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ARTIFICIAL INTELLIGENCE IN MEDICAL DIAGNOSTICS – SOCIAL AND ETHICAL IMPLICATIONS

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ABSTRACT

Artificial intelligence (AI) has become one of the most transformative technologies in contemporary medicine, particularly in the field of medical diagnostics. Advanced machine learning and deep learning systems are increasingly used to analyze medical images, clinical records and complex biomedical data, offering improvements in diagnostic accuracy, efficiency and standardization of care. Alongside these technological advancements, the integration of AI into diagnostic practice generates significant social and ethical challenges that require careful examination. The objective of this review article is to critically analyze the social and ethical implications of artificial intelligence in medical diagnostics based on existing scientific literature. This article was applied, drawing on statements of some organisations, systematic reviews, policy reports and ethical analyses published between 2018 and 2026. The findings indicate that AI-driven diagnostics can enhance early disease detection. Also it can improve access to healthcare. However, they also raise concerns regarding professional accountability, algorithmic bias, transparency, data privacy, patient autonomy and healthcare equity. The review highlights the necessity of interdisciplinary governance frameworks, ethical oversight and continuous evaluation to ensure that AI technologies are implemented in a manner consistent with the core values of medicine and social justice.

KEYWORDS

Artificial Intelligence; Machine Learning; Deep Learning Systems; Medical Diagnostics; Ethics; Social Impact; Healthcare Technology; Health Equity

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1. Introduction

Artificial intelligence (AI) refers to a broad field of computer science focused on the development of systems capable of performing tasks that typically require human intelligence, such as learning, reasoning, pattern recognition and decision-making. In recent years, advances in computational power, data availability and algorithm design have significantly accelerated the adoption of AI across multiple domains, including healthcare [1,2,3,4,5].

Modern medical diagnostics is based on the synergy of various AI technologies, key among which are deep learning, natural language processing (NLP) and clinical decision support systems [6,7,8]. Their common feature is the ability to analyze large, complex datasets and support physicians in making accurate diagnostic decisions [9,10,11]. Artificial intelligence (AI) is being used increasingly in various medical specialties, such as radiology, pathology, cardiology and oncology, supporting diagnostic processes [12,13].

In radiology, AI is primarily used for image classification, lesion detection and triage systems, leading to increased diagnostic accuracy, reduced physician workload and shorter reporting times [14,15]. However, these benefits are accompanied by concerns about overreliance on algorithms, unclear liability for diagnostic errors and limited transparency in decision-making processes (Table 1) [16,17].

Table 1. Clinical Applications of Artificial Intelligence in Medical Diagnostics

Medical field	Main AI applications	Reported benefits	Key ethical and social concerns
Radiology	Image classification, lesion detection, triage systems	Increased diagnostic accuracy, reduced workload, faster reporting	Over-reliance on algorithms, accountability for errors, transparency
Pathology	Histopathological image analysis, cancer grading	Improved consistency, reduced inter-observer variability	Bias in training data, explainability of results
Cardiology	ECG interpretation, risk prediction models	Early detection of arrhythmias, preventive care	Data privacy, clinician deskilling
Oncology	Integrated decision-support systems, precision medicine	Personalized treatment planning, improved outcomes	Equity of access, data governance

In pathology, AI supports the analysis of histopathological images and the assessment of the stage of cancer, among other conditions [18]. These applications improve diagnostic consistency and reduce interobserver variability among clinicians [19]. However, challenges remain related to biases in training datasets and limited explainability of AI-generated results (Table 1) [20].

In cardiology, AI is widely used for electrocardiogram (ECG) interpretation and risk prediction models. These tools enable early detection of arrhythmias and support preventive strategies. At the same time, issues such as data privacy and potential clinician disempowerment must be considered (Table 1) [12,13].

In oncology, AI is contributing to integrated decision support systems and precision medicine, enabling personalized treatment planning and improving patient outcomes. However, concerns about equitable access to such technologies and appropriate data management frameworks remain significant (Table 1) [13,21,22].

2. Methodology

This study was conducted as a narrative literature review with elements of a systematic approach, aiming to critically evaluate the social and ethical implications of artificial intelligence in medical diagnostics. Searches were performed in PubMed, Scopus, Web of Science, and Google Scholar for publications from 2018–2026 using terms including "artificial intelligence", "machine learning", "medical diagnostics", "ethics", "social impact" and "health equity". Additionally, reports and guidelines from international organizations such as the World Health Organization (WHO) and the Organisation for Economic Co-operation and Development (OECD) were included. The methodology followed established principles for literature-based research, including structured search, selection, and thematic analysis of relevant sources.

3. Societal Implications of AI in Diagnostics

The implementation of AI in medical diagnostics also has broader societal implications. In terms of access to healthcare, AI has the potential to improve services in far or under-served areas. It may also exacerbate digital divides and resource inequalities [23,24]. In the context of professional roles, AI can improve decision-making and reduce workload, but it also raises concerns about the loss of diagnostic skills and ambiguity in clinical responsibilities [25]. Finally, in the patient-physician relationship, AI can increase diagnostic confidence, but it also risks weakening interpersonal interactions and trust between patients and healthcare professionals (Table 2) [26].

Despite these advantages, the growing reliance on AI raises concerns about overreliance on automated systems, potential biases and the need for transparency in algorithmic decision-making. Providing clinicians with oversight and critical assessment remains crucial [27,28].

Table 2. Social Implications of AI Adoption in Medical Diagnostics

Domain	Positive impact	Potential risks
Healthcare access	Improved services in remote or underserved areas	Digital divide and resource inequality
Professional roles	Decision support and workload reduction	Loss of diagnostic skills, role ambiguity
Patient–physician relationship	Enhanced diagnostic confidence	Reduced interpersonal interaction and trust

3.1. Changes in the Doctor-Patient Relationship

The introduction of artificial intelligence systems to medical diagnostics is significantly transforming the traditional doctor-patient relationship. Previously, it was primarily based on direct contact, trust and the physician's clinical experience. The presence of AI tools in the diagnostic process introduces an additional "participant" in this relationship – an algorithm [29].

On the one hand, AI can strengthen the relationship by increasing the accuracy of diagnoses and allowing physicians to devote more time to communicating with the patient [30]. Automated data analysis reduces the administrative and diagnostic burden. On the other hand, there is a risk of depersonalization of healthcare, especially when diagnostic decisions are perceived as the result of a "black box" rather than the physician's individual judgment [31].

Furthermore, patients may have difficulty accepting diagnoses generated or supported by AI, especially if the decision-making process is not clearly explained. This can lead to a decline in trust in both the physician and the healthcare system [26,32].

3.2. Impact on Access to Healthcare

Artificial intelligence has the potential to significantly improve access to healthcare, especially in regions with limited human resources and infrastructure. AI-based diagnostic systems can enable faster disease detection, support primary care physicians and reduce wait times for diagnosis [33,34,35].

However, these benefits are not evenly distributed. The high costs of implementing the technology, the lack of digital infrastructure and limited access to data can widen the gap between developed and developing countries. Disparities between urban and rural centers can also exist within a single country [33,35].

Consequently, AI can simultaneously act as a tool for increasing the availability of medical services and a factor in exacerbating existing systemic inequalities [34,36].

3.3. The Problem of Digital Divide and Social Inequality

The development of AI technology in medicine highlights the problem of the digital divide. Older people, those with lower levels of education, or limited access to technology may have difficulty using modern diagnostic tools, such as mobile apps or telemedicine platforms [37,38]. Digital exclusion can lead to the marginalization of certain social groups, which are unable to fully benefit from technological innovations [39,40]. Furthermore, algorithms learning from historical data may not adequately account for population diversity, further exacerbating inequalities.

Therefore, a significant challenge is ensuring the inclusiveness of AI technologies and designing systems that take into account the needs of different social groups [41,42].

3.4. Public Trust in Technology and AI Acceptance

Social acceptance of AI in medical diagnostics depends largely on the level of trust in the technology. Factors such as the transparency of systems, their effectiveness and appropriate communication from medical institutions are crucial here [28].

Research indicates that patients are more likely to accept AI as a tool supporting doctors than as an autonomous decision-making system [43]. A lack of understanding of AI's mechanisms can lead to concerns about diagnostic errors, loss of control and privacy violations [26,44].

Building trust requires not only public education but also implementing quality and safety standards and ensuring accountability for decisions made with AI [43].

4. Ethical Aspects of AI in Medicine

From an ethical perspective, the implementation of AI in diagnostics is based on several fundamental principles. Respect for patient autonomy requires that patients be able to understand and provide informed consent to AI-supported decisions; however, this is undermined by the use of "black box" algorithms that limit transparency [45,46]. Beneficence is reflected in AI's ability to maximize clinical benefits, for example, through early cancer detection and improved prognostic capabilities [47,48]. At the same time, the principle of nonmaleficence emphasizes the need to avoid harm caused by incorrect or biased AI results, especially in underrepresented populations [49]. The principle of equity emphasizes the importance of fair and equal access to AI-assisted diagnostics, as unequal availability across healthcare systems can exacerbate existing disparities (Table 3) [47,48].

Table 3. Major Ethical Challenges Associated with AI-Based Diagnostics

Ethical principle	Description	Examples from the literature
Autonomy	Patients' ability to understand and consent to AI-supported decisions	Black-box algorithms limiting informed consent
Beneficence	Maximizing clinical benefit through AI support	Early cancer detection and improved prognosis
Non-maleficence	Avoidance of harm caused by incorrect or biased AI outputs	Misdiagnosis in underrepresented populations
Justice	Fair and equitable access to AI-enabled diagnostics	Unequal availability across healthcare systems

4.1. Patient Data Privacy and Information Security

AI systems in medical diagnostics rely on the analysis of large data sets, including sensitive health information. This raises significant challenges related to patient privacy and data security.

Improper data management can lead to data leakage, unauthorized access, or use for purposes inconsistent with the patient's intentions. Using data to train algorithms without the full knowledge and consent of the data subjects is particularly problematic [50,51].

Therefore, it is necessary to implement advanced data protection mechanisms, such as anonymization, encryption and strict regulations regarding access to and processing of medical information [50,52,53].

4.2. Legal and Medical Liability in the Event of Misdiagnosis

One of the key ethical issues is the issue of liability for diagnostic errors made with the use of AI. In the traditional model, liability rests with the physician, but when algorithms are used, the situation becomes more complex [54,55].

The question arises as to whether liability should rest with the person using the system, its manufacturer, or the institution implementing the technology. The lack of clear regulations in this area can lead to legal uncertainty and limit the implementation of innovation.

In practice, a shared responsibility model is increasingly being adopted, in which the physician remains the final decision-maker but must be aware of the limitations of the AI system [54,56,57,58].

4.3. Risk of Discrimination in AI Algorithms

Artificial intelligence algorithms learn from data that may contain biases and inequalities present in society. As a result, AI systems can reproduce or even reinforce existing discrimination, for example, based on gender, race, or socioeconomic status [59,60].

An example is lower diagnostic accuracy for groups underrepresented in training datasets. This type of bias can lead to unequal treatment of patients and a deterioration in the quality of healthcare for specific groups [59,61,62].

Minimizing this risk requires careful data selection, regular auditing of algorithms and incorporating principles of fairness and equality into the design of AI systems.

4.4. Transparency and Explainability of AI Systems (Explainable AI – XAI)

Many advanced AI models, especially those based on deep learning, are characterized by low operational transparency. The inability to explain how the system arrived at a specific diagnosis poses a significant ethical challenge [63,64].

Transparency is crucial for both doctors and patients. It enables decision verification, builds trust and allows for the identification of potential errors [65,66]. The concept of Explainable AI (XAI) involves the development of methods that allow for the interpretation of model results in a way that is understandable to the user [64,67].

The implementation of XAI is particularly important in medicine, where diagnostic decisions directly impact the health and lives of patients.

4.5. Legal Regulations and Ethical Standards

The dynamic development of AI in medicine requires an appropriate legal and ethical framework. Regulations should address issues of security, liability, data protection and quality standards for diagnostic systems [28,68].

At the international and national levels, efforts are being made to create guidelines for the use of AI in healthcare. Striking a balance between supporting innovation and protecting patient rights is crucial [49,56,69]. Ethical standards should be based on principles such as patient autonomy, beneficence, nonmaleficence and justice. Their implementation in practice requires collaboration between the medical, technological and regulatory communities [49,69].

5. Discussion

The findings of this review demonstrate that AI in medical diagnostics holds both promise and risk. On the one hand, AI technologies can improve diagnostic accuracy, reduce workload and support earlier disease detection [70]. On the other hand, their integration into clinical practice challenges traditional ethical frameworks and social norms [3,5,7].

A key ethical issue is accountability. When AI systems contribute to diagnostic decisions, responsibility is distributed among clinicians, developers and institutions. This fragmentation complicates legal and ethical accountability, particularly in the case of diagnostic errors. Clear governance structures are necessary to define roles and responsibilities [49,54,55].

Algorithmic biases pose another significant ethical challenge. Biases can arise from imprecise training data or flawed model design, leading to systematic variations in diagnostic performance [24,27,40,60]. Addressing this issue requires conscious efforts to ensure data diversity, continuous monitoring and transparency in model development [27,56]. The patient-physician relationship is also being transformed by AI-based diagnostics. Trust, empathy and communication remain crucial to ethical medical practice and overreliance on automated systems can undermine these values [26,32,44]. The literature highlights the importance of maintaining human-centered care in AI-enabled healthcare environments [3,5,32].

International organizations advocate for ethical principles to guide the development and implementation of AI in healthcare. These include transparency, accountability, integrity and respect for human autonomy [1,2,49,69,71,72]. Governance frameworks emphasize the need for interdisciplinary collaboration, involving clinicians, ethicists, policymakers and patients [6,69,73].

6. Conclusions

AI in medical diagnostics represents a groundbreaking development with profound implications for healthcare systems, healthcare professionals and society at large. This review demonstrates that AI-based diagnostic technologies offer significant benefits, including improved diagnostic accuracy, increased efficiency and the potential to expand access to healthcare services. At the same time, the literature consistently highlights significant ethical and societal challenges related to accountability, transparency, data protection, algorithmic bias and equity in healthcare. Successful and responsible integration of AI into medical diagnostics requires more than just technological advancements. A robust ethical framework, clear regulatory guidelines and interdisciplinary collaboration are essential to ensure that AI systems support human decision-making and do not undermine professional judgment or patient trust. Policymakers, healthcare institutions and developers must collaborate to promote transparency, inclusiveness and fairness in the design and implementation of AI. Future research should focus on assessing the long-term societal implications of implementing AI in diagnostics, developing understandable and error-tolerant algorithms and evaluating governance models that balance innovation with ethical responsibility. Ensuring that AI is a tool that enhances, rather than undermines, the human values that underpin medicine remains a key priority for the global healthcare community.

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