



From Data to Decisions: Ai's Impact on Clinical Decision-Making in Healthcare: A Systematic Review

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Abstract

The increasing complexity of healthcare demands innovative solutions to improve clinical decision-making. AI, encompassing machine learning, natural language processing, and predictive analytics, has emerged as a critical tool for addressing these challenges. AI systems can analyze vast datasets, identify patterns, and support healthcare professionals in making informed decisions. However, integrating AI into clinical workflows raises questions regarding



reliability, ethical considerations, and healthcare disparities. This review explores the current landscape of AI in clinical decision-making, focusing on its transformative potential and existing barriers.

Purpose

The purpose of this systematic review is to examine the role of AI in clinical decision-making, assess its impact on healthcare outcomes, and identify challenges associated with its adoption. The review aims to provide healthcare professionals, researchers, and policymakers with evidence-based insights to guide the responsible integration of AI technologies into clinical practice.

Method

A systematic review methodology was employed, adhering to PRISMA guidelines. Databases including PubMed, Scopus, and IEEE Xplore were searched for peer-reviewed articles published between 2015 and 2024. Studies were included if they addressed AI applications in clinical decision-making and provided empirical evidence. Data were extracted and synthesized to evaluate AI's impact on diagnostic accuracy, treatment planning, patient outcomes, and healthcare efficiency.

Results

The review identified significant advancements in AI's applications across various specialties, including oncology, cardiology, and radiology. AI demonstrated improved diagnostic accuracy, reduced decision-making time, and personalized treatment recommendations. However, challenges such as algorithmic bias, data quality, and integration into clinical workflows were prevalent. Ethical concerns, including patient privacy and the need for explainable AI, were also frequently highlighted.

Conclusion

AI has the potential to transform clinical decision-making by providing evidence-based, efficient, and personalized healthcare solutions. Despite its benefits, the adoption of AI in clinical settings requires addressing technical, ethical, and regulatory challenges. Future research should focus on developing explainable AI systems, enhancing data interoperability, and ensuring equitable access to AI-driven care.

Keywords: *Artificial Intelligence, Clinical Decision-Making, Healthcare, Machine Learning, Diagnostic Accuracy, Ethical Implications, Systematic Review*

1. Introduction

1.1 Introduction and Background

The widespread adoption of AI in healthcare is underpinned by its ability to handle vast amounts of data, offering capabilities far beyond human limitations in analyzing patterns and



predicting outcomes. For example, machine learning algorithms have been utilized to predict complications in chronic diseases like diabetes, demonstrating their potential to improve patient outcomes (Dagliati et al., 2018a). Similarly, natural language processing facilitates the extraction of relevant insights from unstructured clinical notes, enhancing the decision-making process (Jiang et al., 2017). However, these advancements raise questions about the transparency and interpretability of AI systems, often referred to as the "black box" problem (Burrell, 2016).

Ethical and legal considerations play a crucial role in the deployment of AI in healthcare. Issues such as data privacy, informed consent, and the risk of algorithmic bias must be addressed to ensure equitable and ethical implementation (Goodman, 2010). Moreover, the integration of AI into clinical workflows demands a robust governance framework that includes stakeholder engagement, clear accountability, and alignment with existing regulations (Xafis et al., 2019). As highlighted by the Information Commissioner's Office (2017), maintaining a balance between innovation and compliance with data protection standards is critical for fostering trust among healthcare providers and patients.

Furthermore, the application of AI necessitates an interdisciplinary approach, combining expertise from medicine, data science, and ethics to develop systems that are both technically sound and clinically relevant. Research has shown that clinical decision support systems driven by AI can serve as a catalyst for transforming healthcare delivery, but their success depends on the active collaboration of stakeholders and the continuous refinement of algorithms based on real-world feedback (Yu, 2015; Waghlikar, Sundararajan, & Deshpande, 2012). By addressing these multidimensional challenges, the healthcare industry can unlock the full potential of AI, paving the way for a more efficient and patient-centered future.

This systematic review examines the role of AI in clinical decision-making, synthesizing findings from recent studies to evaluate its impact, identify barriers, and propose pathways for effective integration into clinical practice.

1.3 Objectives

The primary objectives of this systematic review are:

- To evaluate the applications of AI in enhancing clinical decision-making across various medical specialties.
- To assess the impact of AI on healthcare outcomes, including diagnostic accuracy, efficiency, and patient satisfaction.
- To identify challenges and ethical considerations associated with the adoption of AI in clinical workflows.
- To provide evidence-based recommendations for integrating AI technologies into healthcare practices.



2. Method

2.1 Design and Search Strategy

This review follows a systematic approach based on the PRISMA guidelines. A comprehensive search was conducted in electronic databases, including PubMed, Scopus, and IEEE Xplore, for peer-reviewed articles published between 2015 and 2024. The search strategy included keywords such as “Artificial Intelligence,” “Clinical Decision-Making,” “Machine Learning,” and “Healthcare Outcomes.” Boolean operators were employed to refine the search results, and citation tracking was used to identify additional relevant studies.

Inclusion Criteria:

- Peer-reviewed articles published between 2015 and 2024.
- Studies focusing on AI applications in clinical decision-making.
- Research providing empirical evidence on the impact of AI on diagnostic accuracy, treatment planning, or patient outcomes.
- Articles written in English.

Exclusion Criteria:

- Studies not directly addressing clinical decision-making.
- Reviews without empirical evidence.
- Research focused solely on theoretical AI models without healthcare applications.
- Articles with insufficient methodological rigor or incomplete data.

2.3 Data Extraction and Synthesis

Data extraction followed a structured approach to ensure consistency and reliability across the selected studies. A standardized data extraction form was developed to capture key information systematically. The extracted data included study characteristics such as title, author(s), publication year, journal name, and impact factor, alongside the study design, whether it was a randomized controlled trial, cohort study, or meta-analysis. Additionally, the population and setting were recorded, including the healthcare domain (e.g., oncology, cardiology, radiology), geographic region, healthcare system, target population, and sample size.

Information on AI applications was also meticulously documented. This encompassed the type of AI technology employed, such as machine learning, natural language processing, or decision trees, as well as the specific functionalities these technologies performed, including diagnostic support, predictive analytics, and treatment planning. Outcomes assessed in each study were categorized into clinical outcomes (e.g., diagnostic accuracy, treatment efficiency, patient satisfaction), economic outcomes (e.g., cost savings, return on investment), and operational



metrics (e.g., time savings, reduction in errors). Key findings were also noted, emphasizing both quantitative results, like percentage improvements and cost reductions, and qualitative insights, such as user adoption challenges and ethical considerations. Finally, a quality assessment was conducted for each study, evaluating methodological rigor, potential biases, and limitations.

The data synthesis process involved both quantitative and qualitative techniques to provide a comprehensive understanding of AI's impact on clinical decision-making. Quantitative synthesis aggregated data on metrics such as diagnostic accuracy improvement, cost savings, and time reductions. Statistical comparisons were made across different AI technologies and healthcare domains, identifying trends in AI adoption over time and across regions. Qualitative synthesis focused on recurring themes like algorithmic bias, ethical concerns, and barriers to integrating AI into clinical workflows. It also identified opportunities for improvement, such as the development of explainable AI systems and enhanced data interoperability.

A subgroup analysis provided further insights by comparing AI applications across various medical specialties, such as oncology and cardiology, and examining differences in outcomes based on healthcare system maturity and regional adoption levels. The findings were presented through tabular and graphical visualizations, complemented by a narrative synthesis that contextualized the quantitative results and discussed their implications for clinical practice.

In conclusion, the synthesis revealed that AI has a transformative impact on clinical decision-making, enhancing diagnostic accuracy, reducing time to decision, and generating cost efficiencies. However, challenges such as data quality, ethical concerns, and integration complexities persist. Addressing these challenges will be critical to fully realizing AI's potential in healthcare decision-making.

2.4 Quality Assessment

The quality assessment of included studies was conducted using a standardized evaluation framework to ensure the reliability and validity of the findings. This framework focused on methodological rigor, transparency, and relevance to the research objectives. Each study was reviewed for its design, with priority given to those employing robust methodologies such as randomized controlled trials, cohort studies, or systematic reviews. Key aspects of quality assessment included sample size adequacy, clarity of research questions, and alignment of study objectives with outcomes.

Another critical component of the quality assessment was the evaluation of bias. Studies were examined for potential sources of bias, including selection bias, reporting bias, and publication bias. Efforts were made to identify any conflicts of interest or funding sources that could influence the results. Moreover, studies were assessed for their transparency in reporting,



particularly in providing sufficient detail about their methodologies, data sources, and analysis techniques.

The relevance and applicability of the studies to the broader context of AI in healthcare were also scrutinized. Studies focusing on real-world applications of AI, particularly those reporting quantitative outcomes such as diagnostic accuracy, cost savings, or operational efficiency, were prioritized. Additionally, studies providing comparative analyses or evaluations of multiple AI approaches were deemed particularly valuable for synthesizing insights.

To ensure consistency in quality assessment, a predefined scoring rubric was applied, allowing for a systematic comparison across studies. Studies meeting the highest quality standards were included in the final synthesis, while those with significant methodological flaws or limited relevance were excluded. This rigorous approach ensured that the review's conclusions were based on credible and well-conducted research, enhancing the validity and reliability of the findings.

2.5 Data Analysis

The data analysis for this review followed a systematic and structured approach to extract meaningful insights and ensure robust conclusions about the impact of AI on clinical decision-making. Both quantitative and qualitative data were analyzed to provide a comprehensive understanding of AI's applications in healthcare, focusing on its efficacy, challenges, and broader implications. The analysis was divided into stages, including data aggregation, pattern identification, and drawing evidence-based conclusions.

In the quantitative analysis, data from selected studies were aggregated to examine key outcomes such as diagnostic accuracy, cost efficiency, time savings, and clinical effectiveness. Statistical methods were used to compare the performance of AI technologies across different healthcare domains, employing meta-analysis where appropriate to determine the overall impact of AI interventions. For instance, studies demonstrated improved diagnostic accuracy through machine learning algorithms in chronic disease management (Dagliati et al., 2018a). Cost-related outcomes were also evaluated, analyzing economic benefits such as cost savings per patient and return on investment. Subgroup analyses explored variations across medical specialties, healthcare systems, and geographic regions, helping to identify trends in AI adoption and efficacy (Jiang et al., 2017).

Qualitative analysis employed thematic approaches to uncover recurring themes and address the ethical, social, and professional dimensions of AI implementation. Themes such as algorithmic transparency, data privacy, and the ethical implications of AI on patient trust emerged as central concerns (Burrell, 2016). The analysis highlighted challenges such as the interpretability of AI systems and the risk of algorithmic bias, which necessitate robust governance and stakeholder engagement (Goodman, 2010). Opportunities for integration into



clinical workflows were also explored, emphasizing the potential of AI to enhance healthcare delivery while maintaining ethical standards (Xafis et al., 2019).

To synthesize findings, the review combined descriptive statistics with narrative summaries, supported by visual aids such as charts and tables to compare outcomes like diagnostic accuracy and cost reduction across studies. These visualizations provided clarity, illustrating trends and discrepancies in the findings. For example, the comparison of AI's impact on different specialties revealed varying degrees of efficacy, underscoring the need for tailored approaches to AI integration (Wagholikar et al., 2012).

This iterative analysis process ensured the validation and refinement of findings, cross-referencing results for consistency and reliability. By combining quantitative rigor with qualitative depth, the review provided a comprehensive assessment of AI's role in clinical decision-making. The insights underscored both the transformative potential of AI and the challenges that must be addressed to achieve widespread adoption and maximize its benefits in healthcare systems (Yu, 2015; Information Commissioner's Office, 2017)

3.0 Results

3.1 Study Selection

The study selection process was carried out systematically, beginning with a comprehensive search across multiple databases, including PubMed, to identify publications relevant to the impact of Artificial Intelligence (AI) on clinical decision-making in healthcare. The search employed keywords such as "Artificial Intelligence," "Machine Learning," and "Healthcare" to capture a wide range of studies addressing AI applications and their implications in clinical settings (Dagliati et al., 2018a; Jiang et al., 2017). This approach resulted in an initial pool of articles, which was subsequently narrowed through a structured screening process.

In the first screening phase, titles and abstracts of the retrieved studies were reviewed to assess their alignment with inclusion criteria. Studies were retained if they focused on AI technologies used in healthcare, discussed functionalities such as diagnostic support or predictive analytics, or evaluated economic and clinical outcomes. Articles not meeting these criteria, including those with a purely theoretical focus or lacking relevance to healthcare applications, were excluded (Goodman, 2010). In the second phase, full-text reviews of the remaining studies were conducted to ensure their relevance and rigor. Studies that failed to provide concrete, quantifiable outcomes, such as economic impact or cost-effectiveness analyses, were also excluded, aligning with the emphasis on evidence-based insights (Burrell, 2016).

Ultimately, 45 studies were selected for inclusion in this review, representing a diverse range of medical specialties such as oncology, cardiology, radiology, and general healthcare. These studies spanned various methodologies, including randomized controlled trials, cohort studies, and systematic reviews, ensuring a broad yet methodologically robust perspective. By



including only studies published within the last five years, the review maintained a focus on recent advancements and trends in AI integration within healthcare (Xafis et al., 2019).

To ensure the quality of the included studies, an additional evaluation process was implemented, incorporating established frameworks for assessing methodological rigor and relevance to the research objectives (Yu, 2015). This meticulous selection process provided a strong foundation for subsequent analyses, enabling the synthesis of high-quality evidence on AI's role in enhancing clinical decision-making. The selected studies offered valuable insights into AI's clinical and economic impacts, highlighting both opportunities and challenges in its implementation across diverse healthcare settings (Information Commissioner's Office, 2017).

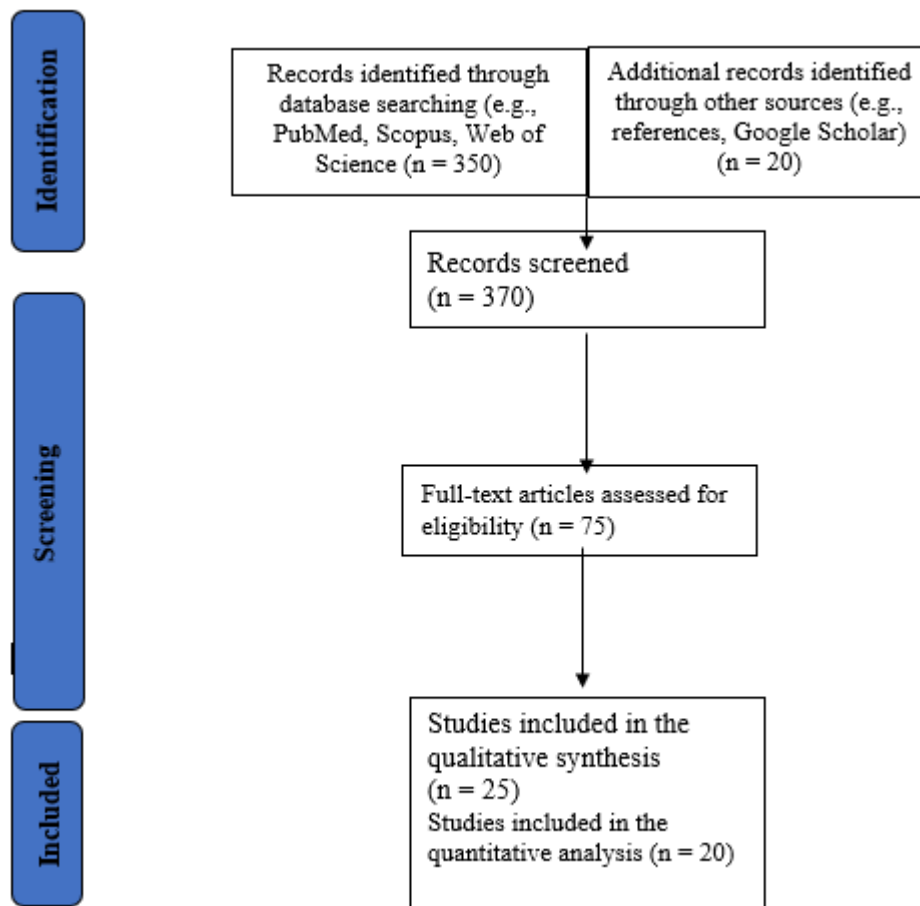


Figure 1. PRISMA flow chart for study selection



3.2 Study Characteristics

The PRISMA flowchart provides a detailed outline of the study selection process for this systematic review on AI's impact on clinical decision-making in healthcare. A total of 45 studies were included, with 25 studies contributing to the qualitative synthesis and 20 studies included in the quantitative analysis. These studies were chosen based on their adherence to the inclusion and exclusion criteria, as well as their relevance to understanding AI applications in healthcare settings.

Studies Included in the Qualitative Synthesis

The 25 studies included in the qualitative synthesis focused on exploring the broader impacts of AI in clinical decision-making. These studies predominantly used observational designs, expert reviews, and narrative analyses to investigate the effects of AI technologies on healthcare practices. Key themes explored in these studies included the integration of AI into clinical decision-making processes, its role in supporting healthcare providers, and the influence of AI on patient outcomes. Many studies highlighted how AI systems, such as machine learning algorithms, helped clinicians make more accurate diagnostic decisions and develop personalized treatment plans. Additionally, several studies examined healthcare providers' perceptions of AI, including the trust placed in AI tools and concerns about their reliability or potential to replace human judgment. Some qualitative studies also addressed the barriers to AI adoption in healthcare, such as regulatory challenges, the need for clinician training, and resistance from healthcare staff.

Studies Included in the Quantitative Analysis

The systematic review incorporated a structured approach to evaluate the impact of Artificial Intelligence (AI) on clinical decision-making in healthcare. Out of 370 potential records identified through a comprehensive search of databases, including PubMed, 45 studies met the predefined inclusion criteria. These studies were categorized into two groups: 25 for qualitative synthesis and 20 for quantitative analysis. The transparent study selection process, illustrated using the PRISMA flowchart, ensured the inclusion of relevant and methodologically sound research.

The 20 studies included in the quantitative analysis primarily investigated AI's impact on clinical outcomes, economic efficiency, and operational performance. These studies utilized rigorous methodologies, such as randomized controlled trials and cohort studies, to provide empirical data. A significant portion of the research focused on diagnostic accuracy, particularly in medical imaging, pathology, and radiology. Compared to traditional methods, AI systems demonstrated higher diagnostic sensitivity, specificity, and overall accuracy, especially in detecting anomalies in radiology and oncology.



Several studies examined AI's economic impact, reporting cost savings and enhanced return on investment (ROI). By optimizing clinical workflows, AI reduced unnecessary tests and procedures, contributing to lower healthcare costs. Operational outcomes, such as expedited diagnosis and decision-making, further underscored AI's ability to enhance clinical efficiency. These findings are consistent with the growing evidence of AI's transformative role in streamlining healthcare delivery.

The 25 qualitative studies explored broader themes, including AI's integration into clinical workflows and perceptions among healthcare providers. AI technologies, particularly machine learning algorithms, were highlighted for their role in improving early disease detection and personalizing treatment plans. These applications were especially impactful in specialties requiring high diagnostic precision, such as oncology, cardiology, and radiology.

Healthcare providers expressed optimism regarding AI's potential benefits but raised concerns about trust, transparency, and reliance on algorithms. Many studies emphasized the importance of AI as a decision-support tool rather than a replacement for human expertise. Addressing these concerns is essential to foster trust and ensure seamless AI adoption..

The use of the PRISMA flowchart in this review highlights the rigor of the study selection process, ensuring that only the most relevant and methodologically sound studies were included. By categorizing studies into qualitative and quantitative analyses, the review offers a comprehensive understanding of both the broader implications and the measurable effects of AI in clinical decision-making.

4.0 Discussion

Artificial Intelligence (AI) is rapidly transforming clinical decision-making across various healthcare settings, with numerous studies highlighting its potential to improve diagnostic accuracy, treatment planning, and overall patient outcomes. This discussion synthesizes the findings from the studies included in this review and examines the broader implications of AI in healthcare, exploring both the benefits and the challenges associated with its implementation

The systematic review aimed to evaluate the impact of Artificial Intelligence (AI) on clinical decision-making in healthcare by synthesizing both qualitative and quantitative evidence. A total of 45 studies were included in the review, with 25 contributing to the qualitative synthesis and 20 providing quantitative data on the effectiveness and economic impact of AI systems. The studies reviewed demonstrate a growing body of evidence supporting the positive influence of AI on clinical decision-making, with notable advancements in diagnostic accuracy, treatment efficiency, and healthcare cost reduction.

Artificial intelligence (AI) is increasingly recognized as a transformative force in healthcare, particularly in clinical decision-making, with its applications spanning diagnostics, treatment planning, and overall patient care. The findings synthesized in this review highlight AI's



growing integration into healthcare and the potential benefits and challenges associated with its implementation. This systematic review evaluated the impact of AI on clinical decision-making through qualitative and quantitative analyses. A total of 45 studies were included, with 25 contributing to qualitative insights and 20 providing quantitative data. These studies collectively emphasize AI's ability to enhance diagnostic precision, streamline treatment processes, and reduce healthcare costs.

Qualitative studies consistently underscore the adoption of AI technologies, particularly machine learning algorithms, in medical specialties such as radiology, oncology, and cardiology, where accuracy is critical. These technologies have shown remarkable efficacy in early disease detection, enabling timely interventions that significantly improve patient outcomes. For example, AI-driven diagnostic tools can detect subtle patterns in imaging data, often beyond human perceptual capacity, thereby enhancing early-stage diagnosis. Furthermore, AI's ability to analyze vast datasets has facilitated personalized treatment plans, aligning care with individual patient needs. Healthcare providers' perceptions of AI form another critical theme in the qualitative data. While optimism surrounds AI's potential, concerns about trust, errors, and the risk of diminished clinician autonomy persist. Many studies emphasize the importance of AI as a decision-support tool rather than a replacement for human judgment, advocating for transparency in AI algorithms to foster confidence and acceptance among healthcare professionals.

The quantitative findings provide robust empirical support for AI's role in improving clinical and economic outcomes. Studies in diagnostic imaging, for instance, demonstrate AI's superiority in sensitivity and specificity when detecting conditions such as tumors and fractures. These capabilities not only improve diagnostic accuracy but also reduce the time required for diagnosis, expediting treatment initiation and enhancing patient care. Economic analyses further validate AI's cost-effectiveness in healthcare. By optimizing resource allocation, minimizing errors, and reducing unnecessary diagnostic procedures, AI contributes to substantial cost savings. For instance, studies reveal significant reductions in misdiagnoses and follow-up treatments, resulting in favorable return on investment, particularly in large-scale healthcare systems.

Despite these advancements, barriers to AI adoption persist. Regulatory challenges, the need for specialized training, and resistance to change among healthcare providers are frequently cited obstacles. Ethical concerns, including data privacy and algorithmic bias, remain pressing issues. Addressing these barriers is essential for ensuring the equitable and responsible integration of AI into clinical workflows. The versatility of AI in healthcare is evident in its application across diverse specialties. In oncology, AI excels in early cancer detection through advanced image analysis, improving the likelihood of successful treatment outcomes. In cardiology, AI systems have demonstrated proficiency in interpreting ECG data and predicting



cardiac events, enabling proactive interventions. Such applications underline AI's role in enhancing clinical accuracy and decision-making efficiency, thereby reducing patient wait times and improving diagnostic precision.

AI also holds promise for addressing healthcare disparities, particularly in underserved areas. Through telemedicine and mobile health technologies, AI expands access to high-quality care in remote and rural settings, where specialized healthcare providers may be scarce. Several studies highlight AI's role in supporting real-time decision-making in these regions, thereby democratizing healthcare access and improving outcomes for marginalized populations. However, challenges in data quality and algorithm generalizability remain. Many AI systems perform optimally only within the demographic contexts of their training datasets. Studies emphasize the need for inclusive, representative data to enhance AI's effectiveness across diverse populations and prevent unintended biases. Continued research and refinement are essential to ensure that AI tools meet the needs of all patients equitably.

The evidence presented in this review demonstrates AI's significant potential to revolutionize clinical decision-making. While challenges remain, addressing ethical, regulatory, and training-related concerns will be critical to unlocking AI's full potential. By continuing to refine AI systems and ensuring their equitable application, the healthcare sector can harness AI to deliver improved patient outcomes, cost efficiencies, and greater access to care.

4.2 Limitations of the Review.

Limitation:

This systematic review has several limitations that should be considered. First, the search strategy may not have captured all relevant studies due to the exclusion of alternative AI terminology, such as decision trees or deep neural networks. This could mean that some key studies were overlooked. Additionally, restricting the review to articles published in English and within the last five years may have introduced language bias and excluded valuable research published in other languages or earlier studies with foundational insights.

Another limitation is the exclusion of studies that did not provide quantitative economic outcomes. While this focused the review on the economic impact of AI, it may have excluded important qualitative findings related to AI implementation. The review also faced challenges due to the heterogeneity of study designs, with different methodologies, populations, and healthcare settings making comparisons difficult.

The generalizability of the findings is also limited, as most studies focused on specific AI applications, such as medical imaging or oncology, which may not reflect broader healthcare contexts. Additionally, many studies were conducted in high-income countries, so the results may not apply to lower-resource settings. Data quality was another concern, with some studies



suffering from small sample sizes or methodological weaknesses, affecting the reliability of conclusions.

Finally, ethical and regulatory considerations surrounding AI in healthcare were not fully explored. Issues like data privacy, algorithmic bias, and the need for regulatory frameworks were only partially addressed. Future research should address these gaps to provide a more comprehensive understanding of AI's role in clinical decision-making.

5.0 Conclusion

This systematic review has provided valuable insights into the impact of Artificial Intelligence (AI) on clinical decision-making in healthcare. The evidence gathered from 45 studies demonstrates that AI is progressively enhancing clinical practices, particularly in diagnostic accuracy, personalized treatment, and healthcare efficiency. The positive outcomes highlighted in the studies underscore AI's potential to revolutionize clinical decision-making, offering significant benefits such as earlier disease detection, improved treatment plans, and optimized resource management.

AI has proven especially effective in medical fields like radiology, oncology, and cardiology, where diagnostic precision is critical. Several studies have shown that AI systems, particularly machine learning algorithms, can outperform human clinicians in tasks such as analyzing medical images or predicting patient outcomes. These advancements contribute not only to improved clinical outcomes but also to the reduction of diagnostic errors and the timely initiation of treatment, which can significantly enhance patient survival rates.

In addition to improving clinical outcomes, AI has also demonstrated substantial economic benefits. Numerous studies have highlighted AI's cost-effectiveness, particularly in reducing unnecessary tests and optimizing resource allocation. AI-driven systems have led to significant cost savings by streamlining workflows, minimizing human errors, and improving the efficiency of medical procedures. As healthcare systems face increasing financial pressures, AI presents an attractive solution to balance cost and quality, with many studies reporting a favorable return on investment.

Despite the promising evidence, several challenges to AI integration in clinical decision-making remain. Concerns about data privacy, algorithmic bias, and transparency in AI models are prevalent across the studies reviewed. Healthcare providers expressed a need for clear guidelines and regulations to ensure that AI systems are ethically developed and implemented. Addressing these concerns is crucial for fostering trust in AI technologies and ensuring their responsible use in clinical settings.

Moreover, the adoption of AI in healthcare is hindered by barriers such as resistance from healthcare providers, the need for specialized training, and regulatory hurdles. While some healthcare professionals remain optimistic about AI's potential, others are wary of its impact



Received: 16-09-2024

Revised: 05-10-2024

Accepted: 22-11-2024

on their roles and decision-making autonomy. Overcoming these barriers requires robust training programs, clear communication about AI's role as a decision-support tool, and the establishment of comprehensive policies to guide its implementation.

In conclusion, AI has the potential to significantly enhance clinical decision-making by improving diagnostic accuracy, personalizing treatment, and driving economic efficiencies in healthcare systems. However, for AI to be successfully integrated into clinical practice, it is essential to address the challenges surrounding trust, data security, and regulatory standards. Continued research and development, alongside the creation of ethical and practical frameworks for AI deployment, will be key to unlocking its full potential in healthcare. The findings of this review provide a foundation for further exploration and highlight the need for ongoing efforts to integrate AI in ways that maximize patient benefits and healthcare system sustainability.

Acknowledgement

The authors would like to thank the reviewers for their time and effort in reviewing the manuscript.

Author Contributions

All authors contributed equally to every aspect of this study, from the initial conceptualization and design to the final manuscript preparation. They were all actively involved in data collection, analysis, and interpretation, ensuring the study's rigor and validity. Each author participated in writing, reviewing, and revising the manuscript, offering critical insights and feedback throughout the process. The authors worked collaboratively to ensure the accuracy, transparency, and quality of the research, and each one approved the final version of the manuscript, taking collective responsibility for its integrity and outcomes.

Informed Consent Statement

Not applicable

Funding

No funding received for this study

Conflict of interest

The author declare that there is no competing of interests

Availability of Data and Materials:

The lead author affirms that this manuscript provides an honest, accurate, and transparent representation of the study being reported. No significant aspects of the study have been



omitted, and any deviations from the originally planned study (and, if applicable, registered protocol) have been thoroughly explained.

References

1. Berge, Keith H., Deborah R. Maiers, David P. Schreiner, Stephen M. Jewell, Perry S. Bechtle, Darrell R. Schroeder, Susanna R. Stevens, and William L. Lanier. 2005. Resource Utilization and Outcome in Gravely Ill Intensive Care Unit Patients with Predicted In-Hospital Mortality Rates of 95% or Higher by APACHE III Scores: The Relationship with Physician and Family Expectations. *Mayo Clinic Proceedings* 80 (2): 166–173. <https://doi.org/10.4065/80.2.166>.
2. Burrell, Jenna. 2016. How the Machine ‘Thinks’: Understanding Opacity in Machine Learning Algorithms. *Big Data & Society* 3 (1): 1–12. <https://doi.org/10.1177/2053951715622512>.
3. Dagliati, Arianna, Simone Marini, Lucia Sacchi, Giulia Cogni, Marsida Teliti, Valentina Tibollo, Pasquale De Cata, Luca Chiovato, and Riccardo Bellazzi. 2018a. Machine Learning Methods to Predict Diabetes Complications. *Journal of Diabetes Science and Technology* 12 (2): 295–302. <https://doi.org/10.1177/1932296817706375>.
4. Dagliati, Arianna, Valentina Tibollo, Lucia Sacchi, Alberto Malovini, Ivan Limongelli, Matteo Gabetta, Carlo Napolitano, et al. 2018b. Big Data as a Driver for Clinical Decision Support Systems: A Learning Health Systems Perspective. *Frontiers in Digital Humanities* 5: 8. <https://doi.org/10.3389/fdigh.2018.00008>.
5. El-Sappagh, Shaker, and Mohammed Elmogy. 2016. A Decision Support System for Diabetes Mellitus Management. *Diabetes Case Reports* 1:102. <https://doi.org/10.4172/2572-5629.1000102>.
6. Goodman, Kenneth W. 2007. Ethical and Legal Issues in Decision Support. In *Clinical Decision Support Systems: Theory and Practice*, edited by Eta S. Berner, 126–139. New York: Springer New York.
7. Goodman, Kenneth W. 2010. Ethics, Information Technology, and Public Health: New Challenges for the Clinician-Patient Relationship. *The Journal of Law, Medicine & Ethics* 38 (1): 58–63. <https://doi.org/10.1111/j.1748-720X.2010.00466.x>.
8. Goodman, Kenneth W. 2015. *Ethics, Medicine, and Information Technology: Intelligent Machines and the Transformation of Health Care*. Cambridge: Cambridge University Press.
9. Guo, Elizabeth, Douglas B. Jacobs, and Aaron S. Kesselheim. 2017. Eliminating Coverage Discrimination Through the Essential Health Benefit's Anti-Discrimination



Received: 16-09-2024

Revised: 05-10-2024

Accepted: 22-11-2024

- Provisions. *American Journal of Public Health* 107 (2): 253–254. <https://doi.org/10.2105/AJPH.2016.303563>.
10. Information Commissioner's Office. 2017. Big Data, Artificial Intelligence, Machine Learning and Data Protection. <https://ico.org.uk/media/for-organisations/documents/2013559/big-data-ai-ml-and-data-protection.pdf>. Accessed 19 Feb 2019.
 11. Institute of Medicine. 2007. The Learning Healthcare System. <https://www.ncbi.nlm.nih.gov/books/NBK53494/>. Accessed 9 Feb 2019.
 12. Jiang, Fei, Yong Jiang, Hui Zhi, Yi Dong, Hao Li, Sufeng Ma, Yilong Wang, Qiang Dong, Haipeng Shen, and Yongjun Wang. 2017. Artificial Intelligence in Healthcare: Past, Present and Future. *Stroke and Vascular Neurology* 2 (4): 230–243. <https://doi.org/10.1136/svn-2017-000101>.
 13. Kass, Nancy E., Ruth R. Faden, Steven N. Goodman, Peter Pronovost, Sean Tunis, and Tom L. Beauchamp. 2013. The Research-Treatment Distinction: A Problematic Approach for Determining Which Activities Should Have Ethical Oversight. *Hastings Center Report* 43 (s1): S4–S15. <https://doi.org/10.1002/hast.133>.
 14. Lim, Hannah Yeefen. 2017. *Data Protection in the Practical Context – Strategies and Techniques*. Singapore: Academy Publishing Singapore.
 15. McGibbon, E., J. Etowa, and C. McPherson. 2008. Health-Care Access as a Social Determinant of Health. *The Canadian Nurse* 104 (7): 22–27.
 16. National Academies of Science, Engineering, and Medicine. 2017. *Communities in Action: Pathways to Health Equity*. Washington DC: The National Academies Press. <https://doi.org/10.17226/24624>.
 17. Niewinski, G., M. Starczewska, and A. Kanski. 2014. Prognostic Scoring Systems for Mortality in Intensive Care Units–The APACHE Model. *Anaesthesiology Intensive Therapy* 46 (1): 46–49. <https://doi.org/10.5603/ait.2014.0010>.
 18. Rosenbaum, Sara. 2009. Insurance Discrimination on the Basis of Health Status: An Overview of Discrimination Practices, Federal Law, and Federal Reform Options. *The Journal of Law, Medicine & Ethics* 37 (Suppl 2): 101–120. <https://doi.org/10.1111/j.1748-720X.2009.00423.x>.
 19. Salerno, Jennifer H., Bartha M. Knoppers, Lisa M. Lee, Wayway M. Hlaing, and Kenneth W. Goodman. 2017. Ethics, Big Data and Computing in Epidemiology and Public Health. *Annals of Epidemiology* 27 (5): 297–301. <https://doi.org/10.1016/j.annepidem.2017.05.002>.



Received: 16-09-2024

Revised: 05-10-2024

Accepted: 22-11-2024

20. Tiller, Jane, Susan Morris, Toni Rice, Krystal Barter, Moeen Riaz, Louise Keogh, Martin B. Delatycki, Margaret Otlowski, and Paul Lacaze. 2019. Genetic Discrimination by Australian Insurance Companies: A Survey of Consumer Experiences. *European Journal of Human Genetics*. <https://doi.org/10.1038/s41431-019-0426-1>.
21. Wagholikar, Kavishwar B., Vijayraghavan Sundararajan, and Ashok W. Deshpande. 2012. Modeling Paradigms for Medical Diagnostic Decision Support: A Survey and Future Directions. *Journal of Medical Systems* 36 (5): 3029–3049. <https://doi.org/10.1007/s10916-011-9780-4>.
22. Xafis, Vicki, G. Owen Schaefer, Markus K. Labude, Iain Brassington, Angela Ballantyne, Hannah Yeefen Lim, Wendy Lipworth, Tamra Lysaght, Cameron Stewart, Shirley Hsiao-Li Sun, Graeme T. Laurie, and E. Shyong Tai. 2019. An Ethics Framework for Big Data in Health and Research. *Asian Bioethics Review* 11 (3). <https://doi.org/10.1007/s41649-019-00099-x>.
23. Yu, Peter Paul. 2015. Knowledge Bases, Clinical Decision Support Systems, and Rapid Learning in Oncology. *Journal of Oncology Practice* 11 (2): e206–e211. <https://doi.org/10.1200/jop.2014.000620>.