Socio-Spatial Studies

Original Research Paper

Doctors for AI? A systematic review

Simindokht Tomraee[1], Seyedeh Hamideh Hosseini[2]*, Reza Toosi[3]

[1] Doctor of Pharmacy, Azad University, Tehran, Iran

[2] Master's degree in English Language Teaching (ELT), Khatam University, Tehran, Iran

[3] Doctor of Medicine, Tehran Medical Sciences Branch of Islamic Azad University, Tehran, Iran

ARTICLE INFO

ABSTRACT

Artificial intelligence is transforming all aspects of human life and healthcare industry is one of the areas of change due to introduction of AI. This systematic review examines the perspectives of doctors on the use of AI in clinical settings, synthesizing findings from peer-reviewed articles to provide a comprehensive understanding of their attitudes, experiences, and concerns. Drawing on studies conducted across diverse healthcare environments, the review identifies prevailing themes, including the perceived benefits of AI in improving diagnostic accuracy, streamlining workflows, and personalizing patient care. However, it also highlights persistent challenges, such as ethical dilemmas surrounding accountability and autonomy, concerns about data privacy, and the potential for algorithmic biases. The findings reveal that while many physicians are optimistic about the transformative potential of AI, significant gaps remain in education and infrastructure that hinder effective adoption. Doctors frequently underscore the need for explainable AI systems, robust regulatory frameworks, and targeted training programs to address these challenges. This review contributes to the growing body of literature on AI in healthcare by offering insights into how medical professionals perceive and engage with this rapidly evolving technology.

INTRODUCTION

AI is revolutionizing the healthcare landscape, fundamentally altering how medical professionals approach diagnosis, treatment, and patient care. This transformation is driven by AI's ability to analyze vast datasets, identify patterns, and deliver insights at unprecedented speeds, thereby complementing human expertise in healthcare. As the healthcare sector increasingly adopts AI technologies, there is a growing interest in understanding how medical practitioners perceive and engage with these innovations. This is critical because physicians, as the primary users of these technologies, play a pivotal role in determining the success of AI integration within clinical environments.

* Corresponding Author

✉ hamideh.hosseini832@gmail.com

☏ +98 9123606278

iD 0009-0005-2117-2260

Despite the potential of AI to enhance healthcare delivery, its adoption raises complex questions about its impact on clinical workflows, professional roles, and patient outcomes. Physicians' perspectives are particularly significant in addressing these questions, as they navigate the intersection of technology, ethics, and clinical decision-making. For instance, while AI tools such as diagnostic algorithms and clinical decision support systems (CDSS) promise to improve accuracy and efficiency, concerns persist about their reliability, explainability, and ethical implications. This dichotomy between the promises and challenges of AI adoption necessitates a comprehensive exploration of how doctors perceive and engage with these technologies (Zalake, 2023).

The Internet has significantly impacted health, contributing to issues like digital eye strain, poor posture, and a rise in sedentary behavior due to prolonged screen time, and even mental health issues (Nosraty et al., 2021). Mental health challenges, including social media addiction, cyberbullying (Arsalani et al., 2022), increased anxiety, and dysfunctional relationships (Nosrati et al., 2023). Moreover, the spread of health misinformation online has led to confusion and harmful practices. However, AI is transforming healthcare, offering solutions to these challenges. Virtual education, as a subset of technological transformation, has been shown to enhance awareness, accessibility, and environmental engagement—especially in socio-cultural contexts where holistic learning is crucial (Dastyar et al., 2023). AI enables faster and more accurate diagnostics through advanced data analysis, helping detect conditions like cancer or heart disease early. It optimizes hospital operations, reducing wait times and improving resource allocation. AI-driven tools, such as wearable devices, promote preventive care by monitoring health in real time. Additionally, AI-powered chatbots provide mental health support, making care more accessible. While the Internet has created health problems, AI is paving the way for a more efficient, proactive, and patient-centered medical system (Zamani et al., 2021).

The integration of AI into healthcare is not without challenges. Ethical dilemmas, such as accountability in AI-mediated decisions and patient data privacy, remain unresolved. Well-designed policies and regulations are crucial for addressing complex challenges, as they can have long-term effects when implemented wisely. Comprehensive legislative frameworks and preventive strategies are essential to mitigate risks and ensure clarity, as fragmented policies often lead to inefficiency and ambiguity, particularly in areas like accountability and governance (Taheri et al., 2022). Furthermore, physicians often grapple with fears of being overshadowed by technology or losing their professional autonomy. Addressing psychological and behavioral dynamics is essential to ensure that AI tools are designed and implemented in ways that complement human judgment and enhance patient care. This mirrors the broader concern that despite having access to vast information, human behavior often diverges from rational engagement with technology or the environment, highlighting a gap in applied intelligence (Barati et al., 2020). Research shows that psychological factors, such as personality traits, play a significant role in social incompatibility, often leading to social and organizational challenges. Preventive measures, including education and behavioral interventions, are essential to address the underlying causes of these issues and foster healthier societal and organizational integration (Jamali et al., 2022). Similarly, the spatial and cultural configuration of environments—like those in educational institutions—can foster or hinder psychological well-being, belonging, and functional interaction (Dariush et al., 2019). At the same time, there is a consensus among researchers that AI cannot replace core human competencies such as empathy, ethical judgment, and holistic patient care. These nuances underscore the need for a balanced approach to AI implementation, one that harmonizes technological advancements with the irreplaceable human elements of medical practice (Pecqueux et al., 2022).

A growing body of literature emphasizes the importance of including medical professionals in discussions about AI design and governance. This need for independent oversight extends to academia, where external influences can shape research agendas and ethical standards in ways that may not align with healthcare priorities (Sarfi et al., 2021). Studies reveal that physicians often prioritize explainability, user-friendliness, and ethical compliance when evaluating AI tools. However, significant gaps in education and infrastructure

persist, limiting their ability to fully utilize these technologies. Importantly, ethics cannot be assumed to be inherently understood; it must be actively taught and reinforced. Research shows that even highly educated individuals, including medical professionals, often lack sufficient awareness of ethical rules and principles, particularly in complex contexts such as AI adoption (Sabbar et al., 2019). Beyond ethical considerations, technological infrastructure also plays a critical role in ensuring accessibility and continuity in essential systems, particularly in underdeveloped societies. Research highlights those deficiencies in technological infrastructure, coupled with limited financial resources, can create significant barriers to effective implementation, whether in education, healthcare, or other sectors (Mohammadi & Kharazmi, 2021). Addressing these gaps is essential for building a collaborative environment where AI serves as an augmentative tool rather than a disruptive force.

This systematic review synthesizes findings from diverse studies to provide a comprehensive **understanding of doctors' attitudes,** experiences, and concerns regarding AI in clinical practice. By analyzing research conducted across various healthcare contexts, it identifies key themes that influence physicians' acceptance and utilization of AI. These themes include the perceived benefits of AI in improving diagnostic accuracy, optimizing workflows, and personalizing care, alongside persistent challenges such as ethical dilemmas, data security concerns, and the risk of algorithmic biases.

Through this review, we aim to contribute to the discourse on AI in healthcare by offering evidence-based insights into how medical professionals perceive its role. By examining both the opportunities and obstacles associated with AI adoption, this work seeks to inform policy decisions, guide educational reforms, and support the development of AI systems that align with the needs and values of the medical community. This introduction provides a foundation for understanding the complex interplay between AI technologies and medical practice, setting the stage for a detailed exploration of the findings in subsequent sections.

METHODOLOGY

A systematic review is a structured, methodical approach to synthesizing research evidence on a

specific topic or question, aiming to provide a comprehensive and unbiased summary of the available knowledge (Shahghasemi et al., 2011). It involves identifying, appraising, and synthesizing data from relevant studies using a predefined protocol, ensuring transparency and reproducibility. Systematic reviews employ rigorous search strategies across multiple databases, establish explicit inclusion and exclusion criteria, and assess the quality of included studies to minimize bias. By analyzing and integrating findings, they provide valuable insights into trends, gaps, and the strength of evidence, often serving as a cornerstone for evidence-based decision-making in fields such as medicine, public health, and policy development.

SEARCH STRATEGY

A comprehensive search was conducted across multiple electronic databases, including PubMed, Scopus, Web of Science, and IEEE Xplore, to identify peer-reviewed articles relevant to the research question. Keywords and MeSH terms used in the search strategy included "artificial intelligence," "healthcare," "physicians' attitudes," "clinical decision support systems," "AI ethics," "medical education," and "doctor-AI interaction." Boolean operators (e.g., AND, OR) were employed to refine search results. Searches were limited to studies published in English from January 2010 to December 2024 to capture the most recent advancements and opinions on the topic.

1. Inclusion and Exclusion Criteria

Studies were included in the review if they met the following criteria:

1. Focused on physicians' perspectives or experiences with AI in healthcare settings.

2. Reported primary data obtained through qualitative or quantitative methods.

3. Discussed themes related to ethical considerations, diagnostic accuracy, workflow optimization, or barriers to adoption.

4. Published in peer-reviewed journals.

Exclusion criteria were:

1. Studies not specific to physicians or clinical practice (e.g., focused on patients or non-clinical staff).

2. Articles lacking primary data, such as editorials, opinion pieces, or commentaries.

3. Publications with insufficient methodological detail to assess quality.

4. Studies focusing solely on non-medical applications of AI.

2. Data Extraction

Data extraction was performed using a standardized form designed to capture relevant study characteristics. Key data fields included:

1. Authors, year of publication, and geographical context.

2. Study design (e.g., cross-sectional survey, qualitative interviews, mixed methods).

3. Sample characteristics (e.g., specialty, number of participants, region).

4. Key findings on physicians' attitudes, perceived benefits, and barriers to AI adoption.

5. Thematic insights on ethical, educational, and infrastructural challenges.

Two independent reviewers extracted data, and discrepancies were resolved through discussion or consultation with a third reviewer.

3. Quality Assessment

The methodological quality of the included studies was evaluated using the Mixed Methods Appraisal Tool (MMAT). Criteria assessed included clarity of research questions, appropriateness of study design, rigor in data collection and analysis, and relevance of conclusions to the stated objectives. Studies were rated as low, moderate, or high quality, and low-quality studies were excluded from the final analysis.

4. Data Synthesis

The findings were synthesized thematically to identify common patterns and variations in physicians' perspectives on AI. A deductive approach was used to categorize themes into predefined areas of interest, such as diagnostic accuracy, workflow improvements, ethical concerns, and training needs. An inductive approach was applied to uncover emerging themes, such as attitudes toward algorithmic bias and the need for explainable AI. The results were then integrated into a narrative synthesis to provide a holistic understanding of the topic.

FINDINGS

As could have been predicted, most research on this subject have been carried out in 2020s. we put our results in temporal order. Blease et al. (2019) conducted an exploratory study to examine UK **general practitioners' (GPs') perspectives on the** potential role of AI in primary care. Using a web-based survey in June 2018, the study gathered responses from 720 GPs about the likelihood of future technology replacing human physicians in six key primary care tasks. Respondents were also invited to provide qualitative comments on their expectations, concerns, and perceived limitations of AI in clinical practice.

The analysis of qualitative responses revealed three major themes: (1) limitations of AI, (2) potential benefits of AI, and (3) social and ethical concerns. GPs identified core human competencies such as communication, empathy, clinical reasoning, and value-based care as irreplaceable by technology. They acknowledged the potential benefits of AI in improving efficiency, particularly by reducing administrative burdens. However, they raised concerns about workforce training gaps, the acceptability of AI to patients, and the ethical implications of relying on AI in healthcare. Some GPs also expressed fears that failing to adopt technological innovations could negatively impact both patients and physicians. The study concluded that while GPs recognized some advantages of AI, they overwhelmingly perceived its role in primary care as limited. These views diverged from the more optimistic predictions of biomedical informaticians, highlighting the need for further qualitative research to explore these perspectives in depth.

Liyanage et al. (2019) investigated perceptions, issues, and challenges associated with the integration of AI in primary health care (PHC). Employing a three-round Delphi methodology, the study gathered insights from PHC and informatics experts, culminating in an online panel discussion involving members of the International Medical Informatics Association and the European Federation of Medical Informatics. The way information is presented and framed can significantly influence public perception, particularly in critical or high-stakes situations. Media framing, for instance, has been shown to shape narratives and influence how societal issues are understood, often

aligning with specific agendas. Similarly, in the context of AI adoption, transparent communication and public engagement are crucial to ensure that AI systems are perceived as supportive tools rather than threats to cultural or professional identity (Kharazmi & Mohammadi, 2020).

The study found consensus on AI's potential to enhance clinical and managerial decision-making, with improvements supported by adopting common data standards. However, participants expressed reservations about AI applications adapting to clinician preferences or behaviors. There was also a lack of agreement on the extent of potential harm AI could cause to patients. The impact of AI on continuity and coordination of care proved particularly challenging to assess. The authors emphasized that while AI could significantly augment healthcare delivery, its implementation must prioritize meticulous design and rigorous evaluation. They called for the PHC informatics community to proactively guide the ethical and effective development of AI applications to ensure safety, reliability, and alignment with clinical needs.

Laï et al. (2020) conducted a qualitative survey to explore perceptions of AI in healthcare among 40 French stakeholders with varied professional backgrounds. The study, conducted in Paris between October 2017 and June 2018, utilized grounded theory methodology to analyze stakeholders' contributions and provide a comprehensive understanding of the topic. Key findings revealed a shared sentiment that AI in healthcare is surrounded by myths, necessitating a balanced perspective. Healthcare professionals emphasized prioritizing patient care and safety, expressing reservations about integrating AI into daily practice. Industrial stakeholders viewed AI as transformative but highlighted legal challenges, particularly those related to accessing individual health data. Institutional actors underscored their regulatory responsibilities, emphasizing the need for structured governance of AI tools. Meanwhile, external observers expressed concerns regarding the balance between technological advancements and core values such as social justice and freedom. Health researchers specializing in AI maintained a pragmatic stance, advocating for improved transitions from research to clinical application. Laï et al. concluded that while AI holds significant potential to revolutionize healthcare, its successful integration requires collaborative efforts among all stakeholders. The authors called for greater inclusion of patient perspectives and collective engagement to address unresolved issues such as accountability in AI-mediated healthcare decisions.

Amann et al. (2020), on behalf of the Precise4Q consortium, examined the critical issue of explainability in AI for healthcare through a multidisciplinary lens. The study focused on AI-based clinical decision support systems, analyzing the technological, legal, medical, and patient perspectives on explainability. Using the "Principles of Biomedical Ethics" framework by Beauchamp and Childress—autonomy, beneficence, nonmaleficence, and justice—the researchers conducted an ethical assessment of explainability's role in clinical practice. From a technological standpoint, the study emphasized the dual need for achieving explainability and determining its practical benefits during system development. Legally, explainability intersects with informed consent, medical device certification, and liability, underscoring the importance of clear and comprehensible AI outputs. Medically, the interaction between healthcare providers and AI tools highlighted the necessity for systems that enhance, rather than hinder, clinical workflows. The patient perspective revealed concerns about trust and transparency, emphasizing the need for systems that empower informed decision-making. The authors concluded that omitting explainability in medical AI threatens ethical principles, potentially leading to negative outcomes for both individual patients and public health. They advocated for greater awareness among developers, clinicians, and policymakers about the challenges of opaque algorithms. The study called for sustained multidisciplinary collaboration to address these limitations and ensure that AI fulfills its potential in healthcare.

Mat Reffien et al. (2021) conducted a cross-sectional study to evaluate physicians' attitudes, expectations, and concerns regarding AI in medicine. The survey, administered to 112 physicians at a tertiary teaching hospital in Malaysia in October 2019, assessed attitudes toward AI applications, anticipated uses, and perceived risks. Participants were divided into clinical (person- and technique-oriented) and non-clinical specialties.

Results showed that physicians from non-clinical specialties had significantly higher attitude scores (mean = 14.94 ± 3.12) compared to those in person-

oriented (mean = 14.13 ± 3.10) and technique-oriented clinical specialties (mean = 13.06 ± 2.88) (p = 0.033). Similarly, tech-savvy participants demonstrated more positive attitudes toward AI (mean = 14.72 ± 3.55) than non–tech-savvy participants (mean = 13.21 ± 2.46) (p = 0.01). Expectations for AI included its potential to optimize workflows and enhance decision-making. However, concerns were raised about legal implications and the risk of errors in clinical applications.

The study emphasized that AI implementation should be preceded by appropriate training and **orientation tailored to physicians' needs.**

Martinho et al. (2021) surveyed medical doctors from the Netherlands, Portugal, and the United States across various specialties to explore their views on the ethical dimensions of AI in healthcare. The study identified four key perspectives: AI as a helpful tool that enhances efficiency, allowing doctors to focus on their core expertise; the necessity of robust rules and regulations due to distrust in private tech companies; confidence in ethics alone to guide AI development, reflecting trust in corporate involvement; and the critical importance of explainable AI tools to engage clinicians and ensure usability. Building trust in AI systems is essential, particularly in healthcare, where institutional trust relies on the interplay of legality, oversight, and the public sphere. Research shows that fostering trust requires efforts from both civil society and governments, where effective structures—such as the separation of powers and the promotion of individual liberties—strengthen legal protections and create a trusted professional environment (Kodabakhshi et al., 2021). While these perspectives highlight the promise of AI in optimizing clinical workflows and decision-making, they also underscore concerns about corporate influence, regulatory needs, and the alignment of AI tools with ethical and practical standards. Martinho et al. emphasize the need for explainable, transparent AI systems, grounded in bioethical principles, with healthcare professionals actively involved in their design and governance to ensure ethical and effective integration into clinical practice.

Pecqueux et al. (2022) conducted a survey to assess the knowledge, acceptance, and expectations of AI applications among German surgeons. The study involved 147 participants from university hospitals, teaching hospitals, and private practices, providing insights into surgeons' familiarity with AI, perceived utility, and concerns regarding its clinical implementation. The results indicated that 52.8% of respondents were familiar with AI applications in medicine, although most self-rated their knowledge as average (41.6%) or rudimentary (37.3%). Surgeons demonstrated differing expectations for **AI's roles, favoring its use in diagnostic confirmation** over therapy decision-making. Respondents expressed stricter requirements for error levels in therapy decisions, reflecting greater skepticism toward its application in that domain. While most participants anticipated that AI could improve diagnostic accuracy, they identified ethical and legal challenges, particularly regarding liability, as significant barriers to its broader adoption. Pecqueux et al. concluded that while German surgeons generally have a positive outlook on AI in healthcare, there is a notable gap in knowledge and practical integration within their field. To address these issues, the authors recommended targeted educational programs for medical students and professionals to enhance understanding of AI development, implementation, and applications in surgery.

Kansal et al. (2022) conducted a cross-sectional study to assess the knowledge, perceptions, and interest in AI among medical students and doctors in Punjab, India. The study utilized post-event questionnaires completed by 367 participants following two free webinars aimed at raising **awareness about AI's role in healthcare. Responses** were analyzed using Likert scales and statistical tests to identify associations between knowledge, gender, medical experience, and other variables. The findings revealed that while a majority (74.4%) believed AI would play a significant role in future healthcare, most participants reported limited knowledge of AI applications (79.6%) and its limitations (82.8%). Medical students demonstrated greater interest in learning about AI (69.3%) and perceived its potential career benefits (84.4%) compared to doctors (51.6% and 65.2%, respectively). Female medical students, despite being less knowledgeable about AI principles (P = 0.001), expressed significantly higher interest in learning about AI than their male counterparts (P = 0.004). Notably, 83.5% of students had never attended a lecture on AI, and 80.7% felt their medical schools

provided minimal guidance on the subject. The study concluded that formalized AI education in medical curricula is crucial for fostering interest and equipping future healthcare professionals with the skills needed to integrate emerging technologies into practice. The authors recommended further large-scale studies to inform policy and curricular changes that support innovation in digital healthcare.

Samhammer et al. (2022) explored physicians' perspectives on integrating artificial intelligence-driven decision support systems (AI-DSS) into clinical practice, particularly focusing on nephrology. This qualitative study employed expert interviews with experienced nephrologists following a test scenario involving AI-DSS. The researchers aimed to identify the needs and challenges associated with using such systems in clinical decision-making. Key findings revealed that physicians emphasized the importance of preserving traditional clinical strengths, such as critical reasoning and professional judgment, even as AI-DSS becomes more prevalent. Challenges included the need for improved explainability of AI systems and ensuring these tools align with the principles of shared decision-making. Physicians expressed a desire for AI systems that foster meaningful interactions, tailored to the specific clinical context. Additionally, participants highlighted the necessity of considering the broader clinical environment when implementing AI-DSS, ensuring that such systems augment rather than complicate the treatment process. The study concluded that the successful adoption of AI-DSS hinges on designing systems that are not only technically robust but also context-sensitive. Prioritizing explainability and adaptability to diverse clinical scenarios was deemed critical for integrating AI-DSS into everyday medical practice effectively.

Buck et al. (2022) conducted a qualitative study **to explore German general practitioners' (GPs')** attitudes toward AI-enabled diagnostic systems. The study, performed between March and May 2020, involved interviews with 18 GPs to identify determinants of their attitudes. The interview transcripts were analyzed, resulting in 307 open codes, which were subsequently grouped into 21 concepts and consolidated into five key categories. The five categories were: (1) Concerns, encompassing fears and doubts regarding AI, such as reliability, ethical implications, and potential loss of clinical autonomy; (2) Expectations, reflecting the perceived benefits and limitations, such as time-saving and improved diagnostic accuracy; (3) Environmental Influences, including the impact of workplace dynamics, stakeholder opinions, technological infrastructure, and media narratives; (4) Individual Characteristics, comprising traits, demographic factors, and AI knowledge that influence attitudes; and (5) Minimum Requirements, representing the essential features for AI systems to gain acceptance, such as explainability, user-friendliness, and compliance with ethical and legal standards. The study also proposed a conceptual model illustrating relationships among these categories. The findings underscored the importance **of addressing GPs' concerns and aligning AI system** designs with their expectations and practical needs.

Tanaka et al. (2023) explored the evolving roles and competencies of physicians in the context of AI implementation in healthcare. The qualitative study utilized focus group interviews with nine physicians from various clinical specialties in Tokyo's suburbs, recruited via snowball sampling. Interviews followed a structured guide and underwent content analysis to identify core themes, achieving data saturation after three sessions.

The analysis yielded three core categories: (1) functions expected to be replaced by AI, (2) functions retained by human physicians, and (3) concerns about AI's impact on the medical field. Participants noted that some physician functions, such as repetitive or data-intensive tasks, could be delegated to AI. However, critical roles requiring empathy, ethical judgment, and value-driven decision-making remained integral to human physicians. Additionally, "functions extended by AI," involving the processing of large data sets, would necessitate new physician roles to interpret AI outputs effectively. The study also highlighted the increasing expectations placed on physicians to assume responsibility for decisions augmented by AI. Concerns included the potential for over-reliance on AI and challenges in maintaining trust within the patient-physician relationship. The authors emphasized the importance of interdisciplinary discussions to address these challenges and guide the transition to an AI-integrated clinical environment.

Zalake (2023) explored doctors' perceptions of using Digital Twins of Doctors (DTDs) in healthcare. DTDs are AI-generated, computer-controlled digital replicas of physicians that mimic their physical and

vocal characteristics. The study aimed to assess the potential benefits, limitations, and ethical considerations of DTDs through semi-structured interviews with 13 doctors. The findings revealed that doctors viewed DTDs as valuable for streamlining repetitive tasks, such as delivering standard health information, and for personalizing patient care through enhanced engagement. Using a **doctor's identity was noted to enhance the credibility** of health information provided via DTDs. However, participants raised concerns about the misuse of their identity, including the risk of spreading misinformation, potential negative impacts on the doctor-patient relationship, and liability issues. The study concluded that while DTDs hold promise for improving efficiency and credibility in healthcare, their adoption requires addressing ethical, legal, and practical concerns. These findings provide insights for guiding the responsible integration of DTDs into clinical practice, emphasizing the need for stringent safeguards against misuse and collaboration with stakeholders to ensure their effective and ethical implementation.

York et al. (2023) investigated clinicians' perceptions of AI in healthcare, particularly its application to interpreting skeletal radiographs for traumatic musculoskeletal injuries. The study collected data through a questionnaire distributed to clinicians across Southeast England over three months, focusing on self-assessed knowledge of AI, confidence in radiograph interpretation, and support for AI implementation in skeletal radiography. The survey, which included 297 respondents, revealed a mean self-assessed knowledge of AI in healthcare at 3.68 out of 10, with senior doctors reporting significantly higher knowledge levels (mean: 4.88). Only 13.8% of participants reported encountering AI in clinical practice. Despite limited exposure, there was strong overall favorability toward AI in healthcare (mean: 7.87) and its application in skeletal radiography (mean: 7.75). Participants preferred AI systems designed to identify positive findings (mean: 7.26) over those ruling out negatives (mean: 6.20). York et al. highlighted a broad acceptance of AI in radiographic interpretation, particularly as a support tool in trauma care. The authors emphasized the need for further education on AI among clinicians to address gaps in knowledge and engage the minority of respondents who expressed reservations about AI integration.

Kempt et al. (2023) explored the phenomenon of disagreements between physicians and AI-based diagnostic decision support systems (DSS) in medical contexts. With the increasing prevalence of autonomous diagnostic tools, the study examined how physicians should navigate situations where their clinical judgment conflicts with DSS recommendations, especially when both appear to be faultless. These conflicts can shift the burden of proof onto physicians, potentially undermining trust and disrupting established workflows. The authors analyzed various causes of such conflicts and proposed a framework for "meaningful disagreements" inspired by the concept of "meaningful human control" over autonomous systems. This framework aims to preserve **physicians' moral responsibility while ensuring that** DSS tools enhance rather than hinder clinical practice. It emphasizes the need for normative clarity in the integration of AI into healthcare, including conditions under which DSS can take on more significant roles without compromising the ethical and professional responsibilities of human clinicians. The study concluded that a balanced approach to resolving physician-AI conflicts is essential for fostering trust and maintaining the reliability of automated systems in medical settings.

Bhavaraju (2023) examined the evolving role of AI in healthcare, emphasizing its contributions to clinical decision-making, image interpretation, data mining, and error reduction. Despite these advancements, the chapter highlighted concerns from physicians, patients, and families about the widespread adoption of AI in clinical practice.

The discussion addressed key issues such as the "hype and hope" surrounding AI, the uncertainties about stakeholder roles, and the challenges of ensuring data validity for AI model training and decision-making. Additionally, the chapter underscored the need for curriculum reform in medical education to equip future healthcare providers with the skills necessary to effectively integrate AI into practice. Broader concerns, including cybersecurity, ethical and legal considerations, privacy, and transparency, were also explored. The chapter concluded that while AI offers significant opportunities to enhance healthcare delivery, its adoption must be accompanied by comprehensive policy discussions and a deliberate

focus on education, governance, and stakeholder engagement to address the challenges it poses.

Alanazi (2023) investigated clinicians' perspectives on the integration of AI into healthcare, focusing on opportunities, challenges, and future directions. Using a qualitative methodology and purposive sampling, the study engaged 26 clinicians in three focus group interviews, each lasting an hour. Discussions centered on the applications, limitations, and implications of AI in enhancing electronic health records (EHRs) and broader clinical practices. Key findings identified five critical areas of AI application in healthcare: predictive analytics, clinical decision support systems, data visualization, natural language processing (NLP), patient monitoring, and emerging trends. Participants emphasized AI's potential to improve EHR functionality, enabling personalized and adaptive healthcare delivery. However, the study also highlighted significant challenges, including technical limitations in language processing, difficulties with context-specific reasoning, and the medico-legal complexities of AI-supported or autonomous healthcare services. The study concluded that while AI has the capacity to transform healthcare systems, its adoption must address barriers such as the nascent state of the technology, the need for transparent governance, and the equitable distribution of benefits.

Sezgin (2023) explored the role of AI in healthcare, emphasizing its potential to complement rather than replace healthcare providers. The study addressed ongoing debates about whether AI might supplant doctors or differentiate those using AI from those who do not. It highlighted the augmentative potential of AI in enhancing diagnostic accuracy, treatment planning, and patient outcomes. Central to the analysis was the human-in-the-loop (HITL) approach, which integrates human oversight into AI systems. This approach ensures that AI tools are guided, supervised, and contextualized by healthcare providers, thereby prioritizing safety, ethical considerations, and quality of care. The HITL model underscores collaboration between AI and healthcare professionals, leveraging the strengths of both to achieve more effective clinical outcomes. The study advocated for organizational adoption strategies that embed AI within multidisciplinary teams.

Pedro et al. (2023) conducted a comprehensive survey of medical doctors in Portugal to evaluate their perspectives on the adoption of AI in clinical practice. This cross-sectional study employed an online quantitative survey targeting key aspects of AI use, including its impact on healthcare quality, delegation of clinical procedures, perceived advantages and disadvantages, and predisposition to integrate AI into medical workflows. The survey also included demographic, professional, and digital proficiency data, achieving a sample size of 1,013 valid responses, representing 99% confidence for licensed Portuguese medical doctors. The results indicated an overall optimism among physicians about AI's potential to improve healthcare delivery. Respondents expressed willingness to adopt AI while recognizing challenges such as gaps in digital health training and the need for integration of AI-related content into medical curricula. Key advantages noted included enhanced data processing and clinical decision-making capabilities. However, concerns were raised regarding potential risks such as over-reliance on AI, ethical dilemmas, and the need to maintain human oversight in critical decisions. The study emphasized the necessity for comprehensive medical education reforms to address digital health proficiency and foster AI adoption.

Amann et al. (2023) conducted a qualitative study to explore the expectations and attitudes of stroke survivors, their families, and healthcare professionals toward AI-powered clinical decision support systems (CDSS) in stroke medicine. This study employed semi-structured interviews in Germany and Switzerland, analyzing data through inductive and deductive thematic analysis under the sociology of expectations framework.

Participants identified four potential roles for medical AI in stroke care: administrative, assistive, advisory, and autonomous. While participants **generally held positive attitudes about AI's ability to** improve decision-making speed, accuracy, and efficiency, they emphasized that AI should complement, rather than replace, human decision-making. Concerns centered on its potential to introduce new challenges, including shifts in professional roles, impacts on the doctor-patient relationship, and risks to patient autonomy and informed decision-making. The findings underscored the importance of integrating relational and ethical considerations into AI development. Participants stressed the need for robust governance

and stakeholder engagement to address the ethical, legal, and social implications of medical AI. They also called for AI solutions to be developed collaboratively with clinicians, patients, and the public to ensure alignment with the realities of clinical care and the needs of those impacted.

Allen et al. (2024) conducted a mixed-methods study to investigate primary care physicians' (PCPs) attitudes toward AI in primary care, focusing on its impact on the doctor-patient relationship and clinical workflows. The study included a survey of 47 PCPs affiliated with a large academic health system in Southern California and follow-up interviews with 15 respondents. This approach combined quantitative and qualitative insights, uniquely framed by specific AI use cases rather than general applications. The findings indicated that PCPs held generally positive views of AI's potential in primary care, particularly for addressing challenges like physician shortages and burnout. However, attitudes were context-dependent, influenced by both technological and procedural factors. PCPs expressed concerns about AI's accuracy, safety, and potential biases. Equally significant were people-and-process concerns, such as its impact on workflows, equity, reimbursement models, and the doctor-patient relationship. The study concluded that successful AI integration in primary care requires alignment among stakeholders to address these multifaceted concerns. The researchers emphasized that AI initiatives must consider not only technical challenges but also the broader implications for clinical practice and interpersonal dynamics in primary care settings.

Banerjee et al. (2024) investigated medical **doctors' perceptions of AI in healthcare through a** web-based survey distributed to physicians across various specialties. The survey, structured into four sections—demographics, AI concepts, education in AI, and implementation challenges—sought to assess familiarity with AI, readiness for its integration, and the perceived obstacles to its adoption in clinical practice.

Key findings indicated a low overall familiarity with AI among participants. Of the 142 physicians surveyed, 52.12% completed the questionnaire, with 67.61% identifying the lack of human supervision as a major limitation in AI implementation. The most significant concern was the degree of autonomy granted to AI systems, with respondents expressing apprehension about fully automated processes. Despite these challenges, a majority of participants showed a keen interest in learning more about AI and recognized the potential benefits it could bring to patient care. Banerjee et al. concluded that to bridge the gap between AI potential and its practical implementation, medical schools and hospitals should prioritize establishing specialized education and training programs for physicians.

Ursuleanu et al. (2024) explored the complex **interplay between physicians' emotional and** attitudinal states and their receptivity to integrating AI in medical practice. The study examined how introverted traits, such as emotions and feelings, and extroverted traits, such as attitudes and engagement, influence the doctor-AI relationship, aiming to identify challenges and opportunities for adopting AI in healthcare. Using a novel framework, the researchers assessed the doctor-patient-AI dynamic with a focus on fostering an aesthetic and ethical interaction within medical practice. The findings highlighted that a holistic approach to this **relationship could enhance physicians' attentiveness** and willingness to adopt advanced AI technologies. By addressing the emotional and attitudinal aspects of doctors, the study suggested that improved receptivity to AI could lead to better integration of these tools, ultimately supporting improved patient care and quality of life outcomes.

The authors concluded that prioritizing emotional and attitudinal factors in the design and implementation of AI systems can strengthen the doctor-AI partnership. This approach encourages physicians to embrace high-performance technologies more effectively, advancing both medical practice and patient outcomes.

Warrington and Holm (2024) conducted a cross-sectional e-survey to assess UK doctors' use of AI in healthcare and their views on its ethical and regulatory implications. The anonymous survey targeted General Medical Council (GMC)-registered doctors, yielding 272 responses. The study found that most respondents rated themselves as slightly or moderately knowledgeable about AI, with men reporting higher self-assessed knowledge levels than women. Doctors in training were more likely to use AI than those post-training. Notably, 37% of AI users employed it to help write reflective pieces for their

professional portfolios. Participants expressed concerns about AI's impact on patient safety and confidentiality. They also strongly advocated for enhanced regulation of AI in healthcare, emphasizing the need for professional bodies such as the GMC, British Medical Association (BMA), and royal colleges to develop formal guidelines for AI usage by doctors. The authors concluded that the findings underscore the need for professional guidance on integrating AI into reflective practices and addressing ethical concerns. They called for further evaluation of doctors' apprehensions and a structured approach to AI regulation to ensure safe and effective implementation in healthcare.

Huang et al. (2024) **examined doctors' ethical** perspectives on using AI-enabled Clinical Decision Support Systems (AI-CDSS) for antibiotic prescribing in a healthcare institution in Singapore. The study involved in-depth interviews with 30 doctors from diverse specialties and roles, conducted between October 2022 and January 2023. The research used clinical vignettes to explore ethical considerations based on the four pillars of medical ethics: autonomy, beneficence, non-maleficence, and justice. Key findings included participants' preference for exercising clinical judgment over AI recommendations, particularly when prescribing broad- or narrow-spectrum antibiotics. Many respondents recognized the limitations of AI-CDSS, such as its potential misrepresentation of non-local populations due to data source biases. Two-thirds of participants prioritized beneficence over patient autonomy by persuading patients to accept the AI-CDSS-recommended treatment, deemed the best practice. Additionally, a significant portion of doctors displayed limited awareness of the implications of data breaches associated with AI-CDSS use. The study concluded that a clear ethical, legal, and regulatory framework is critical for integrating AI-CDSS into healthcare. It emphasized the need for enhanced organizational support and education on AI and ethics to empower doctors and ensure the responsible adoption of AI technologies.

Kerstan et al. (2024) investigated how trust associations and knowledge about AI influence perceptions of risks and benefits, as well as preferences for AI in healthcare. Using a survey of 378 participants, the study employed a path model to explore the relationships between explicit (deliberate) and implicit (automatic) trust in AI versus human physicians, AI knowledge, and the

perceived risks and benefits of AI in healthcare. The findings revealed distinct pathways for how trust and knowledge shape preferences for AI integration. Implicit trust associations significantly influenced preferences for AI over physicians through risk perceptions, but not benefit perceptions. In contrast, AI knowledge influenced preferences primarily through benefit perceptions, not risk. Explicit trust associations impacted preferences via both risk and benefit perceptions. The results suggest that risk perceptions are more strongly tied to affect-driven factors, whereas benefit perceptions rely more on reflective cognition. The study concluded that public trust and knowledge play critical roles in shaping attitudes toward AI in healthcare. It emphasized the need for a dual-focus approach—addressing affective concerns to mitigate risk perceptions and providing clear, accessible information to enhance perceived benefits.

DISCUSSION AND CONCLUSION

This systematic review highlights the mixture of optimism and skepticism among physicians regarding the adoption of AI in healthcare. The findings reveal that while AI technologies hold substantial promise for enhancing diagnostic accuracy, streamlining workflows, and personalizing patient care, significant barriers to their seamless integration into clinical practice persist. The potential benefits of AI, such as reducing administrative burdens and supporting clinical decision-making, were frequently emphasized across the studies. These advantages are particularly appealing in contexts where resource limitations, such as workforce shortages and increasing healthcare demands, strain existing systems. However, the review reveals that the optimism surrounding these technologies is tempered by a host of challenges, including concerns about ethical accountability, data privacy, and algorithmic biases. Physicians expressed apprehension regarding the reliability of AI in complex clinical scenarios and the potential erosion of patient trust due to over-reliance on technology.

A recurring theme was the necessity for explainable AI systems. Physicians consistently emphasized the importance of transparency in AI algorithms to foster trust and ensure informed decision-making. This concern aligns with the broader ethical discourse on the

role of autonomy and accountability in AI-mediated healthcare. Moreover, the lack of robust training and educational frameworks was identified as a critical barrier to adoption. Many studies reported limited knowledge and exposure to AI among medical professionals, highlighting an urgent need for curriculum reforms that incorporate digital health and AI literacy.

Another significant insight from the review is the perceived gap between technological capabilities and clinical realities. Physicians often pointed out that while AI can excel in data analysis and pattern recognition, it cannot replicate core human competencies such as empathy, clinical judgment, and ethical reasoning. This gap reinforces the consensus that AI should augment rather than replace human clinicians, underscoring the value of a collaborative approach that integrates AI as a supportive tool within multidisciplinary teams.

The review also brings attention to the heterogeneity in physicians' attitudes toward AI, influenced by factors such as geographic region, specialty, and prior exposure to technology. For instance, physicians in specialties with high levels of repetitive tasks, such as radiology and pathology, demonstrated a greater openness to AI integration compared to those in patient-facing roles. Additionally, the findings reveal a generational divide, with younger, tech-savvy physicians showing higher levels of enthusiasm and adaptability toward AI applications.

While the transformative potential of AI in healthcare is widely acknowledged, its successful adoption hinges on addressing critical barriers related to education, ethics, and system design. Physicians, as key stakeholders in healthcare delivery, must be actively involved in the development and governance of AI technologies to ensure alignment with clinical needs and ethical principles. This review underscores the need for a balanced approach to AI integration—one that leverages its strengths while safeguarding the irreplaceable human elements of medical practice.

To achieve this, targeted initiatives are required to bridge the knowledge and infrastructure gaps identified in this review. Educational programs that enhance AI literacy among healthcare professionals, coupled with policy frameworks that prioritize

explainability and accountability, are essential steps toward fostering trust and effective utilization of AI technologies. Additionally, interdisciplinary collaboration among clinicians, developers, policymakers, and patients is critical for designing AI systems that are not only technically robust but also contextually relevant and ethically sound.

CONFLICT OF INTEREST

The author declares no conflict of interest.

REFRENCES

Alanazi, A. (2023). Clinicians' views on using artificial intelligence in healthcare: Opportunities, challenges, and beyond. *Cureus, 15*(9), e45255. https://doi.org/10.7759/cureus.45255

Allen, M. R., Webb, S., Mandvi, A., Frieden, M., Tai-Seale, M., & Kallenberg, G. (2024). Navigating the doctor-patient-AI relationship: A mixed-methods study of physician attitudes toward artificial intelligence in primary care. *BMC Primary Care, 25*(42). https://doi.org/10.1186/s12875-024-02282-

Amann, J., Blasimme, A., Vayena, E., Frey, D., & Madai, V. I., on behalf of the Precise4Q consortium. (2020). Explainability for artificial intelligence in healthcare: A multidisciplinary perspective. *BMC Medical Informatics and Decision Making, 20*(310). https://doi.org/10.1186/s12911-020-01332-6

Amann, J., Vayena, E., Ormond, K. E., Frey, D., Madai, V. I., & Blasimme, A. (2023). Expectations and attitudes towards medical artificial intelligence: A qualitative study in the field of stroke. *PLoS ONE, 18*(1), e0279088. https://doi.org/10.1371/journal.pone.0279088

Arsalani, A., Sakhaei, S., & Zamani, M. (2022). ICT for Children: The Continuous Need for Media Literacy. *Socio-Spatial Studies*, 6(1), 1-11. doi: 10.22034/soc.2022.211944

Banerjee, A., Sarangi, P. K., & Kumar, S. (2024). Medical doctors' perceptions of AI in healthcare. *Cureus, 16*(9), e70508. https://doi.org/10.7759/cureus.70508

Barati, N., Dariush, B., Dastyar, F., & Barati, M. (2020). Environmental Intelligence A Holistic Approach to the Human-Environment Relationship. *Armanshahr Architecture & Urban Development*, 13(30), 213-225. doi: 10.22034/aaud.2019.183282.1860

Bhavaraju, S. R. (2023). Artificial intelligence in healthcare: Doctor as a stakeholder. In S. P. Stawicki (Ed.), *Artificial Intelligence in Medicine and Surgery - An Exploration of Current Trends, Potential Opportunities, and Evolving Threats - Volume 1.* IntechOpen. https://doi.org/10.5772/intechopen.111490

Blease, C., Kaptchuk, T. J., Bernstein, M. H., Mandl, K. D., Halamka, J. D., & DesRoches, C. M. (2019). Artificial intelligence and the future of primary care: Exploratory qualitative study of UK general practitioners' views. *Journal of Medical Internet Research, 21*(3), e12802. https://doi.org/10.2196/12802

Buck, C., Doctor, E., Hennrich, J., Jöhnk, J., & Eymann, T. (2022). General practitioners' attitudes toward artificial intelligence–enabled systems: Interview study. *Journal of Medical Internet Research, 24*(1), e28916. https://doi.org/10.2196/28916

Dariush, B., Jalili Sadrabad, S., Taghavian, N., & Mohammadi Oujan, S. (2019). Codification of the Principles and Basics of Designing Higher Educational Spaces with an Emphasis on the Cultural and Social Factors. *Interdisciplinary Studies in the Humanities, 11*(2), 151-181. doi: 10.22035/isih.2019.3359.3600

Dastyar, M., Dariush, B., & Dastyar, F. (2023). Virtual Education, a Complementary Element of the Puzzle of Holistic Education in The Relationship Between Humans and Environment or Iranian Citizens. *Journal of Cyberspace Studies, 7*(2), 237-252. doi: 10.22059/jcss.2023.356702.1088

Huang, Z., Lim, H. Y.-F., Ow, J. T., Sun, S. H.-L., & Chow, A. (2024). Doctors' perception on the ethical use of AI-enabled clinical decision support systems for antibiotic prescribing recommendations in Singapore. *Frontiers in Public Health, 12.* https://doi.org/10.3389/fpubh.2024.1420032

Jamali, K., Salehi, K., & Chorami, M. (2022). A Comparison on Four Personality Types (A, B, C And D) in Criminal and Normal Adolescents. *Medical Journal of Mashad University of Medical Sciences, 65*(5).

Kansal, R., Bawa, A., Bansal, A., Trehan, S., Goyal, K., Goyal, N., & Malhotra, K. (2022). Differences in knowledge and perspectives on the usage of artificial intelligence among doctors and medical students of a developing country: A cross-sectional study. *Cureus, 14*(1), e21434. https://doi.org/10.7759/cureus.21434

Kempt, H., Heilinger, J.-C., & Nagel, S. K. (2023). "I'm afraid I can't let you do that, Doctor": meaningful disagreements with AI in medical contexts. *AI & Society, 38*(1407–1414). https://doi.org/10.1007/s00146-022-01418-x

Kerstan, S., Bienefeld, N., & Grote, G. (2024). Choosing human over AI doctors? How comparative trust associations and knowledge relate to risk and benefit perceptions of AI in healthcare. *Risk Analysis, 44*(4), 939–957. https://doi.org/10.1111/risa.14216

Kharazmi, Z., & Mohammadi, S. (2020). Persian-Language Media Overseas as the Western Tools of Public Diplomacy: Framing COVID-19 Pandemics in Iran by VOA and BBC. *Journal of World Sociopolitical Studies, 4*(1), 1-36.

Kodabakhshi, A. A., Salehi, K., & Dehshiri, M. (2021). Sociological Analysis of Lawyer's Defense Immunity in Iranian Law. *Social Science Quarterly, 14*(4), 175-137.

Laï, M.-C., Brian, M., & Mamzer, M.-F. (2020). Perceptions of artificial intelligence in healthcare: findings from a qualitative survey study among actors in France. *Journal of Translational Medicine, 18*(14). https://doi.org/10.1186/s12967-019-02204-y

Liyanage, H., Liaw, S.-T., Jonnagaddala, J., Schreiber, R., Kuziemsky, C., Terry, A. L., & de Lusignan, S. (2019). Artificial intelligence in primary health care: Perceptions, issues, and challenges. *Yearbook of Medical Informatics, 28*(1), 041–046. https://doi.org/10.1055/s-0039-1677901

Martinho, A., Kroesen, M., & Chorus, C. (2021). A healthy debate: Exploring the views of medical doctors on the ethics of artificial intelligence. *Artificial Intelligence in Medicine, 121,* 102190. https://doi.org/10.1016/j.artmed.2021.102190

Mat Reffien, M. A., Selamat, E. M., Sobri, H. N. M., Mohamed Hanan, M. F., Abas, M. I., Mohd Ishak, M. F., ... Ismail, A. (2021). Physicians' attitude towards artificial intelligence in medicine, their expectations and concerns: An online mobile survey. *Malaysian Journal of Public Health Medicine, 21*(1), 181–189. https://doi.org/10.37268/mjphm/vol.21/no.1/art.742

Mohammadi, S., & Kharazmi, Z. (2021). The Remote Higher Education over COVID-19 Pandemic: The Case Study of Provisions and Priorities of the University of Tehran's Official Website. *Journal of World Sociopolitical Studies, 5*(2), 255-294.

Nosrati, S., Sabzali, M., Arsalani, A., Darvishi, M., & Aris, S. (2023). Partner Choices in the Age of Social Media: Are There Significant Relationships Between Following Influencers on Instagram and Partner Choice Criteria?. *Revista De Gestão E Secretariado, 14*(10), 19191–19210. https://doi.org/10.7769/gesec.v14i10.3022

Nosraty, N., Sakhaei, S., & Rezaei, R. (2021). The Impact of Social Media on Mental Health: A Critical Examination. *Socio-Spatial Studies, 5*(1), 101-11. doi: 10.22034/soc.2021.212042

Pecqueux, M., Riediger, C., Distler, M., Oehme, F., Bork, U., Kolbinger, F. R., ... Kahlert, C. (2022). The use and

future perspective of artificial intelligence—A survey among German surgeons. *Frontiers in Public Health, 10.* https://doi.org/10.3389/fpubh.2022.982335

Pedro, A. R., Dias, M. B., Laranjo, L., Cunha, A. S., & Cordeiro, J. V. (2023). Artificial intelligence in **medicine: A comprehensive survey of medical doctors'** perspectives in Portugal. *PLoS ONE, 18*(9), e0290613. https://doi.org/10.1371/journal.pone.0290613

Sabbar, S., Masoomifar, A., & Mohammadi, S. (2019). **Where We Don't Know How to be Ethical; A research** on Understanding Plagiarism. *Journal of Iranian Cultural Research, 12*(3), 1-27.

Samhammer, D., Roller, R., Hummel, P., Osmanodja, B., Burchardt, A., Mayrdorfer, M., Duettmann, W., & Dabrock, P. (2022). "Nothing works without the **doctor:" Physicians' perception of clinical decision**-making and artificial intelligence. *Frontiers in Medicine, 9.* https://doi.org/10.3389/fmed.2022.1016366

Sarfi, M., Darvishi, M., Zohouri, M., Nosrati, S., & Zamani, **M. (2021). Google's University? An exploration of** academic influence on the tech giant's propaganda. *Journal of Cyberspace Studies, 5*(2), 181-202. 10.22059/JCSS.2021.93901

Sezgin, E. (2023). Artificial intelligence in healthcare: Complementing, not replacing, doctors and healthcare providers. *Digital Health.* https://doi.org/10.1177/20552076231186520

Shahghasemi, E., Heisey, D. R., & Mirani, G. (2011). How do Iranians and U.S. Citizens Perceive Each Other: A Systematic Review. *Journal of Intercultural Communication, 11*(3), 1–13. https://doi.org/10.36923/jicc.v11i3.539

Taheri, M., Milani, A. R., & Salehi, K. (2022). Studying the Legal Criminal Policy of Iran and England Regarding Economic Crimes. *Medical Law Journal, 16,* 1022-1035.

Tanaka, M., Matsumura, S., & Bito, S. (2023). Roles and competencies of doctors in artificial intelligence implementation: Qualitative analysis through physician interviews. *JMIR Formative Research, 7,* e46020. https://doi.org/10.2196/46020

Ursuleanu, T. F., Calin, A. I., Comanescu, M. P., Stefan, H. C., Grigorovici, R., Luca, A. R., Teiu, R. E., & Grigorovici, A. (2024). Mood of the doctors: Problems, challenges and perspectives of AI use in medicine. *Romanian Journal of Oral Rehabilitation, 16*(4). https://doi.org/10.6261/RJOR.2024.4.16.70

Warrington, D. J., & Holm, S. (2024). Healthcare ethics and artificial intelligence: a UK doctor survey. *BMJ Open, 14,* e089090. https://doi.org/10.1136/bmjopen-2024-089090

York, T. J., Raj, S., Ashdown, T., & Jones, G. (2023). **Clinician and computer: a study on doctors'** perceptions of artificial intelligence in skeletal radiography. *BMC Medical Education, 23*(16). https://doi.org/10.1186/s12909-022-03976-6

Zalake, M. (2023). Doctors' perceptions of using their digital twins in patient care. *Scientific Reports, 13*(21693). https://doi.org/10.1038/s41598-023-48747-5

Zamani, M., Nourbakhsh, Y., & Nayebi, H. (2021). Presenting a Pattern for Promoting Social Health Through Social Networks (Case Study: Instagram Social Network). *New Media Studies, 7*(28), 42-1. doi: 10.22054/nms.2022.63698.1277