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The Cost Reduction of Artificial Intelligence-Based Healthcare for Clinical Drug Use : A Literature Review

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Abstrak

Kecerdasan Buatan (AI) berkembang dari kerangka kerja eksperimental menjadi alat klinis yang penting, sehingga sangat penting untuk menilai kelayakan ekonomi dan klinisnya untuk keberlanjutan penggunaan obat. Tinjauan literatur ini mengkaji pengurangan biaya dan dampak AI dalam manajemen pengobatan secara klinis. Sesuai dengan pedoman PRISMA 2020, sembilan studi kredibel yang diterbitkan antara tahun 2021 dan 2026 disintesis dari basis data termasuk PubMed, Scopus, dan Google Scholar. Temuan tersebut diorganisasikan ke dalam tiga dimensi utama, yaitu keamanan kepatuhan pengobatan, optimalisasi sumber daya ekonomi, dan sinergi manusia-AI. Hasilnya menunjukkan bahwa keamanan kepatuhan pengobatan ditunjukkan melalui peran AI dalam mendeteksi interaksi obat (dengan *ChatGPT-4.0*) serta menurunkan risikonya sebesar 15,2%, meningkatkan kepatuhan terapi terutama pengobatan TB dengan *AICure*, serta menurunkan risiko rawat inap melalui dukungan keputusan klinis. Optimalisasi sumber daya ekonomi tercermin dari penurunan biaya pengobatan sebesar 17.3-17.4% dari 2,150 pasien dengan risiko tinggi, serta pemanfaatan input klinis berbiaya rendah tanpa mengorbankan akurasi. Sementara itu, sinergi manusia dan AI menegaskan pentingnya kolaborasi antara tenaga kesehatan dan teknologi yang transparan untuk membangun kepercayaan, meskipun masih terdapat kesenjangan pemahaman. Secara keseluruhan, integrasi AI berkontribusi pada pelayanan kesehatan yang lebih aman, efisien, dan kolaboratif. Meskipun demikian, tinjauan ini menyoroti kesenjangan pengetahuan yang dapat menghambat adopsi teknologi ini. Temuan menunjukkan bahwa penerapan kecerdasan buatan secara signifikan meningkatkan kinerja di dunia farmasi sekaligus menurunkan biaya, namun keberhasilannya bergantung pada penyesuaian sistem agar sesuai dengan keterbatasan di kehidupan nyata.

Kata kunci: Berbasis kesehatan; Kecerdasan buatan; Penurunan biaya; Penggunaan obat; Tinjauan literatur.

Abstract

Artificial Intelligence (AI) evolves from experimental frameworks to essential clinical tools, it is crucial to assess its economic and clinical viability for drug use sustainability. This literature review examines the cost reduction and impact of AI in clinical drug management. In accordance with PRISMA 2020 guidelines, nine credible studies published between 2021 and 2026 were synthesized from databases including Pummeled, Scopus, and Google Scholar. The findings are organized into three key dimensions: medication safety and adherence, economic resource optimization, and human-AI synergy. The results indicate that medication adherence safety is demonstrated through the role of AI in detecting drug interactions (with ChatGPT-4.0), reducing the risk by 15.2% and improving therapy adherence, especially for TB treatment with AICure, and reducing the risk of hospitalization through clinical decision support. Economic resource optimization is reflected in a 17.3-17.4% reduction in treatment costs for 2,150 high-risk patients, along with the use of low-cost clinical inputs without compromising accuracy. Meanwhile, the synergy between humans and AI underscores the importance of transparent collaboration between healthcare professionals and technology to build trust, although gaps in understanding remain. Overall, AI integration contributes to safer, more efficient, and more collaborative healthcare. However, this review highlights knowledge gaps that may hinder the adoption of this technology. Findings indicate that the application of artificial intelligence significantly improves performance in the pharmaceutical industry while reducing costs, but its success depends on adapting the system to real-world constraints.

Keywords: *Artificial Intelligence; Clinical drug use; Cost reduction; Healthcare based; Literature review.*

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1. INTRODUCTION

Computational technology has transformed numerous scientific disciplines, including the pharmaceutical industry and the discovery of novel drug compounds [1]. Artificial intelligence represents one of the key drivers of this transformation. Artificial intelligence is a group of computer programs that assist machines do things that people usually have to think about. Deep learning and machine learning are two examples of these kinds of methods. Many healthcare organizations employ these two types of AI for things like predictive analytics, helping with diagnosis, and generating individualized treatment plans [2]. Generative AI, which uses models that can create new objects from data they have learned, is also becoming a useful tool in many sorts of therapy. AI is changing the way healthcare is delivered in a big way. AI-based technologies, which include machine learning, natural language processing, and deep learning, are being applied to address the critical issues in pharmaceuticals. For instance, artificial intelligence-based drug discovery platforms accelerate the identification of likely candidates by modelling complex systems of biology and estimating the drug–target interactions with greater precision [3]. Deep learning and machine learning have come a long way in the previous few years.

This evolution has resulted in the creation of sophisticated AI systems capable of enhancing diagnostic accuracy, customizing treatment strategies for individual patients, and optimizing healthcare operations [4]. These technologies are moving from being experimental prototypes to important parts of clinical practice, which means they are widely used and authorized, often with formal regulatory approval. They are ready to change patient care in many areas. A lot of individuals think that AI is good for health care [5]. It is really important to find out if AI can be used in clinical practice because it will have a big effect on pricing. AI has made a lot of progress in improving clinical outcomes, but healthcare professionals and politicians need to think about all the economic factors, like how affordable, sustainable, and cost-effective it is, before making decisions [6]. AI is being used in various areas of medicine, such as oncology, cardiology, radiology, and primary care. Deep learning algorithms utilized in medical imaging have exhibited diagnostic accuracies that are either equivalent to or exceed those of seasoned physicians. In oncology, AI-driven prognostic models have been utilized to improve the classification of patient risk, facilitating early interventions and more customized therapy alternatives. These discoveries indicate that AI may significantly influence treatment outcomes. Before these kinds of technologies can be employed, though, there needs to be strong proof that they work in the clinic and a full knowledge of how they will effects the economy [7].

In addition to being useful for treating patients, healthcare policymakers, administrators, and doctors need to consider about how cost-effective these possible AI applications will be [8]. The cost of health care has gone up because of changes in demographics, the increase of chronic diseases, and the problems with modern medical care [2]. Pharmacoeconomic studies are conducted to identify treatment options that provide greater therapeutic effectiveness at lower costs, thereby significantly improving cost-effectiveness [9]. Many people are interested in AI because it can help them save time and money. There are several sorts of economic assessments, and one of them is a detailed economic evaluation [7]. Full economic assessments look at all the costs and benefits of different treatments in great detail. For example, they look at how well a treatment works or quality-adjusted life years or QALY to determine the best way to use resources or get the most value for money. A budget impact study, on the other hand, only looks at how a new treatment might influence the amount of money in a certain healthcare setting or payer's budget. It does not explicitly evaluate therapeutic efficacy or larger socioeconomic effects [10]

2. METHOD

This literature review utilized Springer, Scopus, and Google Scholar, encompassing publications from 2021 to 2026. The search method used Boolean operators to link phrases like "Artificial intelligence" "AI" "Deep learning" "Machine Learning" and "Cost Reduction" and "Clinical Drug Use". Data extraction focused on study design, sample size, type of AI used, and main conclusions about how it affected clinical or operational outcomes. The procedure of choosing articles followed the PRISMA 2020 recommendations like figure 1.

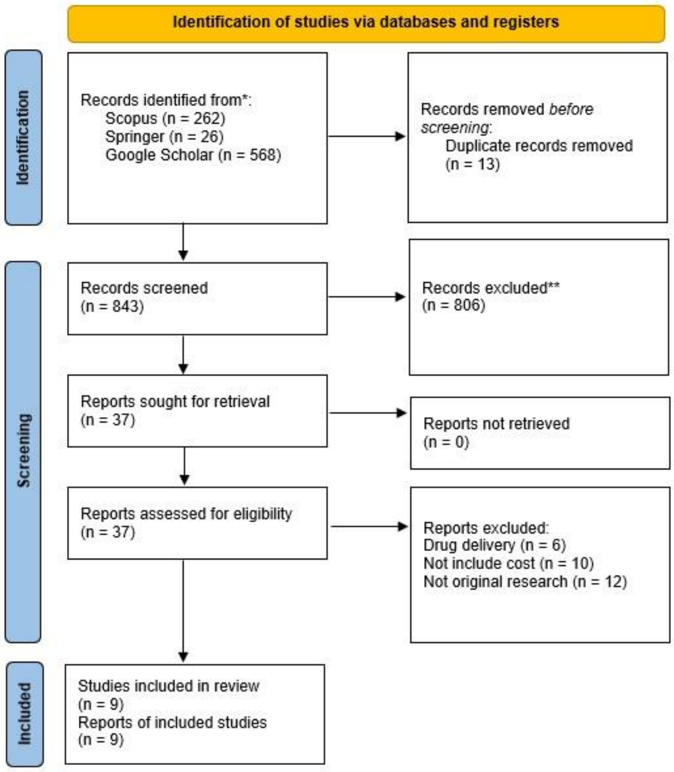

Figure1. Prisma Flowcart
Source: [11]

The first search found 856 articles. After taking out the duplicates, 843 articles were left for the screening stage. Screening by title and abstract resulted in 37 items considered pertinent. Next, a full-text review was done to make sure that the articles met the inclusion criteria. This led to the usage of 9 papers in this literature review.

3. RESULT

Data from each article was extracted using a data extraction sheet that included the author, year of publication, country, study design, population and sample size, study aim, kind of AI used, main finding and result conclucion. The extraction process was carried out to facilitate the grouping and analysis of findings from each study. Next, the collected data was synthesized descriptively to identify patterns of findings across studies by grouping the research based on main themes, such as the enhancement of medication safety and adherence through AI monitoring, the significant economic impact of AI-driven cost optimization, and the critical role of human-AI synergy and education in clinical settings. This approach was used to generate a structured understanding of AI contribution to reduce a cost of clinical drug use.

Table 1. Summary a Literatur Review

Author , year	Count ry	Study design	Population or sample size	Study aim	Kind of AI Used	Main findings	Result and Conclusion
[12]	USA	Explorat ory mixed subjects study	30 licensed pharmacists	To evaluate pharmacists' trust in automated pill verification and test whether displaying AI uncertainty information improves trust and	Bayesian Neural Network	Positioning AI pill verification as a safety tool that could reduce ADE-related costs, though no direct cost-effectiveness/ROI	AI uncertainty improves pharmacists' trust in automated pill verification and supports transparent

				trust calibration during medication dispensing verification		was calculated in this experiment.	AI-human collaboration.
[13]	Nepal	Cross-sectiona l study	301 patientsand 1551 prescribing drugs	Evaluate potential drug-drug interactions (pDDIs)	ChatGPT-4.0	ChatGPT-4.0 accurately identified pDDI occurrence (100%) that reduce a clinical cost	ChatGPT is not a substitute for specialized interaction checkers in critical decision-making
[14]	USA	Markov cohort model	(N=43) and historical DOT control (N=71)	Evaluate whether AiCure (automated AI monitoring of TB medication ingestion) is cost-effective vs traditional DOT in LA County, and quantify ICER and net monetary benefit	AiCure	Cost: AiCure was dominant (lower cost, higher QALYs). AiCure supports TB drug adherence by automated observation/confir mation of medication ingestion.	Conclusion: AI-based treatment monitoring (AiCure) is cost-effective and that monitoring could be support TB elimination goals
[15]	USA	compara tive evaluati on study	Trauma dataset: 14,463 ED admissions for traumatic injury	Develop and validate CoAI, a framework that selects high-information, low-cost features to enable accurate predictions under time/effort/financial constraints, especially in emergency/critical care	CoAI (Cost-aware AI): model-agnostic framewor k	Reduced cost to obtain risk inputs can enable earlier interventions, minimizes financial cost of tests using Medicare fee for service estimates.	CoAI shows that high accuracy clinical prediction is feasible with far fewer, cheaper-to-acquire inputs.
[16]	USA	quasi-experim ental	10.477 patients	Evaluate a clinical pharmacist-led, AI-supported medication adherence program on adherence, selected disease control measures and cost savings	AI-suppor ted analytics	pharmacist-led AI-supported, team-based program improved medication adherence, enhanced disease control	pharmacist-le d, AI-supported can reduced overall medical expenditures across a 10.477-patient population
[17]	Pakist an	Cross sectiona l survey study	Medical students and healthcare professional s	To assess awareness and perceptions of AI use in healthcare and clinical decision-making	Conceptua l AI knowledg e	Respondents showed limited understanding of AI applications in medication management, prescribing optimization, and cost containment	Knowledge gaps may hinder adoption of AI tools for rational drug use and cost-effective prescribing

[18]	Vietnam	narrative article	Not applicable	To outline how AI can help combat antimicrobial resistance (AMR) and increasing accuracy rate of lead compound identification at a much lower screening cost.	ClaSS, LIME	AI can support antimicrobial stewardship, design of new antimicrobials, and optimize antibiotic combinations	a multidisciplinary approach uniting clinical medicine and AI offers promising routes to mitigate AMR
[19]	USA	Retrospective predictive modeling study	1,171 patients	Predict 5-year hospitalization risk and evaluate how medication adherence and preventive care	Logistic Regression, Gradient Boosting, Random Forest, Artificial Neural Networks (ANN)	Low adherence defined as <80% refills, high medication adherence associated with 38.3% reduction in 5-year hospitalization risk.	Both medication adherence and preventive care significantly reduce hospitalization risk, and preventive care prompted by ML yields positive ROI and long-term cost savings
[20]	USA	Retrospective observational cohort	2,150 high-risk Medicaid members	Assess impact on actual claims of an AI-enabled telephonic targeting high-risk Medicaid members, measuring changes in cost and utilization	AI platform providing clinical decision support	Medication costs reduced 17.3–17.4%, most common medication actions were discontinuations (84.6%), AI-supported reconciliation targeted duplicate therapy and risk reduction serious DDIs ↓ 15.2%	AI-enhanced telephonic comprehensive medication management is associated with significant claims-based reductions in total and medication costs and decreases in acute utilization

This review synthesized nine studies examining AI applications across the medication-use pathway, including dispensing verification, drug–drug interaction (DDI) screening, adherence monitoring, antimicrobial stewardship, prescribing optimization, medication management, and risk prediction related to long-term utilization. The evidence base was methodologically diverse—ranging from exploratory mixed-methods work with pharmacists and cross-sectional analyses to retrospective cohorts, predictive modeling, comparative framework evaluation, economic simulation, and a narrative review. This heterogeneity broadens interpretive scope but limits direct comparability, as outcomes varied substantially (e.g., trust calibration metrics, predicted risk, modeled cost-effectiveness, simulated savings, and claims-based utilization/costs). To structure interpretation, findings are synthesized into three themes: (1) medication safety and risk prevention, (2) economic value and cost containment and (3) implementation readiness (trust, workflow fit, and workforce capability).

4. DISCUSSION

Theme 1. AI as a medication safety and risk prevention tool

Several studies emphasized AI as a mechanism for preventing avoidable medication related harm. In dispensing, according to [21] were evaluated automated pill verification using a Bayesian neural network and found that providing uncertainty information improved pharmacists' trust and trust calibration which are indicating that transparency can shape safer human and AI collaboration in verification tasks. At prescribing, [13] assessed ChatGPT-4.0 for identifying potential drug drug interactions and reported strong detection of potential drug drug interactions occurrence in their dataset, while explicitly cautioning that such tools should not replace specialized interaction checkers for critical decisions. At a systems level, [18] described AI supported antimicrobial stewardship, design of new antimicrobials, and optimize antibiotic combinations. In this case, AI can help combat antimicrobial resistance (AMR) and increasing accuracy rate of lead compound identification at a much lower screening cost. In claims-based medication management, [20] reported reductions in serious drug drug interactions risk and utilization alongside medication cost reductions, consistent with risk-focused medication actions (e.g., discontinuations and reconciliation) as key operational levels.

Across these studies, a consistent implication is that safety gains depend on how AI is embedded into clinical and pharmacy decision-making rather than on prediction alone. Following by [21] are particularly informative because they show that uncertainty communication is not merely a usability feature but can function as a safety control by reducing overreliance and supporting calibrated oversight. By comparison, [13] illustrate the governance tension introduced by general purpose systems: even strong screening performance does not justify unsupervised decision authority, especially when validated drug-information databases remain the standard for high-stakes medication safety decisions. Meanwhile, the stewardship framing in [18] broadens the safety concept from individual patient interactions to population-level medication appropriateness, where AI may indirectly prevent harm by supporting more rational antimicrobial use. Together, these findings suggest that AI's most defensible near-term clinical value lies in risk detection and harm prevention, provided outputs are transparent and verification pathways remain explicit.

Theme 2. Economic value and cost containment

Five studies foregrounded economic outcomes or resource constraints. Modeled the cost-effectiveness of an AI-based TB ingestion monitoring platform (AiCure) versus traditional directly observed therapy, concluding that the AI approach was economically favorable (lower cost and higher QALYs in the model) [14]. Reported by [20] real-world claims-based reductions in medication costs (approximately 17%) and reduced acute utilization following an AI-enabled telephonic medication management program for high-risk Medicaid members. According to [19] applied predictive modeling to five year hospitalization risk and reported that higher medication adherence was associated with substantially lower hospitalization risk, framing machine learning enabled preventive care as a pathway to positive ROI and long-term savings. Finally, [15] presented a cost-aware AI framework (CoAI) showing that predictive performance can be retained while using fewer, lower cost features, explicitly accounting for real world costs of obtaining clinical inputs. A clear gradient emerges regarding the strength and immediacy of economic evidence. Claims-based findings by [20] provide the most practice proximal signal that AI-supported medication management can translate into measurable reductions in spending and utilization. In contrast, modeled cost-effectiveness [14] and simulation-based prescribing savings offer compelling projections but require prospective validation to confirm that savings persist under real prescribing behavior, formulary constraints, and implementation variability. Following by [19] add a longer horizon perspective, linking adherence and preventive care with reduced hospitalization risk, suggesting that AI's economic value may be realized through avoided downstream events, not only lower drug acquisition costs. Importantly, CoAI shifts economic thinking from AI as an added layer to AI designed for feasibility, underscoring that models demanding expensive or slow to obtain inputs may fail deployment even if technically accurate [15]. Collectively, the theme supports the plausibility of AI-driven savings through multiple pathways such as substitution, deprescribing, adherence/monitoring, risk prediction, and reduced diagnostic/input burden, while highlighting the need to differentiate projected from realized savings.

Theme 3. Implementation readiness: trust, governance, workflow fit, and workforce capability

Implementation determinants appeared across studies even when not the central endpoint. demonstrated that uncertainty disclosure improves trust calibration in pharmacist verification workflows. Governance needs by advising that LLM outputs should not replace established interaction checkers for critical decisions [13]. [17] reported limited awareness and understanding of AI applications among medical students and healthcare professionals, suggesting education and literacy gaps may impede adoption of AI for rational prescribing and cost containment. In addition, feasibility-oriented designs were evident in approaches that minimized workflow disruption (drug substitution recommender) or explicitly constrained the cost of required inputs (cost-aware AI) [15]. These findings reinforce that AI adoption is a socio-technical challenge: performance, safety, and economic value are mediated by usability, governance, and workforce readiness. Uncertainty-aware interfaces illustrate a practical implementation lever, designing for calibrated reliance rather than maximizing automation [22]. The LLM-based DDI evidence further implies that governance must specify scope of use and verification requirements to prevent unsafe substitution of validated resources [13]. The educational deficits reported by [17] suggest that training is not optional without baseline AI literacy, clinicians may either distrust useful tools or overtrust outputs they cannot properly contextualize. Finally, workflow fit and resource realism [15] indicate that feasibility driven design may be a stronger predictor of adoption than marginal gains in model accuracy.

5. CONCLUSION

Overall, the reviewed evidence from nine studies suggests that artificial intelligence can meaningfully enhance medication-related care when it is deployed as a clinical support tool rather than as an independent decision-maker. The most consistent and substantive impact of AI lies in improving medication safety, particularly through earlier risk detection, reduction of medication errors, identification of unsafe drug combinations, and promotion of more rational antimicrobial use. These safety gains represent the primary mechanism through which AI may also contribute to downstream reductions in adverse drug events and avoidable healthcare utilization. However, the effectiveness of AI is not determined by technical accuracy alone. Its clinical value is strongly shaped by design and governance factors, including how recommendations are communicated, how uncertainty is conveyed, and how outputs are verified within existing professional standards. Economic benefits, such as cost containment and resource optimization, appear plausible but remain unevenly supported, with real-world, claims-based evidence being more robust than modeled projections. Collectively, the findings indicate that AI can support both safety and efficiency in medication management, provided it is transparently designed, well-integrated into clinical workflows, and overseen within strong governance frameworks.

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APPENDIX

This appendix provides a structured overview of the nine primary sources analyzed in this review, detailing the AI technologies employed and their primary clinical or economic outcomes.

No.	*Author (Year)*	*AI Technology Used*	*Key Findings / Outcome*
1	[12]	Bayesian Neural Network	Improved trust in pill verification via uncertainty transparency.
2	[13]	ChatGPT-4.0	100% accuracy in identifying pDDI occurrences.
3	[14]	Computer Vision & ML (AiCure)	"Dominant" cost-effectiveness; improved TB drug adherence.
4	[15]	Cost-aware AI (CoAI)	High-accuracy prediction using low-cost, minimal inputs.

5	[16]	AI-supported analytics	Increase medication adherence program, selected disease control measures and cost savings
6	[17]	Conceptual ML/DL	Identified significant knowledge gaps among medical students.
7	[18]	ML, DL, Random Forest	Optimized antibiotic selection to combat antimicrobial resistance.
8	[19]	ANN, Random Forest, Logistic Reg.	38.3% reduction in hospitalization via adherence monitoring.
9	[20]	AI Clinical Decision Support	17.3–17.4% reduction in medication costs for high-risk members.

REFERENCES

[1] S. R. Fajarini, S. Amin, Ansyirohanisa, Beni Maulana Habib, and Muhammad Rahmat Darmawan, "From Laboratory to Algorithm: The Role of Computational Methods in New Drug Design Discovery in the Digital Era," *JURNAL FARMASIMED (JFM)*, vol. 8, no. 1, pp. 1–10, Nov. 2025, doi: 10.35451/8f4xh746.

[2] Y. A. Fahim, I. W. Hasani, S. Kabba, and W. M. Ragab, "Artificial intelligence in healthcare and medicine: clinical applications, therapeutic advances, and future perspectives," *Eur. J. Med. Res.*, vol. 30, no. 1, Sep. 2025, doi: 10.1186/s40001-025-03196-w.

[3] J. P. S. Saini, A. Thakur, and D. Yadav, "AI-driven innovations in pharmaceuticals: optimizing drug discovery and industry operations," Feb. 03, 2025, *Royal Society of Chemistry*. doi: 10.1039/d4pm00323c.

[4] A. Agarwal, G. Singh, S. Jain, and P. Mittal, "Beyond boundaries: Charting the frontier of healthcare with big data and ai advancements in pharmacovigilance," *Health Sciences Review*, vol. 14, 2025, doi: 10.1016/j.hsr.2025.100214.

[5] A. Babel, R. Taneja, F. Mondello Malvestiti, A. Monaco, and S. Donde, "Artificial Intelligence Solutions to Increase Medication Adherence in Patients With Non-communicable Diseases," Jun. 29, 2021, *Frontiers Media SA*. doi: 10.3389/fdgth.2021.669869.

[6] S. S. Alqahtani, S. J. Menachery, A. Alshahrani, B. Albalkhi, D. Alshayban, and M. Z. Iqbal, "Artificial intelligence in clinical pharmacy—A systematic review of current scenario and future perspectives," Jan. 01, 2025, *SAGE Publications Inc.* doi: 10.1177/20552076251388145.

[7] L. Nagendra, M. Chandran, and M. Hiligsmann, "The economic benefits of fracture prevention," 2025, *Taylor and Francis Ltd.* doi: 10.1080/14737167.2025.2539838.

[8] H. Allam, "Prescribing the Future: The Role of Artificial Intelligence in Pharmacy," Feb. 01, 2025, *Multidisciplinary Digital Publishing Institute (MDPI)*. doi: 10.3390/info16020131.

[9] July, S. T. Rahayu, and A. F. Khairani, "Cost-Effectiveness Analysis of Two or Three Dosage Forms of N-Acetylcysteine in ICU Patients with Pneumonia," *JURNAL FARMASIMED (JFM)*, vol. 8, no. 1, pp. 166–172, Nov. 2025, doi: 10.35451/s13m6d29.

[10] L. G. McCoy *et al.*, "Building health systems capable of leveraging AI: applying Paul Farmer's 5S framework for equitable global health," *BMC Global and Public Health*, vol. 3, no. 1, Dec. 2025, doi: 10.1186/s44263-025-00158-6.

[11] M. J. Page *et al.*, "The PRISMA 2020 statement: An updated guideline for reporting systematic reviews," Mar. 29, 2021, *BMJ Publishing Group*. doi: 10.1136/bmj.n71.

[12] J. Kim *et al.*, "The Effects of Presenting AI Uncertainty Information on Pharmacists' Trust in Automated Pill Recognition Technology: Exploratory Mixed Subjects Study," *JMIR Hum. Factors*, vol. 12, 2025, doi: 10.2196/60273.

[13] R. B. Thapa, S. Karki, and S. Shrestha, "Exploring potential drug-drug interactions in discharge

prescriptions: ChatGPT's effectiveness in assessing those interactions," *Exploratory Research in Clinical and Social Pharmacy*, vol. 17, Mar. 2025, doi: 10.1016/j.rcsop.2025.100564.

[14] J. Salcedo, M. Rosales, J. S. Kim, D. Nuno, S. Suen, and A. H. Chang, "Cost-effectiveness of artificial intelligence monitoring for active tuberculosis treatment: A modeling study," *PLoS One*, vol. 16, no. July, Jul. 2021, doi: 10.1371/journal.pone.0254950.

[15] G. Erion *et al.*, "A cost-aware framework for the development of AI models for healthcare applications," *Nat. Biomed. Eng.*, vol. 6, no. 12, pp. 1384–1398, Dec. 2022, doi: 10.1038/s41551-022-00872-8.

[16] C. Worrall, D. Shirley, J. Bullard, A. Dao, and T. Morrisette, "Impact of a clinical pharmacist-led, artificial intelligence–supported medication adherence program on medication adherence performance, chronic disease control measures, and cost savings," *Journal of the American Pharmacists Association*, vol. 65, no. 1, Jan. 2025, doi: 10.1016/j.japh.2024.102271.

[17] Z. Iqbal and S. Sadaf, "Biosimilars: A Comparative Study of Regulatory, Safety and Pharmacovigilance Monograph in the Developed and Developing Economies," *Journal of Pharmacy and Pharmaceutical Sciences*, vol. 25, pp. 149–182, 2022, doi: 10.18433/jpps32433.

[18] M. H. Tran, N. Q. Nguyen, and H. T. Pham, "A New Hope in the Fight Against Antimicrobial Resistance with Artificial Intelligence," *Infect. Drug Resist.*, vol. 15, pp. 2685–2688, 2022, doi: 10.2147/IDR.S362356.

[19] Y. Zhang and Y. Chen, "The Role of Machine Learning in Reducing Healthcare Costs: The Impact of Medication Adherence and Preventive Care on Hospitalization Expenses," Association for Computing Machinery (ACM), Jul. 2025, pp. 179–185. doi: 10.1145/3771792.3774397.

[20] S. Kessler *et al.*, "Economic and utilization outcomes of medication management at a large Medicaid plan with disease management pharmacists using a novel artificial intelligence platform from 2018 to 2019: a retrospective observational study using regression methods," 2021.

[21] J. Y. Kim *et al.*, "The Effects of Presenting AI Uncertainty Information on Pharmacists' Trust in Automated Pill Recognition Technology: Exploratory Mixed Subjects Study," *JMIR Hum. Factors*, vol. 12, 2025, doi: 10.2196/60273.

[22] Y. Kim *et al.*, "Fully automated quantitative coronary angiography versus optical coherence tomography guidance for coronary stent implantation (FLASH): Study protocol for a randomized controlled noninferiority trial," *Am. Heart J.*, vol. 275, pp. 86–95, 2024, doi: 10.1016/j.ahj.2024.05.004.