Artificial Intelligence in Health Economics: Opportunities and Challenges for the Future. A Targeted Literature Review.

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Background

- Artificial Intelligence (AI) is poised to significantly transform healthcare systems worldwide, with profound implications for health economics [1-2].
- As healthcare expenditures continue to rise due to aging populations, chronic disease prevalence, and technological advancements, stakeholders are increasingly looking to AI as a means to enhance efficiency, reduce costs, and improve patient outcomes [1-2].
- AI technologies including machine learning, natural language processing, and predictive analytics are being integrated across clinical, administrative, and policy-making levels of health systems, with measurable effects on efficiency and quality of care [1-2].
- Despite growing adoption, the economic value of AI in healthcare remains unevenly assessed across regions and applications, highlighting the need for synthesized evidence on both opportunities and limitations from a health economics perspective.

Objective

The objective of the current study was to evaluate the economic implications of AI integration in healthcare, with a focus cost-efficiency, resource optimization, healthcare equity, and impact on insurance and reimbursement frameworks. This targeted literature review synthesizes existing evidence to support policy development and promote economic sustainability in AI-enabled healthcare systems.

Methods

- A targeted literature review was conducted using PubMed, Scopus, and Web of Science databases, covering studies published up to May 2025. Supplementary grey literature sources (e.g., policy reports, institutional reviews) were also reviewed to capture comprehensive insights.
- After conducting a literature search, identified studies were reviewed to remove duplicates. The remaining studies were then independently screened by two reviewers based on predetermined inclusion criteria using the PICOS framework (Population, Interventions, Comparators, Outcomes, and Study Design). The PICOS criteria used in the search strategy are detailed in Table 1.
- A standardized data extraction form, developed for the purpose of this review, was used by the same two reviewers to independently extract data. A third reviewer, where necessary, was involved to resolve potential discrepancies on extracted data between the two reviewers.
- This extraction form was designed to capture information concerning authors, publication year, study design, year of data collection, as well as the key economic and policy implications of AI deployment in healthcare of each study.

Table 1: Study selection criteria considered in the search strategy

	Inclusion criteria	Exclusion criteria
Population	-	-
Interventions	• Explicit focus on AI applications in health economics	-
Comparators	-	-
Outcomes	• Economic indicators (e.g., cost-efficiency, resource use, reimbursement), equity/access impacts	-
Study design/type	• Systematic reviews, health economic evaluations, modeling studies, policy analyses	• Non-healthcare AI applications (e.g., supply chain, finance) • Purely technical AI development without health economic evaluation • Comments
Language restrictions	• English language publications	-
Date of publication	• Studies published until June 2025	-
Countries	-	-

Results

- Six studies[3-8] met inclusion criteria and comprised economic modeling analyses, and policy evaluations published between 2021 and 2025, covering diverse geographic regions including the U.S., UK, EU, India, and Saudi Arabia
- Most studies focused on the economic efficiency of AI in diagnostics, treatment, and administration, with attention to policy readiness, equity, and methodological transparency (Table 2).

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Results

- **Cost-Efficiency and Resource Allocation**
  - ✓AI's ability to process vast amounts of data and identify patterns can lead to more efficient resource allocation in healthcare. By predicting patient needs and optimizing scheduling, AI can reduce unnecessary hospital admissions and streamline care pathways. For instance, predictive analytics can identify high-risk patients, enabling early interventions that prevent costly complications [6].
  - ✓Moreover, AI-driven tools can assist in managing healthcare supply chains, ensuring that resources such as medications and equipment are allocated where they are most needed. This optimization can lead to significant cost reductions and improved patient care quality. [8], AI-enabled supply chain optimization in hospitals could lead to substantial cost saving annually by reducing waste and improving procurement strategies [3,8].

Table 2: Characteristics of included studies

Study	Country/Region	Study Design	Focus Area	Key Findings	Funding
Khanna et al. (2022) [6]	USA & India	Comparative modeling study using cost-effectiveness analysis	Cost-efficiency of AI across diagnostics vs. therapeutic applications	AI-based therapeutic guidance yields better cost-effectiveness ratios than diagnostic-only use; major gains in oncology and cardiology.	Yes (Public health institutes)
Alnasser et al. (2023) [3]	Saudi Arabia	Systematic review	Economic impact of AI on healthcare costs, efficiency, and access	Annual U.S. cost savings projected at $200–360B through improved accuracy, reduced duplication, and automation.	Yes (Public sources)
Vithlani et al. (2023) [7]	UK	Systematic review	Methodological consistency in economic evaluations of AI interventions	Lack of standard economic metrics (e.g., ICERs, QALYs) and heterogeneity in model structures limit generalizability.	Yes (NIHR & UKRI)
Chen et al. (2021) [4]	USA	Narrative review and theoretical analysis of AI fairness	Ethical concerns: algorithmic bias and its health economic consequences	Data bias and model opacity can lead to unequal resource distribution and incorrect prioritization in economic algorithms.	No funding disclosed
McKinsey & Co. (2024) [8]	USA (Global Scope)	Market analysis report using forecasting models and simulations	Forecast of AI-enabled healthcare savings and value-generation opportunities	Predictive analytics and clinical workflow automation can reduce waste, improve provider efficiency, and generate massive macroeconomic value.	Yes (Corporate internal report)
European Commission (2025) [5]	European Union	Policy landscape and technical white paper with EU case studies	Regulatory frameworks, data governance, and health equity in AI adoption	Regulatory gaps exist in transparency and interoperability; policy supports are needed for ethical and equitable implementation.	Yes (EU-funded policy initiative)

- **AI-Driven Diagnostics, Treatment Planning, and Administrative Automation**
  - ✓AI has demonstrated remarkable capabilities in diagnostics, often matching or surpassing human experts in interpreting medical images and identifying diseases [5].
  - ✓These advancements can lead to earlier diagnoses, reducing the need for expensive treatments in advanced disease stages. In treatment planning, AI can analyze patient data to recommend personalized therapies, improving outcomes and minimizing trial-and-error approaches [5].
  - ✓Additionally, automating administrative tasks such as billing, coding, and appointment scheduling can reduce overhead costs and administrative burdens on healthcare providers. Labor market implications are also significant; while AI may reduce demand for some administrative roles, it could increase the need for data scientists and AI-literate clinicians [5].
- **Impacts on Health Insurance Models and Reimbursement Systems**
  - ✓AI's predictive capabilities can transform health insurance by enabling more accurate risk assessments and personalized premium calculations. Insurers can leverage AI to identify fraud, optimize claims processing, and develop value-based reimbursement models that reward outcomes rather than services rendered [7].
  - ✓Changes in underwriting and actuarial practices can make insurance more dynamic but also raise ethical concerns. AI-driven premium pricing could inadvertently penalize individuals based on health data that reflects social determinants of health [7].
  - ✓Furthermore, both public and private insurers will need to adapt their reimbursement strategies to account for AI-supported diagnostics and treatments, ensuring that such services are fairly compensated and widely accessible [7].
- **Health Equity, Access, and Policy Implications**
  - ✓While AI has the potential to improve healthcare access and equity, there is a risk that it may inadvertently widen disparities if not implemented thoughtfully [4].
  - ✓For instance, AI systems trained on non-representative data may perform poorly for underrepresented populations, leading to misdiagnoses or inadequate treatment recommendations. To mitigate these risks, policymakers must establish guidelines that promote inclusive data collection, algorithm transparency, and equitable access to AI technologies [4].
- **Ethical and Regulatory Challenges**
  - ✓The integration of AI into healthcare raises several ethical and regulatory concerns. Issues such as data privacy, algorithmic bias, and the "black box" nature of some AI systems necessitate robust oversight and governance frameworks. The European Union's General Data Protection Regulation provides a foundation for data protection, but additional regulations specific to AI in healthcare may be required [5]

Conclusions

- **AI has a substantial potential to reshape health economics by enhancing efficiency, reducing resource waste, and enabling personalized care delivery.**
- **However, unlocking these benefits depends on robust regulatory oversight, comprehensive data management strategies, and the development of equitable policy frameworks.**
- **To fully realize AI's economic value in healthcare, policymakers must address critical challenges such as algorithmic transparency, ethical accountability, and health equity. Strategic investments in digital infrastructure, regulatory capacity, and interdisciplinary workforce training are essential prerequisites for building sustainable, value-driven, AI-enabled healthcare systems.**