Leveraging AI for Lowering Patient Financial Responsibility in the USA Healthcare

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Abstract:
In the United States, patient out-of-pocket (OOP) costs, including deductibles, copays, coinsurance, and outstanding balances, have increased sharply over the past few decades. This surge is driven mainly by administrative waste, billing coding errors, inefficient care pathways, and rising premiums. Despite huge investments at the national level in digital health infrastructure, patients continue to face unnecessary financial burdens due to scattered information, complex eligibility rules, and billing/coding errors. This paper examines how Artificial Intelligence (AI) and Machine Learning (ML) can help reduce patient costs by focusing on two main drivers of high costs: administrative waste and clinical inefficiency. Through a detailed review of different existing studies on AI applications in increasing administrative efficiency, enhancing cost transparency, optimizing Revenue Cycle Management (RCM), and predictive analytics, this paper shows that AI-driven process optimization can significantly reduce patient financial responsibility. This integrative review paper collects evidence from federal agencies, industry study articles and different healthcare articles to support how AI can help significantly lowering patient costs while improving clinical and operational efficiency. This paper also discusses the challenges and complications of AI deployment in the digital healthcare system.

Index Terms:
Artificial Intelligence, Patient Financial Responsibility, Healthcare Costs, Revenue Cycle Management, Predictive Analytics, US Healthcare, Medical Debt, Out-of-Pocket Cost, Financial Transparency, Healthcare Affordability, Medical Billing Optimization, Administrative Waste

1. Introduction

1.1 Background & Problem Statement

The U.S. healthcare system is a complicated mixture of private insurance and public programs. Because of high medical costs and extensive administrative work, it is considered the most expensive system in the world [1]. In 2023, the United States spent over $4.9 trillion on health care, which was about 18% of the country's economy [1]. As spending keeps rising, patients are paying more through high-deductible health plans and higher cost-sharing. As a result, Patient Financial Responsibility, or out-of-pocket spending, rose to about $1,514 per person in 2023 [1].

This change has a huge economic impact. Medical debt is more than just a financial problem. It often forces people to delay or skip important care, such as filling prescriptions or attending follow-up appointments. This leads to poor health and, ultimately, even higher long-term costs for the entire health care system [2]. The way things work now just isn't sustainable; it's leaving more people stuck with overwhelming costs and declining health.

Challenge Areas	Statistics	Impact
Medical Debt	Nearly 1 in 10 adults owes more than $10,000 [3]	Creates long-term financial burden and economic instability [3]
Affording Healthcare Costs	44% of U.S. adults report difficulty affording healthcare [4]	Limits access to necessary care and increases stress [4]
Paying Medical Bills	28% faced problems paying medical bills in the past 12 months [4]	Leads to financial burden and potential debt [4]
Skipping/Postponing Care	36% of adults skipped or postponed needed healthcare due to cost [4]	Results in worsening health outcomes and delayed treatment [4]
Prescription Access	21% did not fill in prescriptions due to cost; 23% opted for over-the-counter alternatives [4]	Reduces medication adherence and compromises treatment effectiveness [4]
Insurance Premiums	38% of insured adults under 65 worry about affording monthly premiums [4]	Creates insecurity even among insured populations [4]
Worry About Healthcare Costs	62% worry about affording healthcare services; 61% worry about unexpected medical bills [4]	Heightens anxiety and financial uncertainty for families [4]

Table 1: Healthcare cost challenges and Impacts

1.2 Role of AI

Artificial Intelligence (AI) has become a game-changing tool with the potential to fundamentally reshape how healthcare costs are structured in the U.S. The health care system wastes a lot of money, mainly due to endless paperwork and unpredictable prices, and offers AI a significant opportunity to make things more efficient [17]. Notably, administrative labor alone accounts for 15%-30% of the entire U.S. healthcare costs [5].

Reducing administrative waste in health care is an important goal. Various technologies such as machine learning, natural language processing, and robotic process automation, can increase workflow efficiency [7]. These technologies are quickly moving from ideas to real solutions in daily operations.

AI's potential for cost reduction is significant. By automating complex and error-prone tasks within the Revenue Cycle Management (RCM) system, like prior authorization, medical coding, and claims processing, AI can drastically reduce the human labor and rework costs currently embedded in the price of care [8],[9]. The resulting operational efficiency provides a clear path for healthcare organizations to reduce overhead and pass along a portion of those savings to patients, eventually lowering PFR.

This paper will explore the specific pathways by which AI can be leveraged to create a more efficient, transparent, and fair experience for patients, ultimately achieving the goal of lowering the individual cost of care within the US health system.

AI reduces patient financial responsibility in two important ways: directly and indirectly.
Direct Cost Reduction: AI streamlines and automates inefficient administrative processes, such as billing, coding, and claims management, directly lowering the operational costs of healthcare providers and payers. These savings can then be reflected in reduced patient charges, premiums, and co-payments.
Indirect Cost Reduction: AI increases clinical efficiency by leveraging technologies like predictive analytics to provide early diagnosis, personalize treatment plans, minimize costly errors, reduce unnecessary procedures, and prevent expensive emergencies such as hospital readmissions.

1.3 Objective and Novel Contribution

The primary objective of this review paper is to investigate the practical applications of AI technology that directly and indirectly reduce the financial burden on U.S. healthcare patients and it also examines how strategic deployment of Artificial Intelligence across administrative and clinical workflows can help in transforming the U.S. healthcare system to achieve a significant, measurable reduction in Patient Financial Responsibility.

The previous research mainly focuses on the financial impact of AI in healthcare administration and clinical support separately. This study further links how implementing AI in Revenue Cycle Management (RCM) can help reduce patient charges and out-of-pocket costs.

2. Detailed problem

2.1 Understanding Patient Financial Responsibility

Patient Financial Responsibility (PFR) is the portion of a medical bill that insurance does not cover, and the patient must pay out of pocket. In the past, PFR usually meant small co-payments for routine visits. Today, PFR has grown to include high deductibles, higher co-insurance rates, and more services that are not covered [1].

Rise of High-Deductible Health Plans (HDHPs): With HDHP plans, patients must pay all healthcare costs up to a deductible, usually thousands of dollars, before insurance begins to pay [1]. This can create a big and often unpredictable financial barrier to getting needed care, especially for people with serious health problems or sudden medical issues. As a result, patients end up paying for early and often critical services themselves.

Co-insurance and Co-payments: After meeting the deductible, the patient typically remains responsible for a percentage of the total bill (**co-insurance**) or a fixed fee (**co-payment**) for services rendered [1]. As the overall price of medical procedures and drugs continues to climb faster than general inflation, the absolute dollar amounts of co-insurance and co-payments similarly rise, even if the percentage remains constant. The result is that patients end up paying more whenever overall healthcare inflation grows.

Non-covered services: These are medical services, procedures, devices, or supplies that an insurance plan explicitly states it will not pay for under any circumstance. The patient becomes legally and financially responsible for the full billed charge of the service. Unlike covered services, where a patient is responsible for a discounted rate (e.g., co-pays, co-insurance) negotiated between the provider and the insurer, payment for a non-covered service is often due at the full, undiscounted charge unless the provider has a specific self-pay policy. This lack of discounted pricing significantly increases the patient's out-of-pocket costs [10].
Since non-covered services (e.g., cosmetic procedures, certain experimental treatments, or routine adult dental/vision care) fall outside the scope of "covered benefits" by definition, the dollar amount a patient pays for them is not applied to the OOPM (Out of pocket max) [11].

The Consequence: Medical Debt and Health Avoidance: The resulting PFR frequently surpasses the financial capacity of millions of U.S. households, leading to a significant increase in personal medical debt. As reported, medical debt is a major contributing factor to individual bankruptcy and economic instability [3].

Factor	Contribution to Out-of-Pocket (OOP) Spending (%)	Average Annual Cost (Per Enrollee
Deductibles	52%	$453 [12][13]
Coinsurance	26%	$223 [12][13]
Copayments	22%	$193 [12][13]

Table 2: Healthcare spending

3. Root cause

The high and unpredictable patient responsibility costs in the U.S. healthcare system constitute a major public health and economic crisis. The problem is complex, but it essentially comes down to three areas where costs are pushed onto patients.

3.1 Administrative Waste: The Primary Target for AI Intervention

A major but often hidden reason for high U.S. health care costs is the messy, inefficient administrative system. Research shows that the U.S. spends an unusually high share of its healthcare dollars on administrative costs, including billing, coding and claims processing. This complex administrative structure is the single most significant source of waste that AI is targeting for elimination [5][8][17][33].

Complexity of the Revenue Cycle (RCM): The Revenue Cycle Management (RCM) process, the lifecycle of a patient account from scheduling an appointment to receiving final payment, is highly scattered, manual, and prone to error. Every patient encounter involves a web of complex interactions for eligibility verification, prior authorization submissions, medical coding (e.g., ICD-10 and CPT codes), claim submission, and denial management. This complexity requires significant human capital and accounts for 15-30% of national health costs [5]. Manual effort on these tasks creates bottlenecks, increases operational overhead for providers, and ultimately inflates the cost of care billed to patients.

The Burden of Denials and Appeals: One main example of this waste is the high rate of payer claims denials. Claims are often denied due to clerical, coding, or prior authorization errors. Each denial costs providers both time and money, with rework costs estimated between $25 and $118 per claim [8]. In 2023, hospitals spent almost $20 billion each year appealing denials [15]. These administrative expenses, called “friction costs,” are absorbed by the healthcare system and eventually passed on to patients and employers through higher prices and premiums.

The lack of price transparency makes the problem worse. Providers and patients often do not know the real cost of care or the possible PFR until after services are provided [3].

Ineffective Patient Collections: When patients are unable to pay large, unexpected bills, providers have to spend more on collections, including staffing, debt-collection agency fees, and write-offs. These extra costs end up raising premiums and service prices for everyone.

The main research question is whether using Artificial Intelligence (AI), Machine Learning (ML), and predictive analysis can help solve problems like administrative inefficiency, unclear pricing, and high collection costs in the U.S. healthcare system, and if these tools can ease the financial burden on patients.

Waste Category	Estimated Annual Cost (in Billions)	Key Drivers / Factors
Administrative Complexity	$265.60 [16]	Conflicting payer rules, redundant paperwork, and billing/coding inefficiency.
Pricing Failure	$230.7 – $240.5 [16]	Prices for meds/services exceeding production costs; lack of transparency.
Failure of Care Delivery	$102.4 – $165.7 [16]	Poor execution of clinical best practices and medical errors.
Overtreatment (Low-Value Care)	$75.7 – $101.2 [16]	Unnecessary tests, procedures, and screenings with no clinical benefit.
Failure of Care Coordination	$27.2 – $78.2 [16]	Redundant tests and complications due to poor communication between providers.

Table 3: Factors Contributing to Healthcare Waste

4. AI as a game changer in lowering direct costs

The application of Artificial Intelligence within the Revenue Cycle Management (RCM) infrastructure represents the most immediate and direct way to reduce healthcare system costs and, consequently, lower Patient Financial Responsibility (PFR). By eliminating “friction costs, a substantial cost component in the U.S. system, AI transforms non-transparent, error-prone manual processes into seamless, high-speed transactions [17].

4.1 AI-Powered Pre-Service Optimization

The financial success of a healthcare encounter is determined long before the patient receives care, during the pre-service phase. AI is critical in ensuring financial clearance and patient education at this stage.

Eligibility Verification and Financial Transparency: Tools like Robotic Process Automation (RPA) and Agentic AI help verify eligibility and benefits before an appointment or medical procedure [8]. Machine language

models can analyze a patient's plan details against the scheduled service to provide a real-time, personalized estimate of the patient's out-of-pocket cost. This shift from "**bill after service**" to **"price before service"** is critical because it enables patients to make informed decisions. By taking a proactive approach, patients can be saved from "surprise bills," which are a major source of out-of-pocket costs and medical debts. [3].

Prior Authorization (PA): The traditional authorization process often involves a lot of back-and-forth between providers and payers, leading to administrative waste. AI-enabled systems are changing this. Natural Language Processing (NLP) now helps automatically pull needed clinical documentation from the Electronic Health Record (EHR) [7][8].
RPA is used to fill out and submit payer-specific forms and to track prior authorization status. This automatic authorization process can cut down manual work for prior authorization by 50% to 75% [5][8]. It can also reduce approval times by 40% to 50% [5][8]. Faster approvals and less staff time lower the provider's costs, which means fewer expenses need to be covered by higher charges.
AI technologies like RPA and Machine Learning (ML) can make a big difference. By automating high-volume, repetitive, and rule-based tasks in revenue cycle management, AI can cut down on human hours, reduce errors that cause denials, and make costs more predictable. Savings from this kind of automation could be 15-30% of total healthcare costs, directly lowering PFR [5]. Moving from manual work to smart automation is a key step toward making healthcare more affordable.

RCM Factor	Impact of AI Deployment, Monetary Value/Savings
Eligibility Verification	**80% reduction** in document processing time, **99% accuracy** in coverage detection [40]
Prior Authorization	**80%** Faster Authorization by saving (30 hours weekly), Cost Per Request Falls from **$20** to Under **$3**, Decision Times Cut from **14** days to **2** days [37]
Financial Transparency	Provides 95%+ accurate estimates of costs, 40% increase in patient payment rates, and **25% reduction** in bad debt write-offs [32].
Patient Registration	Elimination of manual entry errors at intake. Prevents denials that cost **$118 each** to fix later [8].

Table 4: Pre-Service Reported Outcome

4.2 AI in Claims Submission and Denial Management

Errors in the claims process are a direct contributor to administrative friction costs. AI is deployed to enforce accuracy and efficiency in medical coding and claim validation, hence maximizing "clean claim" submissions.

Computer-Assisted Coding (CAC): AI-powered medical coding systems use NLP to review clinical documentation (e.g., physician notes, operative reports) and automatically assign the correct CPT and ICD-10 diagnosis codes [38]. By learning from huge datasets of clinical language and coding guidelines, these systems can identify coding errors. It can also correct the codes, including both under-coding (which results in lost revenue) and over-coding (which increases audit risk before the claim is submitted).

Predictive Denials Management: Predictive analytics can also find missing documents, expired authorizations, or incorrect codes, so staff can step in early. If denials still happen, AI helps find the cause, creates appeals with the right documents, and highlights important claims for review. By reducing the need to rework denied claims, AI lowers operational costs for providers, which can help ease the financial burden on patients [39].

Machine learning models use past claims data, payer rules, and previous denial patterns to spot high-risk claims before they are submitted.

RCM Factor	Impact of AI Deployment, Monetary Value/Savings
Medical Coding	coding accuracy increased from **85%** to **95%** [29]
Denial Management	Manual rework for one denial costs **$25-$118, and AI reduces these costs by** half [8].
Clean Claim Rate (CCR)	AI validation pushes CCR from ~**75%** to **over 95%** [8].
Revenue Integrity	AI flags missed charges in clinical notes. Without AI, **13% of all charges** are under-coded, and **7% are over-coded.** Recovers an average of **$2.16** million annually [30].

Table 5: In-Service Reported Outcome

4.3 AI-Powered Post-Service Optimization

Shortening the Accounts Receivable (A/R) Cycle

AI also optimizes the post-service financial process with the patient. ML algorithms monitor Accounts Receivable (A/R) status in real time, prioritizing follow-ups and automatically generating personalized payment reminders and flexible payment options for patients with outstanding PFR balances. These automatic processes can cut down the collection cycle, reducing the number of days in A/R by 15-25% [8]. For patients, this makes the process less challenging, more transparent, and more likely to result in a clear, manageable payment plan, helping prevent debt from turning into collections. It also leads to a leaner operational cost structure system-wide.

The measurable efficiencies gained from AI in RCM, reducing manual hours, cutting denial costs, and speeding the payment process, establish a clear, evidence-based path to decreasing the cost of healthcare delivery, which is the foundational requirement for reducing Patient Financial Responsibility in the U.S.

RCM Factor	Impact of AI Deployment, Monetary Value/Savings
Days in Account/receivables	A/R days drop by 15-25% [8]
Manual touchpoints	Decreased from **8-12 to 2** by reducing **60-75%** manual effort

Patient Collections	**(Manual follow-up calls, posting payments, drafting appeals)** **40-60% increase** in patient payment collection [29], Saving **$3.6 billion** annually by automating routine inquiries and optimizing payment recovery [31]

Table 6: Post-Service Reported Outcome

5. AI as a game changer in lowering indirect costs

One of the largest drivers of high-cost care is the unpredictable nature of patient deterioration, particularly the risk of hospital readmissions and emergency department (ED) visits. AI excels at analyzing vast amounts of clinical, social, and environmental data to predict these events.

5.1 Predictive Analytics for High-Cost Interventions

Reducing Hospital Readmissions: Machine Learning (ML) models use patient data, such as demographics, medical history, lab results, discharge summaries, and other social factors, to predict whether a patient can be re-admitted within 30 or 90 days after leaving the hospital [36]. Health care teams can suggest targeted, affordable support such as remote monitoring, follow-up calls, or home health referrals by identifying high-risk patients at early stages. For instance, AI chatbots have shown the capability to reduce hospital readmission by up to 25% [28]. Since a typical hospital stay costs thousands of dollars and often leads to major PFRs, preventing readmissions can help save a lot of money over time.

Predicting Critical care needs: Predictive analytics can also optimize the utilization of expensive hospital resources, such as Intensive Care Unit (ICU) beds (which can cost over $4,300 per day) [5]. AI models predict patient demand and length of stay, helping hospitals to manage resource allocation more effectively and reduce operational waste associated with over- or understaffing. Optimized resource use lowers the hospital's fixed operating costs, a saving that flows back into the system's overall cost structure.

5.2 Enhancing Diagnostics and Personalizing Treatment

Incorrect or delayed diagnoses often lead to long, expensive treatments that may ultimately prove ineffective. AI's ability to spot complex patterns improves diagnostic precision and enables individualized treatment, thereby lowering unnecessary healthcare costs.

Precision in Diagnosis: In fields like radiology, pathology, and dermatology, Deep Learning (DL) algorithms applied to medical imaging and lab data have proven to be diagnostically comparable to, and at times superior to, the skills of expert clinicians [14]. Early detection AI, for instance, has achieved high accuracy in screening for conditions like cancer, detecting diseases at stages when the cost of treatment is substantially lower than in advanced stages [24]. By getting the diagnosis and treatment plan right from the start, AI spares patients from useless, uncertain, and costly procedures. Existing studies found a 25% increase in diagnostic accuracy and an 18% decrease in decision-making time with AI-assisted systems, suggesting lower induced cognitive load for physicians and better patient-centric outcomes[6].

Personalized Treatment Planning: AI-powered decision support system analyzes a patient's unique genetic markers, past treatment history, clinical outcomes, and population-wide data to recommend the most effective and efficient treatment path [7]. AI reduces spending on ineffective treatments, reduces side effects, and speeds time to positive outcomes, directly benefiting patients' financial and physical health by predicting which patients will respond best to b specific drugs or therapies [7].

5.3 Promoting Preventive Care and Patient Engagement

Preventive care is consistently more cost-effective than treating advanced illness. AI enables a continuous, proactive engagement model that can keep patients healthier.

Remote Monitoring and Triage: AI powers remote monitoring tools that track patient data in real time. Using machine learning, they detect early warning signs of decline and alert clinicians to act before a crisis occurs [27]. This constant, low-cost oversight is particularly effective for managing critical illnesses like diabetes and heart disease, which are major drivers of U.S. healthcare spending.

AI-Driven Patient Engagement

AI-powered tools like virtual health assistants and multilingual messaging systems help educate patients, encourage healthier behaviors, and improve treatment plans for patients [28]. For example, studies show that AI-enabled multilingual messaging systems can deliver higher response rates and a 53% reduction in no-show rates for appointments [5]. Reduced no-shows increase provider efficiency and ensure cost-effective patient care. It also prevents gaps that often lead to health crises and higher future PFR. Through these clinical applications, AI changes the cost trajectory of patient care, making health care more affordable. This transformation is a key step toward stabilizing and ultimately lowering the total cost of care, a prerequisite for reducing Patient Financial Responsibility.

6. Challenges, Ethical Considerations, and Implementation Strategy

AI could dramatically reduce what patients pay out of pocket, but only if we address major challenges in technology, ethics, and regulation. A thoughtful plan is needed to make sure AI is used responsibly and fairly.

6.1 Technological and Data-Related Barriers

The foundation of any effective AI application is high-quality, abundant data. The U.S. healthcare system, however, is so fragmented that it causes a major challenge for AI development and deployment.

Data Fragmentation and Interoperability: Patient data is often scattered across different EHRs, insurance systems, and even state boundaries, making it hard to build complete, patient-focused datasets. AI models need shared standards so they can learn from long-term patient data that shows the whole journey, from clinic visits to billing and insurance claims [33]. Without data exchange standards, AI applications will remain limited to local optimization, limiting system-wide impact on PFR.

Data Quality and Trust: Data quality issues such as incompleteness, inconsistency or inaccurately documented information can hamper AI performance. Algorithms must be trained on validated, real-world data to generate reliable predictions. Furthermore, clinicians must develop trust in AI recommendations, which require transparent model explainability. If a clinician does not trust an AI-driven predictive risk score, they will not rely on it to guide a low-cost preventive intervention, thereby negating its cost-saving potential [34].

6.2 Ethical, Legal, and Equity Challenges

The deployment of AI in patient care and financial decisions raises critical ethical and legal questions that must be resolved to protect patients and ensure reasonable outcomes.

Algorithmic Bias and Health Equity: AI models can pick up biases from the data they're trained on. If that data comes from groups with less insurance or limited access to care, the AI may unintentionally downplay risks for underserved patients or suggest treatment plans that aren't appropriate [35]. This could make existing health gaps worse and place an even heavier financial burden on vulnerable patients, working against the very goal of improving the system. Rigorous auditing and testing for fairness must be a mandated part of the AI development lifecycle.

Liability and Regulation: The legal framework for medical AI is still being developed. Clarity is needed on who is liable when an AI-powered diagnostic tool makes an error or an automated RCM system denies a patient's claim wrongly [7]. The FDA and CMS (Regulatory bodies) are working to establish guidelines for the trustworthiness and safety of clinical AI, but policies must also address the financial implications. The absence of clear liability standards creates hesitation in implementing for both healthcare providers and developers.

Patient Privacy and Data Security: AI necessitates the collection and processing of massive amounts of highly sensitive personal health information. The risk of data breaches and cyberattacks is becoming increasingly costly for hospitals. These types of risks must be managed through advanced security protocols [7]. Patient trust in the confidentiality of their data is essential for the continued flow of information that AI systems require to function effectively.

6.3 Strategic Implementation Roadmap

A successful strategy for adopting AI to lower PFR requires a multi-stakeholder approach focused on policy, investment, and cultural change.

Policy/Regulation: Mandatory AI-based price transparency for standard procedures and PFR estimates. Establish clear liability and fairness testing standards for all patient-facing AI tools [3]. It will help reduce surprise medical bills and ensure patients share costs more fairly.

Investment/Infrastructure: Prioritize investment in interoperable EHR systems and cloud-based data warehouses to facilitate large-scale AI training and deployment. It enables system-wide RCM efficiency and personalized care models.

Workforce/Culture: Healthcare organizations should integrate AI education into staff training, emphasizing "human-in-the-loop" models that enhance rather than replace human expertise. By automating routine RCM tasks, AI enables staff to devote more attention to complex care and patient financial counseling [25]. This approach ensures both optimal ROI and responsible use of AI in healthcare.

6.4 Conceptual Model: AI's Economic Leverage on PFR

To explain how Artificial Intelligence AI can cut down the patient financial responsibility (PFR), we can divide the healthcare costs into two main buckets:
1. Clinical costs (the direct medical services patients receive)
2. Administrative costs (such as billing, claims management, compliance, and overhead). Together, these make up the **Total Cost of Care (TCC)**. In the U.S., what patients ultimately pay is tied to the **Total Billed Charge (TBC)**, which is influenced by TCC, markups, and cost-sharing rules (such as deductibles and copayments/co-insurance).

AI acts as an efficiency multiplier and changes the equation. On the **administrative side**, tools like automated claims processing and prior authorization can reduce costs by 15 to 30% [5]. On the **clinical side**, predictive analytics that reduce re-admissions or improve diagnosis can lower expenses by ~ 10-25% [5].
When both buckets shrink, the overall TCC drops. Hence, it means providers and insurers can lower down billing charges and in some cases, adjust premiums or deductibles. The result can be a significant reduction in PFR, the amount patients are responsible for, making care more affordable and accessible.

7. Limitations and Future Research

This study discusses a conceptual framework on how AI can help in reducing the patient financial burden by reducing various healthcare costs. However, it still needs further investigation to ensure that these benefits reach patients.

7.1 Need for Empirical Validation

Current findings are solely based on the conceptual framework and early-stage implementation studies. Future research should focus more on "real-world" testing within diverse hospital systems to prove that AI-driven efficiencies actually lead to lower the patient's financial burden.

7.2 Longitudinal Patient-Level Studies

Current data looks at short-term hospital savings. There is a need for longitudinal studies to track individual patients over several years to see if AI truly reduces a person's lifetime medical debt and prevents them from delaying care due to costs.

7.3 Bias and Equity Measurement Frameworks:

AI systems are only as good as the data they use. Future work must develop strict rules and regulations to ensure AI doesn't favor wealthier patients or those from specific demographics. Research is needed to ensure that cost-saving AI tools are distributed equally, not causing a digital divide where only certain groups benefit from lower healthcare prices.

8. Conclusion

Healthcare costs in the U.S. keep rising, with $4.9 trillion spent each year, and patients are bearing an increasing share of those costs. It is obvious that the system needs a new approach to how care and expenses are handled. This research has shown that Artificial Intelligence (AI) is not just a tool for clinical enhancement but also an important financial technology tool capable of lowering the cost of care for individual patients.

The evidence presented highlights a clear path to PFR reduction.

Administrative Efficiency: AI tools used in Revenue Cycle Management (RCM) process (especially in eligibility verification, prior authorization, and denial management) directly focus on administrative cost and reduce it by 15-30% in the US health care system. By promoting clean claims and providing upfront cost transparency, AI reduces operational costs that inflate billed charges, thereby limiting surprise billing and unmanageable patient debt.

Clinical Optimization: AI in predictive analytics and diagnostics enables a shift from reactive (expensive care) to proactive (low-cost management). By reducing hospital readmissions (up to 25%), minimizing misdiagnosis, and suggesting preventive care, AI reduces the need for critical care, which are the most common triggers of high PFR.

To make the most of this AI revolution, we need to address challenges such as fragmented data, algorithmic bias, and unclear rules on liability and regulation. Still, the promise of a healthcare system that is more affordable, fair, and stable makes AI essential.

8. References

[1] Amin, K., Cox, C., Ortaliza, J. & Wager, E. (2025) Health Care Costs and Affordability. Kaiser Family Foundation. Available at: https://www.kff.org/health-policy-101-health-care-costs-and-affordability/

[2] Nuñez, S. (2025) The US Medical Debt Crisis: Catastrophic Costs of Insufficient Health Coverage. Roosevelt Institute. Available at: https://rooseveltinstitute.org/publications/medical-debt/

[3] Bernstein, D. N. & Crowe, J. R. (2024) Price Transparency in United States' Health Care: A Narrative Policy Review of the Current State and Way Forward. https://doi.org/10.1177/00469580241255823.

[4] Sparks, G., Lopes, L., Montero, A., Presiado, M. & Hamel, L. (2025) Americans' Challenges with Health Care Costs. Kaiser Family Foundation. Available at: https://www.kff.org/health-costs/americans-challenges-with-health-care-costs/

[5] Roy, S. (2025) 6 Ways AI Reduces Healthcare Costs: Proven Strategies That Work. Dialog Health. Available at: https://www.dialoghealth.com/post/ways-ai-reduces-healthcare-costs

[6] Raju, N. & Quazi, F. (2025) Organized Intelligence in Clinical Decision Making. Proceedings of the International Conference on Innovative Computing & Communication (ICICC 2024). Available at: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=5170588 https://doi.org/10.2139/ssrn.5170588

[7] Faiyazuddin, M., Rahman, S. J. Q., Anand, G., Siddiqui, R. K., Mehta, R., Khatib, M. N., Gaidhane, S., Zahiruddin, Q. S., Hussain, A. & Sah, R. (2025) The Impact of Artificial Intelligence on Healthcare: A Comprehensive Review of Advancements in Diagnostics, Treatment, and Operational Efficiency. https://doi.org/10.1002/hsr2.70312

[8] Putty, C. (2025) How AI Reduces Healthcare Costs in 2025. Thoughtful AI. Available at:

https://www.thoughtful.ai/blog/how-ai-reduces-healthcare-costs

[9] CareCloud (2025) How AI Is Transforming Medical Billing and Coding. Available at: https://carecloud.com/continuum/ai-in-medical-billing-and-coding/

[10] Rajagopal, R. (2020) What Is a Non-Covered Service in Medical Billing? Outsource Strategies. Available at: https://www.outsourcestrategies.com/blog/what-is-a-non-covered-service-in-medical-billing/

[11] Kagan, J. (2025) Understanding Out of Pocket Maximums: Definition & Benefits. Investopedia. Available at: https://www.investopedia.com/terms/o/outofpocket-limit.asp

[12] Vu, K., Cotter, L. & Rae, M. (2025) How Much Do People with Employer Plans Spend Out of Pocket on Cost Sharing? Health System Tracker. Available at: https://www.healthsystemtracker.org/chart-collection/how-much-do-people-with-employer-plans-spend-out-of-pocket-on-cost-sharing/

[13] Centers for Medicare & Medicaid Services (2024) National Health Expenditure Data: NHE Fact Sheet. CMS. Available at: https://www.cms.gov/data-research/statistics-trends-and-reports/national-health-expenditure-data/nhe-fact-sheet

[14] Conger, K. (2024) AI Improves Accuracy of Skin Cancer Diagnoses in Stanford Medicine–Led Study. Stanford Medicine. Available at: https://med.stanford.edu/news/all-news/2024/04/ai-skin-diagnosis.html

[15] American Hospital Association (2024) 2024 Costs of Caring. AHA. Available at: https://www.aha.org/guidesreports/2025-04-28-2024-costs-caring

[16] Shrank, W. H., et al. (2019) Waste in the US Health Care System: Estimated Costs and Potential for Savings. JAMA. https://doi.org/10.1001/jama.2019.13978

[17] Code (2025) How Can AI Applications in Healthcare Reduce Costs and Administrative Burdens? Available at: https://healthdatasharing.org/q-and-a/how-can-ai-applications-in-healthcare-reduce-costs-and-administrative-burdens/

[18] CAQH (2024) CAQH 2024 Index Report: Key Takeaways. Council for Affordable Quality Healthcare. Available at: https://www.caqh.org/hubfs/Index/2024%20Index%20Report/CAQH%202024%20Index%20Report%20Key%20Takeaways%20FINAL.pdf

[19] Munz, K. (2025) 2024 CAQH Index Foresees Major Opportunity for Health Care Savings. AJMC. Available at: https://www.ajmc.com/view/2024-caqh-index-foresees-major-opportunity-for-health-care-savings

[20] Experian Health (2025) Healthcare Claim Denial Statistics: State of Claims Report 2025. Experian. Available at: https://www.experian.com/blogs/healthcare/healthcare-claim-denials-statistics-state-of-claims-report/

[21] ZMed Solutions (2025) The Future of Medical Billing: Trends and Innovations in 2025. Available at: https://www.zmedsolutions.net/the-future-of-medical-billing-trends-and-innovations-in-2025/

[22] American Hospital Association (2025) Trailblazers: AILevate Claims Denials. Available at: https://www.aha.org/system/files/media/file/2025/10/trailblazers_ailevate_claimsdenials.pdf

[23] CareCloud (2024) AI in Revenue Cycle Management. CareCloud Continuum. Available at: https://carecloud.com/continuum/ai-in-revenue-cycle-management/

[24] AIP Advances (2024) Early Detection of Skin Cancer Using AI. Available at: https://pubs.aip.org/aip/adv/article/14/4/040701/3282749/Early-detection-of-skin-cancer-using-AI

[25] Becker's Hospital Review (2024) Effective AI in Healthcare RCM Requires Humans in the Loop. Available at: https://www.beckershospitalreview.com/healthcare-information-technology/innovation/effective-ai-in-healthcare-rcm-requires-humans-in-the-loop/

[26] FinThrive (2024) Key Steps for Your RCM Team to Improve Patient Collections. Available at:

https://finthrive.com/blog/key-steps-for-your-rcm-team-to-improve-patient-collections

[27] Mayo Clinic Press Editors (2024) AI in Healthcare: The Future of Patient Care and Health Management. Available at: https://mcpress.mayoclinic.org/healthy-aging/ai-in-healthcare-the-future-of-patient-care-and-health-management/

[28] Wah, J. N. K., et al. (2025) Revolutionizing E-Health: The Transformative Role of AI-Powered Hybrid Chatbots in Healthcare Solutions. Frontiers in Public Health. https://doi.org/10.3389/fpubh.2025.1530799

[29] Enter Health (2025) Medical Billing Automation: How AI Reduces Manual Errors. Available at: https://www.enter.health/post/medical-billing-automation-how-ai-reduces-manual-errors

[30] Ingenious Med (2025) Revolutionize Your Rev Cycle with Ingenious Med's AI Powered Automated Charge Capture. Available at: https://ingeniousmed.com/revolutionize-your-rev-cycle-with-ingenious-meds-ai-automated-charge-capture/

[31] Coherent Solutions (2025) How AI Chatbots Advance Healthcare for Patients and Providers. Available at: https://www.coherentsolutions.com/insights/how-ai-chatbots-advance-healthcare-for-patients-and-providers

[32] Spry (2025) Healthcare Revenue Cycle Management Best Practices. Available at: https://www.spryt.com/blog/healthcare-revenue-cycle-management

[33] AthenaHealth (2025) The Future of Interoperability: Leveraging AI to Improve Care and Reduce Administrative Burdens. Forbes. Available at: https://www.forbes.com/sites/athenahealth/2025/12/11/the-future-of-interoperability-leveraging-ai-to-improve-care-and-reduce-administrative-burdens/

[34] Informatica (2023) Trusted Data for Healthcare AI and Analytics. Available at: https://www.informatica.com/content/dam/informatica-com/en/collateral/white-paper/trusted-data-for-healthcare-ai-and-analytics_white-paper_5287en.pdf

[35] Harvard T.H. Chan School of Public Health (2023) Algorithmic Bias in Health Care Exacerbates Social Inequities: How to Prevent It. Available at: https://hsph.harvard.edu/exec-ed/news/algorithmic-bias-in-health-care-exacerbates-social-inequities-how-to-prevent-it/

[36] Zhang, Y., Zhang, X., Wang, Y. & Li, J. (2023) Interpretable Machine Learning Models for Hospital Readmission Prediction. BMC Medical Informatics and Decision Making, 23(1), Article 193. https://doi.org/10.1186/s12911-023-02193-5

[37] Droidal (2024) Manual vs AI Prior Authorization: A Complete Comparison. Available at: https://droidal.com/blog/manual-vs-ai-prior-authorization/

[38] Artigen Tech (2024) AI in Medical Coding: Enhancing ICD 10 & CPT Accuracy. Available at: https://www.artigentech.com/blogs/ai-in-medical-coding-icd10-cpt-accuracy/

[39] Enter.Health (2024) How AI Can Predict & Prevent Insurance Claim Denials. Available at: https://www.enter.health/post/ai-predict-prevent-insurance-claim-denials

[40 HOM RCM (N.D.) How AI Is Helping Healthcare Organizations Cut RCM Costs and Improve Efficiency. Available at: https://www.homrcm.com/blogs/how-ai-is-helping-healthcare-organizations-cut-rcm-costs-and-improve-efficiency