

Artificial Intelligence in Health Care: Opportunities, Challenges, and the Road Ahead

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A comprehensive, collective approach to navigating the challenges of bias, privacy, and ethical considerations presented by the use of artificial intelligence in health care will require robust frameworks, continuous learning, and a commitment to equity. The insights and discussions presented in this issue are a testament to the ongoing efforts in North Carolina and beyond to find a balance between innovation with responsibility, ensuring that AI can deliver on its promise to enhance outcomes.

Introduction

Artificial intelligence (AI) is revolutionizing various industries, but its potential impact on health care is especially profound. From operational efficiencies to clinical diagnoses, personalized treatment plans to public health applications, AI promises to enhance nearly every facet of health care delivery. Properly implemented, AI has vast potential to improve patient outcomes, streamline health care processes, reduce costs, and drive innovation. However, as with most transformative technologies, along with massive upside potential come significant risks and uncertainties, as well as important ethical considerations. Effectively managing these challenges will require robust methods, implementation approaches, and regulatory frameworks.

Notably, North Carolina has emerged as a hub for AI innovation in health care, with numerous research institutions and tech companies leading the way in developing and implementing AI solutions.

Articles in this issue explore the exciting potential of AI in medicine while also addressing the complex challenges that come with it. With perspectives spanning diverse facets of health care, these discussions highlight the transformative impact AI can have on our health systems. Deploying AI effectively and safely goes beyond mere technical implementation—it requires a comprehensive approach to data collection, sharing, analysis, and interpretation. The complexity of health care means that AI's influence can ripple through systems in unexpected ways. By diving deep into these critical matters, the articles in this issue provide valuable insights into how AI can revolutionize health care economically and outline the steps necessary to overcome the hurdles ahead.

The articles in this issue can be generally classified into three themes, though these are interconnected and overlapping.

Transformative Potential of AI in Health Care

AI holds immense promise for transforming health care, and several articles in this issue delve into this potential from various perspectives. Ashok Krishnamurthy, director of the Renaissance Computing Institute at UNC-Chapel Hill, and coauthors detail how AI can help to enhance decision-making, improve patient outcomes, and optimize resource allocation [1]. Krishnamurthy, however, also emphasizes the significant challenges posed by biases in AI algorithms and the need for diverse datasets to ensure equitable impacts. Yvonne Mosley, Miriam Tardif-Douglas, and LaPonda Edmondson of the North Carolina Healthcare Association, in their commentary explore AI's integration into North Carolina's health care system specifically [2]. They highlight its potential to enhance operational efficiency and patient care, while also addressing ethical and privacy concerns, as well as the necessity for a robust information technology infrastructure to support AI adoption. Practical applications of AI in care management and health care administration are then covered by Sean Harrison, Melissa Leigh, and Daniel Hallenbeck of Acentra Health. Their discussion on intelligent document processing and human-in-the-loop approaches illustrates how AI can streamline operations and enhance decision-making processes core to health system administration [3].

Jordan Bryan and Didong Li of the Department of Biostatistics at UNC-Chapel Hill describe how machine learning is currently applied to electronic health record (EHR) data and how innovations in this area may lead to further automation of management, display, and diagnostic use of EHR [4]. Soma Sengupta and coauthors from UNC-Chapel Hill and xCures delve into how this platform aggre-

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gates clinical data across care sites and generates data in support of clinical care and research, including clinical trials [5].

Ethical and Privacy Considerations

Several articles in this issue delve into the critical ethical and privacy considerations surrounding the use of AI in health care. Thomas Hofweber, director of the AI Project in the Department of Philosophy at UNC-Chapel Hill, and Rebecca L. Walker, professor of philosophy and social medicine and core faculty in the Center for Bioethics at UNC-Chapel Hill, address the ethical issues of using machine learning, particularly focusing on patient confidentiality, data security, and the interpretability of AI models in their article. They highlight the potential for perpetuating existing health inequities through historical data and stress the need for ethical frameworks to guide AI development [6]. Ritu Agarwal and Guodong Gao of the Center for Digital Health and Artificial Intelligence at Johns Hopkins University further explore the ethical concerns related to patient autonomy and data biases, calling for vigilant and equitable implementation of AI [7]. Michael J. Pencina and Mary E. Klotman of Duke Health and Duke University School of Medicine, in their sidebar, emphasize the vital role of academic medical centers in ensuring the ethical and effective implementation of AI [8]. They highlight Duke's important initiatives in scrutinizing AI tools for safety, effectiveness, and fairness, and the importance of partnerships and community engagement to build trust and ensure transparency.

In-Depth Insights from Industry Leaders

This issue also includes in-depth interviews that provide detailed insights into the implementation of AI. With Stephen Aylward, founder of the North Carolina office of the open-source software company Kitware, we discuss the integration of AI in medical imaging [9]. In this wide-ranging interview, Dr. Aylward discusses AI's potential to improve diagnostic accuracy in point-of-care ultrasound applications and imaging-specific challenges, as well as offering insights on the need for multi-center clinical trials to ensure robust performance. The second interview, with Rich Caruana of Microsoft Research, emphasizes the necessity of using interpretable "glass box" models in health care to ensure clinicians can understand and trust AI's decisions [10]. As a pioneer in this area of research, he provides important insights into how AI can be designed to better support clinicians in their care for patients.

Conclusion

This issue of the *North Carolina Medical Journal* provides a nuanced overview of AI's role in health systems from diverse perspectives. Taken together, the contributors underscore both the massive potential and the inherent risks and uncertainty of integrating AI into medicine.

The biggest risk may lie in not taking a longer view and failing to calibrate our approach to AI adoption appropriately. While a cautious approach is vital, it is also essential to recognize that some failures are inevitable. When these occur, it will be crucial not to let them derail the progress and future benefits that AI promises. The potential for AI to save and improve lives is vast, and learning from setbacks will be key to realizing its full potential.

Managing the challenges of bias, privacy, and ethical considerations requires robust frameworks, continuous learning, and a commitment to equity. By taking a comprehensive and forward-thinking approach, we can navigate these complexities and harness AI to transform health care for the better. The insights and discussions presented in this issue are a testament to the ongoing efforts to balance innovation with responsibility, ensuring that AI can deliver on its promise to enhance health care outcomes while safeguarding against its risks.

As we move forward, it is imperative to maintain this balanced perspective, fostering collaboration across disciplines, institutions, and communities. By doing so, we can ensure that AI's integration into health care is not only successful but also equitable, ethical, and ultimately beneficial for all. NCMJ

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