

Responsible AI for Patient Care Transitions: Balancing Fairness and Efficiency

Manaf Zargoush and Somayeh Ghazalbash

Health Policy and Management, DeGroote School of Business

McMaster University

1280 Main Street West, Hamilton, L8S 4L8, Canada

zargoush@mcmaster.ca

Abstract

Integrating Artificial Intelligence (AI) with healthcare offers transformative opportunities to enhance the management of healthcare operations, including continuity of care and resource efficiency. This study presents a Machine Learning (ML)-based framework to improve patient care transitions by identifying and prioritizing interventions for individuals at high risk of care fragmentation. Using a rich, longitudinal dataset spanning over a decade of patient hospitalization records, our predictive-prescriptive analytics model proactively identifies at-risk patients, optimizing resource allocation and mitigating disruptions in care provision. We benchmark our AI-driven approach against conventional strategies, including random and naïve interventions, demonstrating significant efficiency gains in cost savings and equitable resource allocations among equity-seeking groups. A key contribution of this work is the explicit consideration of fairness in decision-making, analyzing the trade-offs between operational efficiency and fairness, a key ethical consideration. Our findings highlight AI's potential to streamline healthcare operations while balancing equity and efficiency, informing broader strategies for responsible and cost-effective healthcare management. By addressing biases and improving care continuity for vulnerable populations, this study advances the methodological and practical aspects of AI applications in healthcare as well as the ethical discourse surrounding its deployment. Our approach provides a novel perspective on leveraging emerging technologies, such as AI, to enhance patient outcomes while upholding principles of fairness and accountability.

Keywords

Responsible Artificial Intelligence, Patient Care Transition, Digital Transformation, Fairness.

Biographies

Manaf Zargoush is an Associate Professor of Health Policy and Management at the DeGroote School of Business, McMaster University in Canada. His main areas of research expertise include using Data Science (ML, AI, statistical modeling) for descriptive and predictive analytics and optimization (stochastic dynamic optimization, Markov and Semi-Markov Decision Processes, Partially Observable Markov Decision Processes) for prescriptive analytics of a wide range of health-related problems, such as medical decision-making, and healthcare operations management. His works have been published in top-tier journals, including *Production & Operations Management*, *Scientific Reports*, *Journal of Big Data*, *Health Policy*, *International Journal of Medical Informatics*, *OMEGA*, and *PLOS ONE*.

Somayeh Ghazalbash is a Sessional Faculty, Senior Research Scientist, and Postdoctoral Fellow at McMaster University, specializing in Responsible AI in Healthcare. She holds a PhD in Health Management from the DeGroote School of Business at McMaster University, where she developed expertise in AI/ML-driven healthcare decision-making. Her research focuses on the intersection of Data Analytics, AI/ML, and Health Management, tackling challenges in healthcare operations, patient care transitions, and clinical decision-making. She is particularly interested in fairness-aware AI, ensuring predictive models equitably optimize healthcare decisions while balancing efficiency and ethical considerations. Her work bridges technical AI advancements with practical applications in healthcare policy and practice.