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The Fear of Artificial Intelligence among Healthcare Workers: A Narrative Review

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Received 19/10/2022; revised 7/12/2022; accepted 18/12/2022

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Abstract

Introduction: The rapid integration of artificial intelligence (AI) in healthcare has generated both opportunities and apprehensions among healthcare workers. While AI promises to enhance patient care and operational efficiency, it also raises concerns about job displacement, ethical dilemmas, and the depersonalization of care. This systematic review aims to synthesize evidence from interventional studies and clinical trials to understand the efficacy of various interventions in mitigating healthcare workers' fears of AI, thereby facilitating smoother integration of these technologies into clinical practice.

Methods: The review focused on interventional studies and clinical trials conducted between 2007 and 2022, involving healthcare workers' perceptions and attitudes towards AI. Databases such as PubMed, Scopus, Web of Science, and PsycINFO were searched using terms related to AI, healthcare workers, and fear. Studies were included if they involved interventional approaches to address apprehensions about AI, reported risk ratios, and confidence intervals. The quality of included studies was assessed, and data on intervention effectiveness were extracted and analyzed.

Results: Six studies met the inclusion criteria, demonstrating a range of interventions from educational programs to VR simulations. The effectiveness of these interventions varied, with educational programs showing up to a 50% increase in positive attitudes towards AI (risk ratio 1.5, 95% CI, 1.2 to 1.9). AI decision-support systems in diagnostics showed a 75% effectiveness in increasing confidence levels (95% CI, 65% to 85%). Peer-led forums and VR experiences also significantly reduced AI-related fears, though to varying degrees.

Conclusions: This review highlights that targeted interventions, particularly those offering practical exposure and comprehensive education about AI, can significantly reduce healthcare workers' fears. However, the effectiveness of these interventions underscores the importance of multifaceted approaches that combine ethical guidance with hands-on experience.

Keywords: Artificial Intelligence, Healthcare Workers, Fear, Intervention, Attitude, Clinical Trials

Introduction

The emergence of artificial intelligence (AI) in healthcare has revolutionized the way medical services are delivered, offering unprecedented opportunities for improving patient care, diagnostic accuracy, and treatment outcomes. Despite these advancements, there is a growing body of evidence indicating a significant level of fear and apprehension among healthcare workers regarding the integration of AI into their professional practices. Studies have shown that up to 70% of healthcare professionals express concerns about the reliability of AI and its implications for patient safety [1]. Additionally, a survey found that 65% of nurses and 58% of physicians worry about being replaced by AI technologies in the future [2], highlighting the existential anxiety experienced by healthcare workers in the face of rapidly evolving technological landscapes.

This fear is not unfounded, as the integration of AI into healthcare settings can lead to significant changes in workflow, job roles, and required skill sets. Research indicates that nearly 50% of healthcare workers believe that AI will dramatically alter their job responsibilities within the next decade [3]. Furthermore, a substantial proportion of healthcare staff, approximately 40%, report receiving inadequate training on how to work alongside AI technologies [4], exacerbating feelings of unease and inadequacy. The lack of clear guidelines and ethical frameworks for AI use in medical practice has also been cited as a major concern by 60% of medical professionals [5], who fear the potential for malpractice and ethical violations. Moreover, the potential for AI to dehumanize patient care is a significant source of anxiety among healthcare providers. A recent study found that 55% of healthcare workers are concerned that increased reliance on AI could compromise the quality of patient-provider interactions [6]. This sentiment is echoed in patient populations, with over 60% of patients expressing a preference for human interaction in their care, even in an age dominated by technological solutions [7]. The apprehension towards AI is further compounded by data privacy and security concerns, with 75% of healthcare professionals worrying about the vulnerability of AI systems to data breaches and cyberattacks [8]. The cultural and organizational resistance to AI adoption in healthcare settings cannot be overlooked. Approximately 45% of healthcare administrators report significant resistance to AI integration within their organizations, often stemming from a lack of understanding and fear of change among staff [9]. This resistance is further fueled by concerns over job security, with 70% of administrative staff worried about the displacement of human workers by AI technologies [10]. Such statistics underscore the multifaceted nature of the apprehension surrounding AI in healthcare, encompassing not only practical and ethical considerations but also deeply rooted fears about the future of the medical profession.

Given the substantial impact of these fears on the adoption and effective use of AI in healthcare, it is imperative to conduct a thorough review of the literature to understand the origins, extent, and implications of these concerns. The aim of this review was to narratively synthesize evidence from the medical literature regarding the fear of artificial intelligence among healthcare workers, identifying key themes, and exploring potential strategies for addressing these concerns.

Methods

The methodology for this systematic review was meticulously designed to identify, assess, and synthesize all relevant literature concerning the fear of artificial intelligence among healthcare workers. The search strategy was developed with the objective of capturing a comprehensive range of studies that explored attitudes, perceptions, and concerns related to the integration of AI technologies in healthcare settings. The primary search terms used included "artificial intelligence," "healthcare workers," "fear," "attitude towards AI," "AI in healthcare," and

"perception of AI." These terms were used in various combinations and with appropriate Boolean operators to ensure a broad capture of relevant literature. The literature search was conducted across several electronic databases, including PubMed, Scopus, Web of Science, and PsycINFO, to ensure a wide coverage of medical, psychological, and interdisciplinary studies. The search was limited to documents published in the English language between 2007 and 2022, aligning with the inclusion criteria that focused on the most recent 15 years to capture the evolution of AI technologies and their perception in healthcare. This temporal restriction was chosen to reflect the rapid advancements in AI and its increasing relevance to the healthcare sector during this period.

Inclusion criteria for the review were strictly defined to ensure relevance and quality of the evidence. Only interventional studies that directly addressed the integration of AI into healthcare practices and measured healthcare workers' attitudes, fears, or perceptions were considered. The studies had to involve healthcare professionals, including doctors, nurses, and allied health workers, as participants. Reviews, opinion pieces, and non-empirical studies were excluded, as were studies focusing on AI applications outside the healthcare worker-patient interface, such as administrative tasks or non-clinical uses. Exclusion criteria were applied to omit studies that did not specifically address the fear of AI among healthcare workers, such as those focusing solely on the technical aspects of AI development without considering human factors. Studies published before 2007 were excluded to maintain the relevance of the review to current technology and practices. Additionally, studies that did not present original research, such as editorials, commentaries, and conference abstracts, were also excluded from the review to ensure a focus on empirical evidence.

The study selection process followed a structured approach. Initially, titles and abstracts were screened for relevance based on the predefined inclusion and exclusion criteria. This preliminary screening was conducted by two independent reviewers to minimize bias and ensure thoroughness. Following this initial screening, full texts of potentially relevant studies were obtained and assessed in detail for eligibility. Any discrepancies between reviewers regarding study inclusion were resolved through discussion or, if necessary, consultation with a third reviewer. Finally, the selected studies were subjected to a quality assessment and data extraction process. Information regarding the study design, sample size, healthcare professions represented, AI technologies evaluated, and key findings related to healthcare workers' fears and attitudes towards AI was systematically extracted and tabulated. This structured approach ensured that the review was comprehensive, transparent, and replicable, providing a solid foundation for synthesizing the current state of knowledge on the fear of AI among healthcare workers.

Results and discussion

The results of this systematic review, which focused on interventional studies and clinical trials examining the fear of artificial intelligence among healthcare workers, highlight a diverse range of interventions aimed at addressing apprehensions related to AI technologies in healthcare settings. Six studies, meeting the inclusion criteria, were analyzed to understand the effectiveness of various interventions on healthcare workers' perceptions and attitudes towards AI. The sample sizes of these studies varied significantly, ranging from 30 to over 200 participants, reflecting a wide spectrum of research contexts and populations within the healthcare sector. One interventional study utilized a comprehensive training program on AI technology, aimed at demystifying AI tools for clinicians. The program included hands-on sessions, case studies, and interactive discussions. Post-intervention assessments showed a significant improvement in participants' attitudes towards AI, with a risk ratio (RR) of 1.5 (95% CI, 1.2 to 1.9) indicating a 50% increase in positive attitudes towards AI adoption in clinical practices [11]. This suggests that educational interventions can effectively mitigate fears by enhancing understanding and familiarity with AI technologies. Another study focused on the integration of AI decision-support systems in diagnostic processes, comparing the diagnostic accuracy and confidence levels of healthcare workers with and without AI assistance. The intervention group, which used AI support, reported higher confidence in their diagnostic decisions and a reduced

fear of AI replacing their roles, with an effectiveness percentage of 75% (95% CI, 65% to 85%) [12]. This trial highlights the potential of AI to complement, rather than replace, the expertise of healthcare professionals. A different approach was taken in a study that implemented a peer-led discussion forum, enabling healthcare workers to share experiences, challenges, and strategies for integrating AI into their practice. The intervention aimed to build a supportive community around the use of AI. Post-intervention, there was a reported decrease in anxiety related to AI, with a risk ratio of 0.7 (95% CI, 0.5 to 0.9), indicating a 30% reduction in AI-related apprehensions among participants [13]. This underscores the importance of peer support and open dialogue in addressing the psychological dimensions of technological change.

An innovative intervention involved the use of virtual reality (VR) simulations to expose healthcare workers to future AI-enhanced healthcare environments. Participants experienced immersive scenarios where AI tools assisted in patient care, aiming to reduce fear through familiarity. The effectiveness of this intervention was notable, with a 60% improvement in participants' openness to AI integration in their work environment (95% CI, 50% to 70%) [14]. This study exemplifies the potential of using advanced technologies to facilitate positive attitudes towards AI. Contrastingly, a clinical trial employing a series of workshops focused on ethical considerations and the responsible use of AI in healthcare did not demonstrate a significant change in participants' fear levels, with a reported effectiveness of only 20% (95% CI, 10% to 30%) [15]. This indicates that while ethical education is crucial, it may not be sufficient on its own to alleviate fears without addressing practical concerns and demonstrating the benefits of AI in improving patient care.

Lastly, a study involving the introduction of AI-based diagnostic tools in a controlled setting, with subsequent feedback sessions to discuss experiences and concerns, reported mixed results. While some participants showed increased confidence in using AI tools, others remained skeptical about the technology's reliability and implications for their professional autonomy. The effectiveness of this intervention was quantified with a 40% improvement in attitudes towards AI (95% CI, 30% to 50%) [16], suggesting that hands-on experience with AI, coupled with open discussions, can partially mitigate fears but may not universally convince all healthcare workers of the technology's benefits. These studies collectively demonstrate that interventions designed to familiarize healthcare workers with AI, through education, hands-on experience, or peer discussions, can significantly impact their perceptions and attitudes. However, the effectiveness of these interventions varies, indicating that a multifaceted approach, addressing both practical and ethical concerns, is likely necessary to fully alleviate fears associated with AI in healthcare. The review's included studies highlight a range of intervention strategies, from educational programs and peer-led forums to immersive virtual reality (VR) experiences, each aiming to mitigate apprehensions towards AI in healthcare settings. The risk differences observed in these studies offer a nuanced understanding of the effectiveness of various interventions in changing healthcare workers' attitudes towards AI. The educational training program reported a significant improvement in participants' attitudes towards AI, with a risk ratio indicating a 50% increase in positive attitudes [11]. This is consistent with findings from other literature, where educational interventions similarly enhanced healthcare workers' openness to AI, albeit with slightly lower effectiveness percentages ranging from 30% to 45% [19,20]. This discrepancy may be attributed to differences in the depth and breadth of the training content, suggesting that comprehensive, hands-on educational approaches may be more effective in reducing AI-related fears.

Comparatively, the use of AI decision-support systems in diagnostic processes, which showed a 75% effectiveness in increasing confidence and reducing fear [12], aligns with results from similar studies in the literature. For instance, a study found that the introduction of AI support tools in radiology improved diagnostic accuracy and reduced uncertainty, with an effectiveness of approximately 70% [21]. This indicates a strong potential for practical, task-specific AI applications to positively influence healthcare workers' perceptions by demonstrating clear benefits in their daily tasks. The peer-led discussion forum's effectiveness in reducing AI-related anxiety by 30%

[13] is slightly lower than outcomes reported in studies focusing on collaborative learning and community support, where effectiveness reached up to 50% [22,23]. This variance may highlight the importance of structured support systems and the role of organizational culture in modulating responses to technological changes. Virtual reality (VR) simulations, which resulted in a 60% improvement in openness to AI [14], present an innovative method not widely covered in existing literature. However, a study incorporating VR for surgical training found similar improvements in acceptance and readiness for technology integration, indicating the potential of immersive experiences to address fears by simulating real-world applications of AI [24].

Interestingly, the workshops on ethical considerations showed the least effectiveness in altering fear levels [15], a finding echoed in literature where ethical training alone was insufficient to change attitudes towards AI without parallel exposure to practical benefits [25,26]. This underscores the complexity of addressing fears rooted in ethical and existential concerns, suggesting that interventions need to balance ethical considerations with demonstrations of AI's practical value. The mixed results from the introduction of AI-based diagnostic tools [16] resonate with findings from a study that examined the deployment of AI in emergency medicine, showing varied responses based on individuals' previous experiences with technology [25]. This suggests that personal factors and prior exposure to technology may significantly influence the effectiveness of interventions aimed at reducing fear of AI. In synthesizing these findings with the broader literature, it becomes evident that interventions most effective in mitigating healthcare workers' fears of AI are multifaceted, combining practical hands-on experience with educational and ethical discussions. This review highlights a critical gap in the literature regarding the integration of these elements into cohesive intervention strategies. Future research should focus on developing and testing comprehensive intervention models that address both the practical and ethical dimensions of AI in healthcare, aiming to foster a more informed, confident, and accepting workforce. This systematic review possesses several strengths that underscore its significance and applicability in clinical practice. Firstly, the inclusion of only interventional studies and clinical trials ensures that the findings are based on empirical evidence, providing a robust foundation for understanding the effectiveness of various interventions in mitigating healthcare workers' fears of artificial intelligence (AI). The diversity of intervention strategies examined, ranging from educational programs to immersive virtual reality simulations, offers a comprehensive overview of possible approaches to address apprehensions towards AI in healthcare settings. Furthermore, the review's focus on risk ratios and confidence intervals offers precise and quantifiable insights into the effectiveness of these interventions, facilitating evidence-based decision-making for healthcare administrators and policy-makers looking to integrate AI technologies in a manner that is sensitive to the workforce's concerns. However, the review is not without limitations.

The variability in sample sizes and intervention designs across the included studies may introduce heterogeneity, potentially affecting the generalizability of the findings. The restriction to studies published in English also limits the scope of the review, possibly excluding relevant research conducted in other languages that could offer additional insights into the global perspective on healthcare workers' fears of AI. Additionally, the focus on interventional studies, while strengthening the review's empirical basis, may overlook qualitative insights from observational and exploratory studies that could provide deeper understandings of the nuances and underlying factors contributing to these fears.

Conclusions

this systematic review elucidates the effectiveness of various interventions designed to reduce healthcare workers' fears of artificial intelligence in clinical practice. The findings reveal that educational programs and practical exposure to AI technologies can significantly improve attitudes towards AI, with risk ratios indicating up to a 50% increase in positive attitudes towards AI adoption [11], and effectiveness percentages as high as 75% in enhancing confidence with AI-assisted diagnostic processes [12]. Despite

these promising results, the review also highlights the necessity for comprehensive intervention strategies that not only educate but also address ethical considerations and practical implications of AI in healthcare. The synthesis of empirical evidence presented here provides a valuable guide for the development of targeted interventions aimed at fostering an AI-ready healthcare workforce, underlining the critical role of addressing fears and apprehensions to ensure the successful integration of AI in healthcare environments.

Conflict of interests

The authors declared no conflict of interests.

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Table (1): Summary of the studies aiming at evaluating and minimizing fears towards AI among health workers

Study ID	Sample Size	Population Characteristics	Type of intervention	Effectiveness of the intervention	Study conclusion
[11]	120	Clinicians in various specialties	Comprehensive AI training program	50% increase in positive attitudes towards AI (RR 1.5, 95% CI, 1.2 to 1.9)	Educational interventions can significantly mitigate fears by enhancing understanding and familiarity with AI.
[12]	205	Radiologists and medical imaging technicians	AI decision-support systems in diagnostics	75% effectiveness in increasing confidence (95% CI, 65% to 85%)	Practical, task-specific AI applications can positively influence healthcare workers' perceptions by demonstrating clear benefits.
[13]	87	Nurses and allied health professionals	Peer-led discussion forums	30% reduction in AI-related apprehensions (RR 0.7, 95% CI, 0.5 to 0.9)	Peer support and open dialogue are crucial in addressing the psychological dimensions of technological change.
[14]	150	Healthcare workers in a hospital setting	Virtual reality simulations of AI in patient care	60% improvement in openness to AI (95% CI, 50% to 70%)	Immersive technologies like VR can facilitate positive attitudes towards AI by simulating real-world applications.
[15]	95	Healthcare ethicists and administrators	Workshops on ethical considerations of AI	20% effectiveness in altering fear levels (95% CI, 10% to 30%)	Ethical education alone may not be sufficient to alleviate fears without addressing practical concerns.
[16]	134	Primary care physicians and specialists	Hands-on experience with AI-based diagnostic tools	40% improvement in attitudes towards AI (95% CI, 30% to 50%)	Hands-on experience with AI, coupled with open discussions, can partially mitigate fears but may not universally convince all healthcare workers.


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