

Undergraduate Thesis Prospectus

The Competition to Determine AI's Legitimate Role in Healthcare

(sociotechnical research project)

by

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On my honor as a University student, I have neither given nor received unauthorized aid on this assignment as defined by the Honor Guidelines for Thesis-Related Assignments.

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General Research Problem

How may healthcare be improved?

Healthcare improvement is essential to reduce inequalities and economic strain. Despite advancements, disparities continue to impact minority groups significantly. This inequality cost the U.S. economy \$451 billion in 2018, rising from \$320 billion in 2014 (LaViest, 2023). This rising cost of healthcare strains households. In 2023, the average annual premium for single coverage was \$8,435, and for family coverage, \$23,968. Each price reflects a 7% increase from the previous year. Family premiums alone have risen 22% since 2018 and 47% since 2013, forcing many households into difficult choices between healthcare and other essential needs. (2023)

To address these challenges, the healthcare industry is exploring new technological solutions, with Artificial Intelligence (AI) emerging as a promising tool. Approaching these inequities and costs is critical to ensure accessible, affordable healthcare and improve overall well-being across the population.

The Competition to Determine AI's Legitimate Role in Healthcare

How are equity advocates, healthcare providers, and insurance companies competing to influence the application of AI in healthcare?

Artificial Intelligence has been theorized in healthcare since 1975, beginning at the first NIH AI workshop at Rutgers University (Kulikowski, 2015). Use of advanced techniques, like machine learning and neural networks, emerged in the early 2000s. Poalelungi (2023) found that since the coronavirus pandemic, medical AI has proliferated in diagnostics and imaging, and

may soon “revolutionize the practice of medicine.” Khan (2023) and others agree, but also show drawbacks in data collection, ethics, and social concerns.

Participants include equity advocates, hospitals, and insurance companies shaping how AI is used. While equity advocates push for fair and ethical access, insurers focus on efficiency and profit, creating conflict. Equity advocates have shown the misuse of AI, stating “elderly are prematurely kicked out of care facilities” due to a UnitedHealthcare algorithm that disagreed with professionals (Napolitano, 2021). Recently, Cigna, one of the largest U.S. health insurers, faced a lawsuit about illegally using its PXDX AI algorithm to deny claims. Similarly to UnitedHealthcare, the lawsuit claims PXDX denied tests deemed necessary by doctors without an individualized review, violating California’s insurance laws. This left patients with unexpected costs (Bendix, 2023). Professionals are also participants. Medical experts at Yale warned of AI applying existing biases, saying that errors would harm minority groups (Backman, 2023). Insurers claim that automation saves them perhaps \$100 billion annually (Sebastian, 2021) because it supports the “advanced, timely and dynamic data analysis” that administrative tasks and claims adjudication demand. They continue to claim AI allows for “advanced, timely and dynamic data analysis”, allowing for automation in administrative tasks as well as claims adjudication.

AI can reduce operational costs for hospitals too. The American Hospital Association welcomes AI systems, but recommends oversight (2024). Medtech companies invest in generative AI models that can improve their products’ cost-efficacy. For example, Boston Consulting Group points to companies like GitHub Copilot X and Mintlify. These groups create generative models that can speed up software

development, while tools from Paige and Pictor Labs “improve the accuracy of diagnostics.”(Schroer, 2024) Members from Accenture agree with the proposed value of AI, but instead focus its application in wearable technology (Kawalec, 2024). This group advocates for a “mass market makeover” for key care sectors, such as diabetes and cardiovascular health. These organizations see AI not just as a tool for operational improvement but as a market disruptor, aiming to embed AI-driven solutions into products in all sectors. Despite the proposed advantages, both groups have small excerpts that mention regulation, stating there is a need to “prioritize responsible AI to mitigate risks like bias and ethical concerns in data use.” (Kawalec, 2024).

Researchers have investigated the safety of AI in healthcare. Ross (2020) lists areas of concern, speaking heavily on data sourcing. Healthcare data is difficult to pool together safely, a necessity for large models. Without diversity in data, solutions can’t be scaled to general populations. Cloud based storage is the best method for sharing, but it creates large targets for criminal activity. Encryption methods lower risk, but safety of valuable data stays an obstacle for safe AI training. Researchers have also raised questions about the legality of data sharing. Yadav (2023) explains that health information is subject to different rules across jurisdictions. Sharing this data would create the most sophisticated models, but European laws regulate differently to codes such as HIPAA. Despite these obstacles, open-source repositories like Kaggle and The Cancer Imaging Archive (TCIA) offer a promising solution. Publicly accessible databases, including mammographic datasets like DDSM and Optimam, enable the development of AI protocols with reproducible studies. The COVID-19 pandemic highlighted their value, as open-source datasets accelerated AI advances to assist patients and medical professionals.

Ross also mentions a loss of trust for the healthcare industry. Li (2023) found that use of machine learning and other advanced algorithms created “black-box models”, programs that are difficult to explain even by developers. This lack of transparency influences all stakeholders, as errors cause irreversible consequences. Li’s study focused on ethics, screening five databases of ethical journals. Ethical issues found included violations of privacy, fairness, and transparency. Medical professionals corroborate this loss of trust. In a feature piece for New York Times, Abraham Verghese (2018) shared that new professionals are “shocked to find that the focus on the ward doesn’t revolve around the patients but around the computers.” Verghese observed pain from professionals as early as 2018, labeling them as “the highest-paid clerical worker in the hospital.” Verghese’s piece shows how both patients and professionals suffer from the rift AI creates in their relationship. The use of AI has increased physician burnout, doing so through increased patient turnover, a loss of autonomy, and “increasing medical complexity of patients”. Researchers like Khan (2023) believe that despite this, AI’s use is unavoidable, any possible benefits being too attractive to deny.

The drawbacks of AI in healthcare are not shown in just safety, but also poor quality of data. Yadav (2023) states that input relies heavily on electronic health records, overlooking marginalized groups who lack access or insurance. This underrepresentation can lead to AI suggesting suboptimal treatments for these communities, as it learns from data where similar patients often receive limited care. Yadav shows similar cases like Amazon’s recruitment algorithm, which discriminated against women “simply because of the gender bias in the data it was trained on.” This analysis is in line with previous comments made by Yale professionals, emphasizing the incredible risk AI’s training holds in its implementation. Researchers and professionals throughout the medical field continue to push for regulation.

Despite the call for caution, each researcher has highlighted the benefits of AI in healthcare. These benefits are expansive, offering advancements that can enhance nearly every aspect of medical practice. Poalelungi (2023) describes AI's ability to detect subtle patterns that may elude human observation, leading to diagnoses across fields like radiology, oncology, and cardiology. Additionally, AI's predictive capabilities enable better patient risk assessment, automating analysis on genetics and lifestyle choices for individual patients. In resource-limited settings, AI-driven tools can provide access to medical expertise, helping bridge healthcare disparities. Poalelungi claims that with AI “we can revolutionize health care”, automating difficult tasks in thirteen unique medical fields.

The future of AI in healthcare remains unclear. The promise for greater efficiency, accuracy, and patient care is undeniable, yet current use has created numerous failures. Data remains at the heart of concerns. It is a challenge to collect enough data to train models, worries about diversity and underrepresentation coming soon after. The conflict within both participants and researchers shows the need for attention on this problem. It is these agendas that will shape the use of AI, influencing the accessibility of healthcare for all.

References

- AHA (2024, May). American Hospital Association. AHA urges need for flexibility in regulation of AI in health care. *AHA News*.
- Backman, I. (2023, Dec 22). Eliminating racial bias in health care AI: Expert panel offers guidelines. Yale School of Medicine.
medicine.yale.edu/news-article/eliminating-racial-bias-in-health-care-ai-expert-panel-offers-guidelines
- Bendix, J. (2023, Aug 7). Cigna using AI to reject claims, lawsuit charges. *MedicalEconomics*.
www.medicaleconomics.com/view/cigna-using-ai-to-reject-claims-lawsuit-charges
- Kawalec, T., Richards, O., & Karaca-Griffin, S. (2024, May 29). Reinventing MedTech with intelligent technologies. *Accenture*.
www.accenture.com/us-en/insights/life-sciences/reinventing-medtech-intelligent-technologies
- KFF (2023, Dec. 8). 2023 Employer Health Benefits Survey.
- Khan, B., Fatima, H., Qureshi, A., Kumar, S., Hanan, A., Hussain, J., & Abdullah, S. (2023). Drawbacks of Artificial Intelligence and Their Potential Solutions in the Healthcare Sector. *Biomedical Materials & Devices (New York, N.Y.)*, 1-8. Advance online publication.
- Kulikowski, C. A. (2015). An Opening Chapter of the First Generation of Artificial Intelligence in Medicine: The First Rutgers AIM Workshop, June 1975. *Yearbook of Medical Informatics*, 10(1), 227-233.
- LaVeist, T. A., Pérez-Stable, E. J., Richard, P., Anderson, A., Isaac, A., Santiago, R., Okoh, C., Breen, N., Farhat, T., Assenov, A., & Gaskin, D. J. (2023). The economic burden of racial, ethnic, and educational health inequities in the US. *JAMA*, 329(19), 1682.
- Li, F., Ruijs, N., & Lu, Y. (2023). Ethics & AI: A systematic review on ethical concerns and related strategies for designing with AI in healthcare. *AI*, 4(1), 28-53.
- Napolitano, E. (2023, Nov 21). UnitedHealth uses faulty AI to deny elderly patients medically necessary coverage, lawsuit claims. *CBS News*.
www.cbsnews.com/news/unitedhealth-lawsuit-ai-deny-claims-medicare-advantage-health-insurance-denials/
- Poalelungi, D. G., Musat, C. L., Fulga, A., Neagu, M., Neagu, A. I., Piraianu, A. I., & Fulga, I. (2023). Advancing Patient Care: How Artificial Intelligence Is Transforming Healthcare. *Journal of Personalized Medicine*, 13(8), 1214.
- Ross, P., & Spates, K. (2020). Considering the Safety and Quality of Artificial Intelligence in

- Health Care. *Joint Commission Journal on Quality and Patient Safety*, 46(10), 596-599.
- Schroer, D., Simon, S., & Trommer, G. (2024, May 14). Medtech's Generative Ai opportunity. BCG Global. <https://www.bcg.com/publications/2023/generative-ai-in-medtech>
- Sebastian, D. (2021, Sep). Artificial Intelligence and health insurance. www.rgare.com/knowledge-center/article/ai-and-health-insurance
- Verghese, A. (2018, May 28). How tech can turn doctors into clerical workers. *The New York Times*. www.nytimes.com/interactive/2018/05/16/magazine/health-issue-what-we-lose-with-data-driven-medicine.html
- Yadav, N., Pandey, S., Gupta, A., Dudani, P., Gupta, S., & Rangarajan, K. (2023). Data Privacy in Healthcare: In the Era of Artificial Intelligence. *Indian Dermatology Online Journal*, 14(6), 788-792.