Chapter 9
The Governance of Artificial Intelligence and Big Data in Healthcare Supply Chain Management

Paruss Panhwar
http://orcid.org/0009-0003-6567-820X
School of Public Administration, Northwest University, Xi'an, China

Mukut Sikder
http://orcid.org/0000-0002-1415-2203
Institute of Blue and Green Development, Shandong University, Weihai, China

Shaoguo Zhai
School of Public Administration, Northwest University, Xi'an, China

ABSTRACT

Healthcare Supply Chain Management (HSCM) advances the overarching societal objective of creating a sustainable system; however, artificial intelligence (AI) and big data (BD) have become essential facilitators of governance performance. Therefore, this chapter offers a comprehensive overview for AI and BD integration in HSCM with governance implications using PRISMA and SWOT frameworks to synthesize foundational studies published between 2015 and 2025. The results indicate that AI and BD support accurate predictions, optimize processes, and make overall systems resilient. However, ongoing challenges—such as data interoperability, algorithmic transparency, cybersecurity risks, and ethical governance—still hinder effective

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implementation. Finally, the study embraces theoretical principles and validation with governance-focused assessments, suggesting a sustainable use of AI and BD in HSCM co-benefits.

INTRODUCTION

Healthcare supply chains are inherently complex systems that must ensure the continuous availability of essential medicines, medical devices, and critical equipment across multiple facilities and regions. Their resilience, the ability to anticipate, absorb, and recover from disruptions—is crucial for maintaining operational continuity, particularly in areas such as inventory management, procurement, logistics coordination, and distribution (Vikas et al., 2025). Recent global crises, including the global pandemic, have exposed vulnerabilities in supply chain operations, highlighting challenges in forecasting demand, mitigating shortages, and efficiently allocating resources (Dubey et al., 2021; Ivanov and Dolgui, 2020). Artificial intelligence (AI) and big data (BD) analytics have emerged as key enablers for strengthening healthcare supply chain resilience. AI, including machine learning and deep learning, can analyze complex datasets to improve predictive accuracy, optimize inventory levels, and support adaptive decision-making in real time (Bajwa et al., 2021; Bekbolatova et al., 2024). Complementing AI, big data provides high-volume, high-velocity, and high-variety information from electronic health records, medical imaging, genomics, wearable sensors, and other operational sources, forming a foundation for evidence-based planning and resource allocation (Mauro et al., 2015; Shojaei et al., 2024). In the context of HSCM, building resilient systems ensures operational continuity during crises, while integrating AI and BD provides a governance-oriented approach to enhance efficiency, support sustainable growth, and optimize resource use (Sikder et al., 2024b; Vikas et al., 2025). Such technologies enable healthcare organizations to forecast demand, reduce operational inefficiencies, coordinate green logistics effectively, and maintain transparency and accountability across the supply chain, thereby strengthening resilience in critical areas (Queiroz et al., 2021; Wamba et al., 2020).

The healthcare industry is increasingly exposed to systemic disruptions arising from pandemics, geopolitical conflicts, political instability, and inflationary pressures, exacerbating sustainability challenges, rising costs, and social inequities (Isik and Aktürk, 2022; Thomas, 2024). In response, artificial intelligence and big data have emerged as key enablers of healthcare system performance, strengthening clinical decision-making, disease prediction, large-scale analytics, and supply chain resilience (Jiang et al., 2017; Naz et al., 2022). Since 2019, the global pandemic has highlighted the effectiveness of AI-driven applications in outbreak prediction,