2. Frequency of exposure to artificial intelligence (AI) tools

Exposure to AI tools		**AI tools reduce the cognitive load associated with decision-making in clinical practice**	
Type	**Percentage**	**Type**	**Percentage**
Never	9.9	Strongly disagree	8.6
Rarely	18.5	Disagree	8.6
Daily	49.4	Neutral	23.5
Weekly	14.8	Agree	37.0
Monthly	7.4	Strongly agree	22.2
Total	100	Total	100.0
AI tools enhance healthcare staff's ability to think critically and solve problems in complex clinical situations		**My colleagues rely on AI tools to make important clinical decisions**	
Type	**Percentage**	**Type**	**Percentage**
Strongly disagree	7.4	Strongly disagree	4.9
Disagree	3.7	Disagree	13.6
Neutral	16.0	Neutral	22.2
Agree	54.3	Agree	45.7
Strongly agree	18.5	Strongly agree	13.6
Total	100.0	Total	100.0

Source: Developed by the author.

Table 3. Perceived impact of artificial intelligence (AI) tools on clinical decision-making

AI tools help healthcare staff process and interpret medical data more efficiently		**I feel that AI tools empower me to make better clinical decisions**	
Type	**Percentage**	**Type**	**Percentage**
Strongly disagree	6.2	Strongly disagree	7.4
Disagree	2.5	Disagree	27.2
Neutral	23.5	Neutral	45.7
Agree	45.7	Agree	19.8
Strongly agree	22.2	Strongly agree	100.0
Total	100.0	Total	7.4
The use of AI tools supports the retention of key clinical skills, such as diagnostic ability and patient management		**The use of AI tools reduces healthcare staff's hands-on clinical skills (e.g., performing physical examinations and surgeries)**	
Type	**Percentage**	**Type**	**Percentage**
Strongly disagree	6.2	Strongly disagree	7.4
Disagree	2.5	Disagree	27.2
Neutral	23.5	Neutral	45.7
Agree	45.7	Agree	19.8
Strongly agree	22.2	Strongly agree	100.0
Total	100.0	Total	7.4

Source: Developed by the author.

professionals may be unsure of AI's impact on their decision-making.

Table 4 presents healthcare professionals' varied perspectives on the impact of AI tools in clinical practice. A significant portion of respondents (37%) agreed that AI tools reduce the need for traditional manual practices in healthcare, with 14.8% strongly agreed. However, concerns about the potential negative impact of AI on the development of hands-on skills remained, as 29.6% agreed and 22.2% strongly agreed that AI could hinder the development of skills related to patient care. Despite this, the majority of respondents (49.4%) believed that AI positively influences their professional development and cognitive capabilities, with only 3.7% strongly disagreed with this statement. These findings suggest that while AI was viewed as a helpful tool in improving efficiency, there are ongoing concerns regarding its long-term effects on skill retention and independent decision-making.

Table 5 presents responses regarding concerns about the long-term effects of AI tools on healthcare

Table 4. Perceived impact of artificial intelligence (AI) tools on medical practices

The use of AI tools results in a reduction of the need for traditional or manual medical practices in healthcare work		**I believe that AI tools can negatively impact the development of new skills, particularly those related to hands-on patient care**	
Type	**Percentage**	**Type**	**Percentage**
Strongly disagree	8.6	Strongly disagree	4.9
Disagree	12.3	Disagree	11.1
Neutral	27.2	Neutral	32.1
Agree	37.0	Agree	29.6
Strongly agree	14.8	Strongly agree	22.2
Total	100.0	Total	100
I have concerns about the long-term effects of using AI tools on healthcare staff's ability to make independent decisions and retain professional skills		**AI positively impacts my overall professional development and mental capabilities**	
Type	**Percentage**	**Type**	**Percentage**
Strongly disagree	3.7	Strongly disagree	3.7
Disagree	12.3	Disagree	12.3
Neutral	21.0	Neutral	21.0
Agree	49.4	Agree	49.4
Strongly agree	13.6	Strongly agree	13.6
Total	100.0	Total	100.0

Sources: Developed by author.

Table 5. Concerns and impact of artificial intelligence (AI) tools on healthcare practices

I have concerns about the long-term effects of using AI tools on healthcare staff's ability to make independent decisions and retain professional skill		**Use of AI tools negatively impacts the professional practices of healthcare**	
Type	**Percentage**	**Type**	**Percentage**
Disagree	0	Disagree	3.7
Strongly disagree	9.9	Strongly disagree	23.5
Neutral	25.9	Neutral	32.1
Agree	44.4	Agree	30.9
Strongly agree	19.8	Strongly agree	9.9
Total	100.0	Total	100.0

Source: Developed by the author.

staff's ability to make independent decisions and retain professional skills, as well as the impact of AI on professional practices. A majority of respondents (44.4%) agreed that they have concerns about the long-term effects of AI tools on healthcare staff's independent decision-making and skill retention, while 25.9% were neutral. On the other hand, when asked whether the use of AI tools negatively impacts professional practice, most respondents disagreed (23.5%), while a significant portion remained neutral (32.1%). These findings suggest that while healthcare professionals were concerned about the potential long-term effects of AI on decision-making and skills retention, the general view did not indicate a strong negative impact on professional practices.

For the statistical analysis, the results of significant differences are outlined as follows: when considering sex (male and female), the use of AI tools was associated with a reduction in the need for traditional or manual medical practices in healthcare work. The analysis revealed $F = 7.604$, p=0.007, indicating a significant difference between the groups. This suggests that opinions on this topic varied significantly across groups, requiring further investigation. In addition, the results showed significant differences ($p \leq 0.05$) in several areas when examining years of experience in relation to AI tools in healthcare. A key finding is that AI tools helped healthcare staff process and interpret medical data more efficiently, with a p-value of 0.000, demonstrating a clear advantage in data handling. Furthermore, healthcare workers reported feeling more confident in making clinical decisions when AI tools were used, with a significant p-value of 0.001, underscoring the positive impact of these tools on decision-making confidence.

Moreover, AI tools provided recommendations that influenced clinical decision-making, as evidenced by a p-value of 0.000. This suggests that AI plays a crucial role in shaping decisions made by healthcare professionals. In addition, AI tools empowered healthcare workers to make better clinical decisions, further supported by a p-value of 0.000. This empowerment is particularly valuable in complex clinical situations.

Interestingly, the use of AI tools was also linked to the retention of key clinical skills, such as diagnostic ability and patient management (p=0.000), indicating that these tools can complement traditional skills. However, concerns were raised about AI's potential to reduce healthcare staff's hands-on clinical skills, such as performing physical examinations and surgeries, with a p-value of 0.001 suggesting a negative impact on practical skills. Furthermore, AI tools contributed to a reduction in the need for traditional or manual medical practices (p=0.000), reflecting the shift toward more automated approaches. However, some workers believed that AI tools could negatively affect the development of new skills, particularly those related to hands-on patient care, as shown by a p-value of 0.000.

Regarding professional development, AI tools had a positive impact on overall development and mental capabilities (p=0.000). However, concerns about the long-term effects of AI on the ability to make independent decisions and retain professional skills were noted (p=0.004). Some participants also expressed the belief that AI tools might negatively affect professional practice in healthcare (p=0.000), emphasizing the need for careful consideration of their role. Finally, AI tools enhanced healthcare staff's ability to think critically and solve problems in complex clinical situations, as indicated by a p-value of 0.000, highlighting the cognitive benefits of these technologies.

The results highlight significant differences ($p \leq 0.05$) in several aspects of healthcare roles in relation to the use of AI tools. One area of importance is confidence in clinical decisions. Healthcare workers reported greater confidence in their decision-making abilities when AI tools were used, as indicated by a p-value of 0.003. This confidence is further supported by the fact that AI tools provide recommendations that influence clinical decisions (p=0.028), suggesting that these tools play an active role in shaping the decision-making process.

AI tools also appeared to empower healthcare workers by helping them make better clinical decisions, with a p-value of 0.011 reinforcing this positive impact. However, despite these benefits, concerns were raised that the use of AI tools could reduce healthcare workers' hands-on clinical skills, such as performing physical examinations or surgeries (p=0.008). This reduction in practical skills could be a potential drawback of relying on AI in healthcare settings. On the other hand, AI tools were also seen as contributing positively to professional development and enhancing mental capabilities (p=0.002), suggesting that they may support growth in other important aspects of healthcare roles. Yet, there are concerns about the long-term effects of AI use, particularly regarding its impact on healthcare workers' ability to make independent decisions and retain essential skills (p=0.007). This underscores the need for a balanced approach to integrating AI into healthcare to ensure that professionals maintain their core competencies while benefiting from technological advancements.

The results showed significant differences ($p \leq 0.05$) in several areas related to the frequency of exposure to AI tools in healthcare. One key finding was that the use of AI tools reduced the need for traditional or manual medical practices in healthcare work, with a p-value of 0.001, indicating that AI is increasingly

replacing more conventional methods. This shift, however, raised concerns, as some participants believed that AI tools could negatively impact the development of new skills, particularly those related to hands-on patient care (p=0.000), suggesting that over-reliance on AI might hinder the growth of practical clinical skills.

On a more positive note, AI was perceived to have a positive impact on overall professional development and mental capabilities (p=0.001), pointing to the benefits of AI in enhancing cognitive functions and professional growth. Despite these advantages, concerns were raised about the long-term effects of AI tools on healthcare staff's ability to make independent decisions and retain professional skills, as reflected by a p-value of 0.016, suggesting a potential risk of dependency on AI over time. Further concerns were expressed regarding the negative impact of AI tools on the professional practice of healthcare (p=0.000), indicating that some professionals fear AI could undermine the quality of care or professional standards. In addition, AI tools were seen to reduce the cognitive load associated with decision-making in clinical practice (p=0.000), making decision-making more efficient but possibly at the cost of diminishing critical thinking skills. Finally, there was a significant concern that AI tools could limit healthcare staff's ability to make independent decisions in clinical practice (p=0.000), suggesting that over-exposure to AI may reduce healthcare workers' autonomy in clinical settings.

The independent samples t-test results demonstrated significant differences in perceptions of AI tools in clinical practice. There was a noticeable variation in how much colleagues rely on AI tools for critical decisions (p=0.003), with one group reporting less reliance. Similarly, one group viewed AI tools as less efficient in processing medical data (p=0.010), reflecting a more negative perspective on their usefulness. Confidence in decision-making also varied significantly (p=0.002), with one group feeling less confident when using AI tools. The influence of AI on clinical decisions differed between groups, with one group perceiving a stronger impact ($p < 0.001$). A similar trend was observed in the perceived empowerment from AI tools in making better decisions (p=0.002), with one group feeling less empowered. There was also disagreement regarding whether AI tools helped retain critical clinical skills (p=0.002), with one group expressing more skepticism. AI's effect on reducing hands-on skills, such as physical examinations and surgeries, was perceived more negatively by one group (p=0.016). Finally, concerns about AI's long-term effects on decision-making and skill retention were more pronounced in one group ($p = 0.003$). These findings suggest varying experiences and perceptions of AI's role in clinical practice, indicating areas that may require further exploration to address concerns and clarify AI's impact on healthcare.

The test of homogeneity of variances (Levene's test) assessed whether different groups had similar variances in their responses. A significant result ($p \leq 0.05$) indicates unequal variances, challenging the assumption of homogeneity required for tests like analysis of variance. Several significant differences were found in perceptions of AI tools in clinical practice. For example, AI tools' ability to help healthcare staff process medical data efficiently showed significant variation (Levene statistic = 6.172, p=0.000), indicating differing levels of consistency in responses across groups. Similarly, the perception of AI tools limiting healthcare staff's independence in decision-making also had significant variability (Levene statistic = 10.053, p=0.000), suggesting inconsistency across groups. In addition, perceptions of empowerment through AI tools (Levene statistic = 3.046, p=0.022) and the retention of key clinical skills (Levene statistic = 2.498, p=0.050) revealed significant variance, showing inconsistent views on AI's role in these areas. The impact of AI tools on hands-on clinical skills (Levene statistic = 13.665, p=0.000) and the need for traditional medical practices (Levene statistic = 6.118, p=0.000) also demonstrated substantial differences across groups. Furthermore, concerns about AI's impact on skill development and professional practices (Levene statistics = 6.549 and 6.870, respectively; both p=0.000) highlighted variability in opinions. Finally, the perception that AI tools reduce cognitive load in decision-making (Levene statistic = 5.289, p=0.001) showed differing views among groups. These findings suggest significant differences in how groups perceive the impact of AI tools in clinical practice, highlighting varied experiences and opinions that warrant further investigation.

5. Discussion

This study explores the increasing integration of AI tools into clinical practices, affecting healthcare professionals' cognitive workload, decision-making, and professional development. The results are consistent with existing literature that emphasizes AI's potential to enhance healthcare by reducing cognitive load and increasing efficiency (Buntinx et al., 2020; Jha et al., 2020). However, concerns have emerged regarding AI's impact on hands-on clinical skills and independent decision-making, which are crucial for healthcare professionals' long-term autonomy.

A key finding is that 59.2% of healthcare professionals believe AI reduces cognitive load. This aligns with studies indicating that AI's ability to

process large datasets enables clinicians to focus on higher-level tasks (Amir et al., 2022). Furthermore, 59.3% of respondents reported enhanced critical thinking and problem-solving, supporting the CLT, which asserts that reducing extraneous cognitive load through technology improves decision-making (Sweller, 2011). This positive perception reinforces the idea that AI complements human expertise in healthcare rather than replacing it.

However, concerns about AI undermining hands-on clinical skills, particularly in areas such as physical examinations and surgeries (49.2%), were raised. This is consistent with the concept of "skill degradation," where over-reliance on technology may hinder the development of manual and diagnostic skills (Mann & Stokes, 2019). Literature on automation advocates for a hybrid model, where AI assists rather than replaces human capabilities, ensuring sustainable healthcare development (Davenport & Kalakota, 2019).

The study also reveals significant variation in responses based on demographic factors such as years of experience and gender. More experienced healthcare professionals tend to view AI as a supportive tool, while those newer to the field are more dependent on AI for guidance (Brock et al., 2021). This highlights the need for tailored AI training and implementation strategies to address different levels of expertise and familiarity with technology. In addition, 44.4% of respondents expressed concerns about AI limiting independent decision-making, fearing excessive reliance on AI. This is supported by the dependency on automation theory, which suggests that increasing AI integration may reduce professionals' ability to make decisions without technological assistance (Parasuraman & Riley, 1997). While AI can enhance decision-making, it is essential that healthcare professionals retain the cognitive and practical skills needed to navigate complex clinical environments.

AI in healthcare has garnered significant attention, with studies exploring both its advantages and drawbacks. A prominent theme in the literature is the enhancement of cognitive functions, such as decision-making and data interpretation. AI tools assist healthcare professionals by efficiently analyzing large datasets, thus reducing the cognitive load (Topol, 2019). This study's findings align with these themes, as respondents reported improvements in cognitive functions and critical thinking. However, balancing technology with human skills remains a challenge. Researchers such as Brynjolfsson and McAfee (2014) emphasize AI's dual nature – improving efficiency while potentially undermining traditional skills. The study's finding that AI could reduce hands-on clinical skills echoes these concerns, especially in fields like surgery that requires manual dexterity. Hybrid models combining AI with human expertise are recommended to preserve essential clinical skills (Davenport & Kalakota, 2019).

The study highlights the integration of AI tools into clinical practices, and specific examples of these tools can clarify their practical relevance. AI tools in healthcare, such as clinical decision support systems, machine learning algorithms for diagnosing medical conditions, and advanced systems like robot-assisted surgery and AI-driven data analytic platforms, enable healthcare professionals to analyze large datasets, offer evidence-based recommendations, and assist in surgeries. Some examples include:

(i) Clinical decision support systems: These tools assist in diagnosing medical conditions by analyzing patient data and offering recommendations. For example, IBM Watson Health helps diagnose cancer by analyzing extensive medical literature and patient records.
(ii) AI-driven data analytics: Platforms like Google Health's AI algorithms for interpreting medical imaging, such as radiology scans, enhance diagnostic accuracy by identifying patterns that are invisible to the human eye. This study suggests that AI tools like these significantly improve healthcare workers' ability to interpret complex data, leading to more accurate diagnoses and treatment plans.
(iii) Robot-assisted surgery: Systems such as Da Vinci Surgical Systems provide enhanced precision in complex procedures. While AI supports the technical aspects of surgery, it does not replace the surgeon's expertise but rather augments it to improve patient outcomes.

Including these examples allows the study to better illustrate the practical applications of AI tools in healthcare settings, demonstrating their tangible impact on cognitive workload and clinical outcomes.

In terms of professional development, AI is viewed as enhancing healthcare workers' cognitive capabilities and empowering them to solve complex problems. The theory of professional identity development suggests that AI support can bolster healthcare workers' professional confidence (Simmons et al., 2021). This study found that most healthcare professionals believe AI positively influences their professional development, supporting this theory.

However, concerns about AI's long-term effects on decision-making autonomy are well-documented. The concept of "human-in-the-loop" decision-making stresses the importance of maintaining human oversight in AI-driven processes (Gunkel, 2018). The findings of this study reflect these concerns, as participants believe that AI could restrict their ability to make independent clinical decisions.

In summary, the integration of AI in healthcare presents both opportunities and challenges. While the

study emphasizes AI's role in reducing cognitive load and enhancing professional development, concerns regarding the erosion of hands-on clinical skills and decision-making autonomy persist. These findings highlight the need for a balanced approach to AI adoption, ensuring it complements human expertise. Furthermore, future research should explore the long-term effects of AI on skill retention, decision-making autonomy, and the development of training programs to help healthcare professionals navigate technological advancements.

As AI tools continue to be integrated into healthcare, several ethical considerations must be addressed to ensure their responsible use, particularly regarding data privacy and equitable access. AI tools often require access to large datasets, including patient histories, test results, and imaging, raising significant privacy concerns. Maintaining the confidentiality of patient data is crucial, and AI tools such as IBM Watson Health and Google's diagnostic systems must comply with healthcare regulations such as HIPAA (Health Insurance Portability and Accountability Act) in the United States and GDPR (General Data Protection Regulation) in Europe to mitigate these risks. Healthcare institutions must prioritize data encryption, anonymization, and secure cloud storage, along with compliance with data protection laws. Transparency about how patient data is collected and used for AI purposes will foster trust between healthcare professionals, patients, and AI developers.

While AI has the potential to significantly improve healthcare delivery, its benefits may not be universally accessible. Factors such as geography, economic disparities, and healthcare infrastructure can limit access to AI-powered solutions. In low-resource areas, such as rural or underserved regions, AI tools may be unavailable due to high costs or lack of infrastructure, which could exacerbate health inequities. To ensure equitable access, global healthcare organizations and policymakers should advocate for affordable, open-source AI solutions that can be implemented across diverse healthcare environments. Training local healthcare workers to use these technologies effectively is also crucial. Collaboration between governments, NGOs, and AI developers can help create scalable solutions to ensure that AI benefits are accessible to all, regardless of income or location.

6. Conclusion

This study provides valuable insights into the growing role of AI tools in clinical practices, highlighting their positive impact on healthcare professionals' cognitive workload, decision-making, and professional development. The results indicate that AI significantly reduces cognitive load, allowing healthcare workers to handle complex tasks more efficiently and focus on higher-order decision-making and critical thinking. These benefits align with existing research suggesting that AI tools streamline processes, improve clinical outcomes, and enhance healthcare delivery by processing large datasets in real time.

However, concerns about AI's potential negative effects, particularly on hands-on clinical skills and independent decision-making, have emerged. As AI becomes more integrated into healthcare workflows, there is a risk of diminishing manual and diagnostic capabilities, which are crucial for long-term professional effectiveness and patient care. This concern is particularly evident in fields such as surgery and physical examinations, where direct patient interaction is essential.

The study underscores the importance of adopting AI in a manner that complements human expertise rather than replacing it. A balanced integration of AI should enhance healthcare professionals' roles while preserving core competencies for independent decision-making and direct patient care. Achieving this requires designing AI systems and training programs that promote a collaborative relationship between humans and machines, ensuring that healthcare workers can maximize the benefits of AI without sacrificing their autonomy or clinical competence.

Furthermore, the findings align with theoretical frameworks like CLT and professional identity development, demonstrating AI's potential to enhance cognitive functions and decision-making abilities. However, the study also raises concerns about skill degradation, echoing the theory of dependency on automation. The integration of AI into healthcare has profound societal implications. While AI can improve healthcare delivery by reducing cognitive load and supporting decision-making, it is essential to ensure that it does not compromise hands-on care. A balanced approach will help advance healthcare efficiency while preserving essential human skills, ultimately benefiting both patients and society.

For healthcare professionals, AI offers valuable support in decision-making, data analysis, and critical thinking, potentially enhancing professional development. However, there is a risk of over-reliance on AI, which could undermine autonomy and reduce hands-on clinical skills. Training programs should therefore focus on integrating AI while preserving core competencies, ensuring that professionals remain capable of independent decision-making and maintaining practical skills. From an organizational standpoint, healthcare institutions must implement AI in ways that complement human expertise, offering tailored training for staff based on their experience and fostering collaboration between AI and human

practitioners. In addition, AI integration should not compromise decision-making autonomy or clinical skills.

This study's limitations include its reliance on self-reported data, which may be biased, and its focus on a specific set of AI tools and healthcare professionals, limiting generalizability. Future research should examine AI's long-term effects on skill retention and professional development in various healthcare settings. In addition, studies on AI's impact on patient outcomes and the development of comprehensive AI training programs are needed for effective integration into clinical practice.

The following are several recommendations for AI training programs:

(i) Hybrid training model: AI training should complement traditional medical education. Healthcare professionals should be trained to use AI tools effectively while maintaining clinical judgment, promoting decision-making that integrates AI recommendations without over-relying on technology.

(ii) Scenario-based training: Incorporate AI into scenario-based training programs that simulate real clinical situations. This will help professionals integrate AI with traditional practices and build confidence in making independent decisions when AI may be less reliable.

(iii) Regular skills refresher courses: Healthcare professionals should participate in refresher courses to maintain core competencies, such as physical examinations and diagnostics. This ensures that AI complements, rather than replaces, essential hands-on skills.

(iv) Focus on ethical use of AI: Training should cover the ethical use of AI, including its limitations, human oversight, and potential biases. Healthcare workers must learn to critically assess AI recommendations and understand its implications across patient populations.

(v) Differentiated training based on experience: Training should be tailored to the professional's experience level. For instance, senior doctors may focus on advanced AI applications, while newcomers may learn foundational concepts and the daily use of AI tools.

(vi) Continuous feedback and evaluation: AI training should be ongoing, with regular feedback on professionals' use of AI in clinical settings. Performance evaluations should track the impact of AI on practice and identify areas for improvement.

By implementing these recommendations, healthcare organizations can ensure AI supports professionals without undermining their clinical skills or autonomy, ultimately enhancing healthcare delivery and professional development.

Acknowledgment

The author would like to extend his gratitude to MBA student Mosa Alhusaini for facilitating the distribution of the survey.

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