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**ARTICLE TITLE** THE EXPANDING ROLE OF ARTIFICIAL INTELLIGENCE IN MEDICAL DIAGNOSIS AND TREATMENT: IMPACTS ON CLINICAL QUALITY, PATIENT OUTCOMES, AND THE FUTURE OF PHYSICIAN EMPLOYMENT – A REVIEW

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# THE EXPANDING ROLE OF ARTIFICIAL INTELLIGENCE IN MEDICAL DIAGNOSIS AND TREATMENT: IMPACTS ON CLINICAL QUALITY, PATIENT OUTCOMES, AND THE FUTURE OF PHYSICIAN EMPLOYMENT – A REVIEW

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## ABSTRACT

Artificial intelligence (AI) is rapidly transforming medical diagnosis and treatment, presenting significant opportunities to enhance diagnostic accuracy, streamline clinical workflows, and enable more personalized, data-driven patient care. This narrative review synthesizes contemporary evidence on the expanding applications of AI in diagnostic interpretation, therapeutic decision-making, and clinical management, while also examining its broader implications for healthcare quality, patient outcomes, and the future of physician employment. A structured review methodology was applied, incorporating 54 peer-reviewed studies published between 2015 and 2025 across key medical domains, including radiology, oncology, chronic disease management, predictive analytics, and healthcare workforce transformation. The reviewed literature demonstrates that AI-based systems can equal or exceed clinician performance in selected, well-defined diagnostic tasks, contributing to earlier disease detection, improved risk stratification, and more optimized treatment planning. At the same time, the translation of these technologies into routine clinical practice remains constrained by persistent challenges, including algorithmic bias, limited transparency and explainability, regulatory uncertainty, data privacy concerns, and variability in real-world performance. Beyond clinical outcomes, the growing automation of cognitive tasks traditionally performed by physicians raises important questions regarding professional deskilling, evolving role boundaries, and the reconfiguration of medical labor. While AI is unlikely to fully replace clinicians, its continued integration is expected to substantially reshape clinical responsibilities, interdisciplinary collaboration, and required skill sets. Overall, this review underscores the dual impact of AI as both a driver of improved clinical quality and a catalyst for structural change within the medical profession, and identifies key research and policy priorities necessary to ensure its safe, ethical, and equitable implementation.

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## KEYWORDS

Artificial Intelligence, Medical Diagnosis, Clinical Quality, Treatment Decision Support, Patient Outcomes, Physician Workforce

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## Introduction

Artificial intelligence (AI) has emerged as one of the most transformative forces shaping contemporary healthcare, with its influence increasingly extending beyond administrative automation into highly complex domains of diagnostic reasoning and therapeutic decision-making [1,2]. Rapid advances in machine learning, deep neural networks, generative artificial intelligence, and natural language processing have enabled AI-driven systems to detect pathological patterns in medical imaging, forecast clinical risk trajectories, and support treatment selection with levels of speed and precision that were previously unattainable [3,4]. These developments reflect a broader paradigm shift within digital health, in which computational technologies are no longer peripheral tools but are becoming integral components of everyday clinical workflows [5]. Against a backdrop of rising patient demand, increasing diagnostic complexity, and persistent workforce shortages, AI is widely positioned as a potential solution for improving efficiency, accuracy, and accessibility across healthcare systems [6].

Despite growing enthusiasm for AI-enabled innovation, substantial uncertainty remains regarding the extent to which these technologies will fundamentally reshape clinical practice. An expanding body of empirical research suggests that AI systems can match or even outperform human clinicians in selected diagnostic tasks, particularly in fields such as radiology, dermatology, cardiology, and pathology [4,7]. In parallel, AI-supported treatment decision systems are advancing rapidly, offering increasingly personalized therapeutic recommendations derived from large-scale clinical and real-world datasets that exceed human cognitive processing capacity [8,9]. These capabilities raise profound questions about the evolving division of labor between clinicians and intelligent technologies. Specifically, it remains unclear whether AI will primarily function as a tool that augments clinical expertise or whether it will progressively substitute for certain diagnostic and analytical functions traditionally performed by physicians [1,10]. This tension between augmentation and displacement represents a central research problem in contemporary healthcare innovation.

The implications of AI adoption extend well beyond technical performance metrics. Healthcare organizations and regulators must confront complex issues related to system reliability, patient safety, accountability, fairness, and transparency when integrating AI into clinical decision pathways [3,6]. Algorithmic bias remains a persistent concern, as models trained on demographically unrepresentative datasets may systematically underperform for minority or underserved populations, thereby reinforcing existing health disparities [11,12]. Furthermore, the opaque “black-box” nature of many advanced AI models continues to generate skepticism among clinicians, undermining trust and limiting large-scale adoption [13,14]. In the absence of robust mechanisms for explainability and governance, clinicians may be reluctant to rely on AI-generated recommendations, particularly in high-risk clinical contexts where professional accountability is paramount [15].

Equally important, yet often underrepresented in technical evaluations, are the professional and workforce consequences associated with the expanding use of AI in clinical care. As automated systems increasingly assume responsibility for routine or pattern-based diagnostic tasks, concerns regarding clinician deskilling have gained prominence [16]. Reduced engagement in core diagnostic activities may erode professional expertise over time, potentially compromising clinical resilience in situations where AI systems are unavailable or malfunctioning [10]. At the same time, the integration of AI is giving rise to new forms of professional expertise, including algorithmic oversight, clinical data governance, and interdisciplinary collaboration between clinicians and technical specialists [17]. These dynamics suggest that AI may not eliminate medical roles but instead transform them, raising critical questions about how medical education and workforce planning should evolve to sustain clinical competence and professional identity in increasingly digitalized healthcare environments.

Given these challenges and opportunities, a comprehensive review is warranted to synthesize current evidence on the clinical, social, and professional impacts of AI in medical diagnosis and treatment. While numerous studies have examined discrete applications of AI—such as automated radiological interpretation or AI-driven oncology decision support—far fewer have integrated these findings into a cohesive assessment that simultaneously addresses clinical quality, patient outcomes, and workforce implications [2,18]. Understanding this intersection is essential for guiding responsible implementation, informing policy development, safeguarding clinical expertise, and promoting equitable patient care.

Accordingly, the objectives of this review are threefold: (1) to evaluate existing evidence on the diagnostic and therapeutic performance of AI systems and their effects on clinical quality and patient outcomes; (2) to analyze key challenges associated with AI implementation, including issues of safety, bias, transparency, and clinician reliance; and (3) to examine how AI-driven automation may reshape the future roles,

competencies, and employment landscape of physicians. Collectively, these objectives address the central research question of how the expanding role of AI in medical diagnosis and treatment can simultaneously enhance clinical performance while challenging traditional professional structures within healthcare.

### **Methodology**

This review employed an enhanced narrative review design aimed at synthesizing interdisciplinary evidence on the expanding role of artificial intelligence (AI) in medical diagnosis and treatment, as well as its implications for clinical quality, patient outcomes, and the future of physician employment. A narrative approach was selected due to the heterogeneity of the AI healthcare literature, which spans multiple clinical domains, methodological frameworks, and socio-professional perspectives [2,18]. Although the review was not conducted as a formal systematic review or meta-analysis, structured and transparent procedures were applied to enhance methodological rigor, consistency, and reproducibility [7].

### **Study Design**

The study was designed as a structured narrative review incorporating elements of systematic search strategies. This hybrid design allowed for broad thematic coverage while maintaining methodological clarity [2,7]. The review focused on peer-reviewed studies addressing one or more of the following domains: (1) AI systems used in diagnostic interpretation, including applications in radiology, pathology, cardiology, and dermatology; (2) AI tools supporting treatment decision-making, patient stratification, and therapeutic planning; (3) the impact of AI on clinical quality, safety, and patient outcomes; and (4) the influence of AI technologies on physician roles, professional competencies, employment patterns, and workforce restructuring [1,8,10,16]. Eligible sources included empirical studies, systematic reviews, meta-analyses, theoretical analyses, and authoritative institutional reports that provided insight into clinical or workforce-related implications of AI.

### **Data Sources and Search Strategy**

A comprehensive literature search was conducted across five major academic databases: PubMed, Scopus, Web of Science, IEEE Xplore, and Google Scholar. Searches were performed between October 2024 and February 2025 to capture the most recent developments in AI-enabled healthcare, particularly in rapidly evolving areas such as generative AI and multimodal clinical decision support systems [4,9]. The search strategy combined controlled vocabulary terms with free-text keywords and employed Boolean operators to refine results [2]. The primary search string included combinations of terms related to artificial intelligence, medical diagnosis, clinical decision support, treatment planning, clinical quality, patient outcomes, and physician workforce dynamics.

Additional filtering terms included deep learning, machine learning, generative AI, algorithmic bias, and explainability, reflecting key methodological and ethical challenges identified in the literature [3,11,13]. Reference lists of all included studies were manually screened to identify additional relevant sources. Grey literature, including reports from international organizations, was reviewed selectively when it directly addressed ethical, regulatory, or workforce-related dimensions of AI adoption in healthcare [6,17].

### **Inclusion and Exclusion Criteria**

To ensure relevance and scientific validity, studies were included if they met the following criteria: publication between 2015 and 2025, reflecting the period of accelerated AI development in healthcare; publication in peer-reviewed journals or as high-quality institutional reports; availability in English; and provision of empirical evidence or theoretical analysis related to AI-assisted diagnosis, AI-supported treatment decision-making, clinical outcomes or quality of care, and professional or workforce implications [2,7,16]. Studies were excluded if they consisted solely of conference abstracts without full-text availability, focused exclusively on technical algorithm development without clinical or workforce relevance, lacked evidence-based reasoning, or addressed robotic surgical systems without decision-support AI components [3].

### **Study Screening and Selection Process**

The initial database search yielded 742 records. After the removal of duplicate entries, 618 abstracts were screened based on titles and abstracts to assess relevance. Of these, 128 articles were selected for full-text review. Following detailed evaluation against the predefined inclusion and exclusion criteria, 54 studies were retained for final synthesis. A PRISMA-style flow structure adapted for narrative review methodology was applied to enhance transparency in the study selection process, encompassing stages of identification, screening, eligibility assessment, and inclusion [7].

### **Data Extraction and Analysis**

For each included study, relevant data were extracted manually and organized into a thematic matrix. Extracted variables included clinical domain, type of AI model, target clinical task, outcome measures related to diagnostic accuracy, workflow efficiency, and patient outcomes, as well as reported professional, ethical, and regulatory implications [3,8,9]. Particular attention was paid to workforce-related outcomes such as clinician trust, deskilling risks, changes in professional roles, and attitudes toward AI-supported decision-making [10,14,16].

Given the heterogeneity of study designs, outcome measures, and clinical contexts, a qualitative thematic analysis was conducted. The analysis proceeded in three stages: first, findings were grouped into four overarching thematic categories corresponding to diagnostic performance, treatment decision support, clinical quality and outcomes, and workforce implications; second, cross-study comparisons were performed to identify convergent patterns, conflicting results, and contextual modifiers such as healthcare setting or specialty [7,11]; third, a narrative synthesis was developed to address the core research question, with particular emphasis on differences between experimental and real-world performance, clinician–AI collaboration models, risks associated with automation bias, and long-term workforce effects [15,16].

### **Ethical Considerations**

As this review relied exclusively on publicly available data and did not involve primary data collection or direct patient involvement, formal approval from an ethics committee was not required. Nevertheless, ethical dimensions reported within the included studies—particularly those related to patient safety, data privacy, accountability, and responsible AI deployment—were systematically considered during analysis and synthesis [6,13].

### **Results**

A total of 54 studies met the predefined inclusion criteria, encompassing a broad spectrum of artificial intelligence (AI) applications across diagnostic imaging, predictive analytics, oncology, cardiology, chronic disease management, and health workforce research. The extracted findings were systematically organized into four overarching thematic domains: (1) diagnostic accuracy and system performance, (2) AI-supported treatment decision-making and therapeutic optimization, (3) impact on clinical quality and patient outcomes, and (4) implications for physician roles, competencies, and employment. The synthesized results within each thematic area are presented below [2,7].

#### **Diagnostic Accuracy and System Performance**

Across the reviewed literature, AI systems demonstrated consistently strong diagnostic performance, particularly in clinical domains characterized by high reliance on imaging data and pattern recognition. Deep learning architectures—most notably convolutional neural networks (CNNs)—were frequently reported to match or exceed the diagnostic accuracy of board-certified specialists in tasks such as detecting pulmonary nodules on computed tomography scans, classifying dermatological lesions, identifying arrhythmias from electrocardiographic data, and differentiating malignant from benign tissue in digital histopathology [3,4,7]. Several studies further reported reductions in interobserver variability when AI-assisted diagnostic tools were incorporated into clinical workflows [1].

Comparative analyses consistently indicated that AI systems improved diagnostic sensitivity and specificity, with particularly notable reductions in false-negative rates during early disease detection. This effect was especially pronounced in oncology, where timely identification of breast, lung, and colorectal cancers plays a critical role in prognosis and treatment outcomes [4,18]. In controlled experimental environments, AI algorithms exhibited high stability and reproducibility, supported by access to large, well-annotated datasets and standardized validation protocols [7].

However, performance variability emerged as a recurring theme when AI systems were deployed in real-world clinical settings. Multiple studies reported declines in algorithmic accuracy when models were applied to patient populations that differed demographically or clinically from their original training cohorts [7,11]. Image-based diagnostic tools trained predominantly on data from specific ethnic or geographic populations demonstrated reduced performance when generalized to broader or more diverse groups, underscoring persistent concerns related to algorithmic bias and limited external validity [11,12].

Importantly, the strongest diagnostic outcomes were consistently observed in hybrid diagnostic workflows that combined AI-generated outputs with physician interpretation. Such collaborative models outperformed both AI-only and clinician-only approaches, contributing to faster triage, reduced cognitive burden in high-volume clinical environments, and improved detection of subtle abnormalities that may be overlooked under time pressure [1,3].

### **AI-Supported Treatment Decision-Making and Therapeutic Optimization**

Evidence from 23 of the included studies indicated that AI-based tools play an increasingly influential role in treatment decision-making across multiple medical specialties. Clinical decision support systems (CDSS) were shown to integrate multimodal data sources—including laboratory results, imaging findings, genomic profiles, and historical treatment outcomes—to generate personalized therapeutic recommendations tailored to individual patient characteristics [8,9].

In oncology, AI-driven decision support tools improved chemotherapy regimen selection by predicting treatment response, estimating toxicity risk, and supporting personalized therapeutic strategies [8,18]. In cardiology, machine learning models enhanced risk stratification for conditions such as heart failure and arrhythmias, enabling clinicians to refine medication management and preventive interventions more precisely [9]. Studies focusing on chronic disease management further demonstrated that AI-enabled monitoring systems improved treatment adherence and facilitated timely clinical intervention by flagging early indicators of physiological deterioration [19].

AI-assisted treatment planning also demonstrated benefits in surgical and perioperative contexts. Predictive models estimating operative risk and postoperative complications supported preoperative planning and more efficient resource allocation, contributing to reductions in adverse events [5]. Emerging applications of generative AI enabled the creation of patient-specific simulations that assisted clinicians in anticipating intraoperative challenges and tailoring procedural strategies [4].

Despite these advances, clinician trust and acceptance emerged as recurrent barriers to widespread adoption. Several studies reported clinician hesitation in following AI-generated treatment recommendations when model reasoning processes were insufficiently transparent [13,14]. The persistent “black-box” nature of many AI systems undermined confidence, particularly in high-stakes clinical scenarios where responsibility for adverse outcomes ultimately rests with the physician [15].

### **Impact on Clinical Quality and Patient Outcomes**

A substantial proportion of the reviewed literature documented positive associations between AI integration and improvements in clinical quality, workflow efficiency, and patient outcomes. AI-enabled early detection of both acute and chronic conditions frequently translated into earlier therapeutic intervention, contributing to improved survival rates, reduced hospitalizations, and enhanced long-term disease control [4,6].

In emergency care settings, AI-supported triage systems reduced patient waiting times and improved prioritization of high-risk individuals [11]. In primary and outpatient care, predictive analytics facilitated proactive management of chronic diseases, reducing exacerbation rates and unplanned hospital admissions [9,19]. Several studies highlighted the value of continuous data streams derived from wearable devices and patient-reported outcomes, which allowed clinicians to intervene before overt clinical deterioration occurred [19].

Workflow optimization represented another major benefit of AI adoption. Automated systems assumed responsibility for repetitive and administrative tasks, including documentation support, image preprocessing, data extraction, and scheduling. This redistribution of labor reduced clinician workload and enabled greater focus on complex clinical reasoning and patient communication [5,10]. Multiple studies linked these changes to reductions in burnout and improvements in professional satisfaction among healthcare providers [10].

At the same time, the findings revealed important risks associated with AI deployment. Poorly calibrated models occasionally generated misleading outputs that posed patient safety concerns when not subject to adequate human oversight [3]. Model drift, resulting from changes in clinical practice patterns and patient populations, was identified as a growing challenge requiring continuous monitoring and retraining [11]. Additionally, several studies documented instances of automation bias, in which clinicians over-relied on AI recommendations despite contradictory clinical evidence, particularly when training in AI interpretation was limited [15].

### **Implications for Physician Roles, Competencies, and Employment**

The reviewed studies provided substantial insight into how AI adoption is reshaping the professional landscape of medical practice. While none of the evidence supported the complete replacement of physicians by AI systems, the literature consistently pointed to significant transformations in professional responsibilities and required competencies [1,10].

Automation of routine diagnostic and analytical tasks altered the distribution of work within healthcare teams. Specialties such as radiology, dermatology, and pathology were frequently identified as particularly affected due to their reliance on pattern recognition, an area in which AI excels [3,4]. Rather than eliminating

these specialties, AI appears to be redefining their focus toward complex interpretation, patient-centered communication, ethical oversight, and multidisciplinary collaboration [1].

Concerns regarding professional deskilling emerged as a recurring theme. As clinicians increasingly rely on AI-assisted interpretation, reduced exposure to foundational diagnostic tasks may erode independent clinical expertise over time, potentially compromising resilience in situations where AI systems are unavailable or malfunctioning [10,16]. These concerns were especially pronounced in studies examining long-term workforce implications and training pathways [16].

Conversely, AI integration was also associated with the emergence of new professional roles and competencies. Responsibilities related to AI system supervision, algorithmic auditing, clinical data governance, and interdisciplinary coordination between clinicians and technical specialists were increasingly highlighted as essential components of modern medical practice [14,16,17]. Workforce analyses suggested that while large-scale physician unemployment is unlikely, a redistribution of tasks and evolving role differentiation across specialties is probable, necessitating adaptive approaches to medical education and workforce planning [10,17].

### **Discussion**

The findings of this review illustrate the dual nature of artificial intelligence (AI) in contemporary healthcare. AI functions simultaneously as a catalyst for improving diagnostic accuracy, therapeutic planning, and system efficiency, and as a disruptive force that challenges established professional roles, clinical workflows, and the traditional boundaries of physician expertise [1,2]. Interpreting these findings therefore requires an integrated perspective that accounts not only for clinical performance, but also for ethical considerations, professional identity, and broader socio-organizational implications of AI adoption [6,17].

#### **Clinical Interpretation of AI's Diagnostic and Therapeutic Capabilities**

The consistent evidence demonstrating that AI systems can match or exceed clinician performance in selected diagnostic domains supports their role as advanced decision-support tools rather than autonomous clinical agents [4,7]. AI excels at processing large volumes of data, identifying subtle patterns, and operating effectively under conditions of time pressure and cognitive overload—capabilities that complement, rather than replace, human clinical judgment [1]. Improvements in early disease detection, risk stratification, and treatment optimization observed across multiple studies align with the broader objectives of precision medicine and data-driven healthcare [8,18].

At the same time, the variability in real-world performance observed across studies underscores the contextual dependency of AI systems. Declines in algorithmic accuracy when applied to patient populations differing from training datasets highlight the limitations of generalizability and the persistent influence of data bias [7,11]. These findings reinforce the necessity of population-diverse training data, external validation, and continuous post-deployment evaluation to ensure clinical reliability and equity [11,12]. AI should therefore be viewed not as a universally applicable solution, but as a technology whose effectiveness is contingent on careful contextualization and governance.

#### **Implications for Clinical Quality, Safety, and Workflow Efficiency**

The integration of AI into clinical workflows offers substantial opportunities to enhance healthcare quality by reducing diagnostic delays, improving resource allocation, and alleviating administrative burden [5,6]. By automating routine and repetitive tasks, AI systems may mitigate clinician burnout and enable greater focus on complex decision-making, patient communication, and relational aspects of care that remain resistant to automation [10]. In this sense, AI has the potential to strengthen—not diminish—the human dimensions of clinical practice [1].

However, the findings also highlight important safety-related challenges. Automation bias, whereby clinicians over-rely on AI-generated recommendations, represents a significant risk when AI outputs are accepted uncritically or without adequate verification [15]. Model drift, driven by evolving clinical practices and population characteristics, further threatens the long-term reliability of deployed systems if not actively monitored and updated [11]. These risks underscore the necessity of maintaining strong human oversight and embedding AI systems within governance frameworks that prioritize accountability and patient safety [6].

The development of explainable AI (XAI) has been widely proposed as a strategy to enhance clinician trust and appropriate reliance on AI systems. Nevertheless, several studies caution that explainability alone is insufficient if not accompanied by clinician education, workflow integration, and institutional support structures [13,21]. Effective implementation therefore requires a socio-technical approach that addresses both system design and human factors.

### **Professional and Workforce Implications**

The most far-reaching consequences of AI adoption may lie in its impact on the medical workforce. The automation of routine diagnostic and analytical tasks raises legitimate concerns regarding professional deskilling, particularly when clinicians become increasingly dependent on algorithmic interpretation [16]. Reduced engagement in foundational cognitive activities may erode diagnostic expertise over time, potentially compromising resilience in situations where AI systems fail or are unavailable [10,16]. Evidence from other highly automated industries suggests that such skill degradation is a realistic risk rather than a theoretical concern.

At the same time, the reviewed literature indicates that AI is reshaping rather than eliminating medical roles. New forms of professional expertise are emerging around AI system supervision, algorithmic auditing, clinical data governance, and interdisciplinary collaboration between clinicians and technical specialists [14,16,17]. These developments point toward hybrid professional identities in which clinical expertise is complemented by digital literacy and critical engagement with intelligent systems.

From an employment perspective, fears of widespread physician displacement are not supported by current evidence. Instead, a redistribution of tasks and evolving role differentiation across specialties appears more likely [10,17]. Specialties heavily reliant on pattern recognition—such as radiology, pathology, and dermatology—are expected to undergo the most significant restructuring, while areas emphasizing communication, ethical judgment, and complex care coordination may experience role expansion [3,4]. These trends underscore the importance of adaptive workforce planning and targeted reform in medical education.

### **Ethical, Regulatory, and Societal Considerations**

Beyond clinical and professional domains, AI adoption raises ethical and societal challenges that shape its legitimacy and long-term sustainability. Algorithmic bias remains a critical concern, particularly when AI systems trained on non-representative datasets risk reinforcing existing health inequities [11,12]. Issues related to data privacy, accountability for AI-assisted decisions, and the opacity of algorithmic processes further complicate implementation and undermine trust among clinicians and patients [6,13].

Public and patient perceptions also play a significant role in AI acceptance. While concerns persist that AI may depersonalize care or undermine clinician authority, evidence suggests that patients are more likely to accept AI when it demonstrably improves accuracy, efficiency, and access to services [12]. Transparent communication about the role of AI as a supportive tool rather than a replacement for human judgment is therefore essential for maintaining trust and aligning AI deployment with societal expectations.

### **Synthesis: Navigating the Dual Impact of AI in Healthcare**

Taken together, the findings of this review underscore the dual impact of AI in healthcare. AI technologies enhance diagnostic precision, therapeutic planning, and system efficiency, while simultaneously challenging traditional professional structures and redefining the boundaries of medical expertise [1,2]. The long-term success of AI integration will depend on how effectively healthcare systems balance technological innovation with the preservation of clinical judgment, professional autonomy, and ethical responsibility.

Ultimately, AI's contribution to medicine will be maximized not through the replacement of clinicians, but through thoughtfully designed partnerships that support human decision-making. Strategic implementation, guided by empirical evidence and informed by ethical and social considerations, is essential to ensure that AI enhances clinical quality, protects patient safety, and promotes equitable and sustainable healthcare systems [6,17].

### **Conclusions**

This review demonstrates that artificial intelligence (AI) is rapidly and fundamentally transforming the landscape of medical diagnosis and treatment, offering substantial benefits for diagnostic accuracy, workflow efficiency, and patient outcomes across multiple clinical domains [1,2]. The synthesized evidence indicates that AI-enabled systems consistently enhance diagnostic sensitivity and specificity, support data-driven treatment planning, and facilitate earlier clinical intervention. By automating repetitive analytical and administrative tasks, AI tools also contribute to reduced clinician workload and improved overall healthcare system performance [5,10].

At the same time, the findings emphasize that the benefits of AI are neither uniform nor guaranteed. Variability in algorithmic performance across populations, persistent risks of bias, limited transparency of advanced models, and the potential for automation bias underscore the necessity of cautious, context-aware implementation [11,12,15]. AI systems cannot be assumed to function reliably across diverse real-world settings without rigorous validation, continuous monitoring, and appropriate governance structures [6,7].

Ensuring patient safety, equity, and clinical relevance must therefore remain central priorities in AI deployment strategies.

Beyond clinical performance, this review highlights the far-reaching professional implications of AI integration. While current evidence does not support the replacement of physicians by AI systems, it clearly indicates that many traditional clinical roles are evolving [1,10]. The automation of routine diagnostic tasks introduces a risk of professional deskilling if clinicians become overly dependent on algorithmic outputs [16]. Conversely, the growing demand for AI supervision, quality auditing, ethical oversight, and clinical data governance signals the emergence of new areas of medical expertise and responsibility [14,16,17]. These developments necessitate adaptive approaches to medical education, training, and workforce planning to ensure that clinicians remain competent and capable of effective collaboration with advanced AI technologies.

Future research should prioritize several critical areas. First, large-scale, population-diverse validation studies are needed to improve generalizability and reduce algorithmic bias [7,11]. Second, the development and clinical integration of explainable AI models should be advanced to enhance clinician trust and appropriate reliance on algorithmic support [13,21]. Third, longitudinal research is required to assess the long-term effects of AI adoption on clinician skills, professional identity, and workforce distribution [10,16]. Fourth, robust ethical and regulatory frameworks must be established to clarify accountability, ensure transparency, and promote fairness in AI deployment [6]. Finally, greater emphasis should be placed on the design and evaluation of human–AI collaboration models that preserve clinician autonomy while enhancing patient-centered care [1,17].

By addressing these priorities, healthcare systems can more effectively harness the potential of AI to improve clinical outcomes while safeguarding human expertise. Ultimately, the future impact of AI in medicine will depend not only on technological innovation, but also on evidence-based, ethically grounded strategies that balance efficiency with equity, safety, and professional integrity [1,6].

#### Author's contribution

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All authors have read and agreed to the published version of the manuscript.

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