Sustainable Hospital Supply Chain Management in India: A Systematic Literature Review and Research Agenda

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Abstract: Hospital supply chains are critical to the effective delivery of health services, directly impacting cost efficiency, service quality, and patient outcomes. In the Indian healthcare sector, rising demand, regulatory complexity, resource constraints and infrastructure limitations further accentuate the need for resilient and sustainable hospital supply chain management (HSCM). This paper presents an in-depth and structured review of the available literature on HSCM in India, with special emphasis on sustainable leadership, supply chain efficiency, digital technologies, artificial intelligence (AI) and circular economy (CE) practices. This study, based on Dynamic Capacity Theory (DCT), develops a comprehensive conceptual framework that links leadership commitment and organizational capabilities to sustainable supply chain practices and hospital performance across economic, environmental and social dimensions. The paper discusses the theoretical underpinnings, synthesizes previous research, identifies relevant challenges specific to India and outlines actionable managerial and policy implications. Significant research gaps have been identified and future research directions have been proposed to advance resilient, efficient and sustainable healthcare supply chains in emerging economies.

Keywords: Healthcare logistics, Hospital supply chain management, Sustainability, Artificial intelligence, Circular economy, Dynamic capability theory India.

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I. INTRODUCTION:

Healthcare systems rely significantly on efficient supply chains to assure the continuous availability of medications, medical devices, consumables, and critical services. In contrast to traditional commercial supply chains, hospital supply chains operate in high-risk contexts where interruptions have a direct impact on patient safety and clinical outcomes. As a result, hospital supply chain management (HSCM) has become an important strategic function.

Rapid population expansion, epidemiological shift, regulatory complexity, and differences in infrastructure have all exacerbated supply chain issues in India. The COVID-19 pandemic uncovered more vulnerabilities in forecasting, procurement, inventory visibility, and logistics coordination. Simultaneously, sustainability pressures ranging from medical waste creation to ethical sourcing have prompted hospitals to reconsider traditional supply chain strategies.

Although the global literature on healthcare supply chains is growing, research on sustainable hospital supply chain management (SHSCM) in India is still fragmented, descriptive, and theoretically underdeveloped. The linked roles of leadership, digital technology, artificial intelligence (AI), and circular economy (CE) practices have received very little attention.

To address these limitations, this work uses a systematic literature review (SLR) methodology to synthesize existing research on Indian hospital supply chains. This study, guided by dynamic capabilities theory (DCT), seeks to get a structured understanding of the main facilitators, practices, and results of sustainable human capital management. The objectives of this SLR are to:

1. Systematically identify and categorize available literature on HSCM in India.
2. Examine sustainability and enabling mechanisms in hospital supply chains.
3. Evaluate the impact of leadership, digitization, AI, and circular economy practices.
4. Create a theory-based conceptual framework.
5. Identify gaps and suggest future research directions.

II. METHODOLOGY

Systematic Literature Review

This systematic literature review (SLR) follows the PRISMA 2020 principles and established review procedures for logistics and supply chain management research. The review design prioritizes methodological clarity and replicability with a well-defined search strategy, inclusion and exclusion criteria, and systematic screening procedures. Furthermore, the study uses a rigorous method to theoretical synthesis to integrate and evaluate current scholarly contributions.

2.1 Review Scope and Research Questions

The review focuses on the logistics and supply chain management aspects of hospital operations in India, with specific attention on sustainability, digitalization, artificial intelligence, and circular economy techniques.

2.2 Search Strategy and Data Sources

A structured and systematic search was performed across major scholarly databases, including Scopus, Web of Science, PubMed, and Google Scholar, using specified and precisely crafted keyword strings. These keywords were created to collect important material on healthcare logistics, hospital supply chains, sustainability, artificial intelligence, and the circular economy, assuring complete coverage of the interdisciplinary research domain.

2.3 Inclusion and Exclusion Criteria

Only peer-reviewed journals published in English were considered. Conference papers, practitioner reports, and research without a logistics or SCM focus have been eliminated.

2.4 Screening and Selection Process

Article screening was done in three stages: duplicate removal, title abstract screening, and full text assessment. To improve reliability, inter-reviewer consistency checks were implemented.

2.5 Data Coding and Synthesis Approach

A coding framework was developed to extract data on logistics activities, SCM practices, sustainability dimensions, technologies, theories, and performance outcomes. Thematic synthesis and theory mapping techniques were applied.

III. DESCRIPTIVE AND METHODOLOGICAL ANALYSIS OF THE LITERATURE

3.1 PRISMA Flow and Study Characteristics: The initial database search generated a considerable number of results. Following the removal of duplicates and irrelevant studies using title and abstract screening, full-text assessment resulted in the final list of articles considered for synthesis.
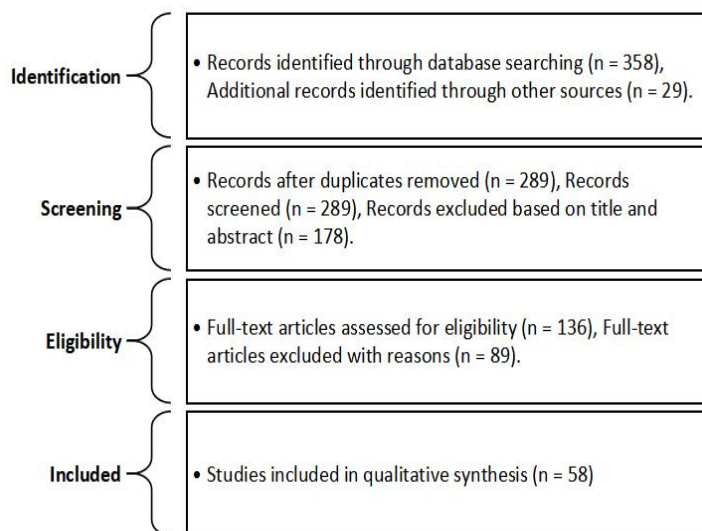

Figure 1 illustrates the PRISMA-based screening and selection process.

3.2 Descriptive Profile of Reviewed Studies

Dimension	Categories	Key observations
Publication period	2005–2014, 2015–2019, 2020–2024	Majority of studies published post-2015, sharp increase after COVID-19
Journal outlets	SCM, Logistics, Healthcare management, Sustainability	Logistics-focused journals underrepresented
Research methods	Survey, Case study, Conceptual, Mixed methods	Predominance of qualitative and descriptive studies
Theoretical lens	RBV, Institutional theory, Stakeholder theory, DCT	Limited explicit theory use, DCT rarely applied
Geographic focus	Public hospitals, Private hospitals, Mixed	Private sector more frequently studied

Table 1. Descriptive profile of reviewed studies

3.3 Research Methods and Analytical Techniques

The literature is dominated by qualitative case studies and surveys, with limited advanced quantitative logistics modeling, optimization, and AI-based analytics, emphasizing methodological limitations.

IV. THEMATIC SYNTHESIS:

Logistics-Oriented Perspectives

Theme	Key logistics focus	Representative insights
Leadership and governance	Strategic alignment, logistics integration	Leadership commitment enables cross-functional logistics coordination
Supply chain competencies	Procurement, inventory, supplier management	Competency development linked to efficiency and service reliability
Digital logistics	ERP, RFID, blockchain, HIS	Improved visibility and coordination across hospital supply networks
AI and analytics	Forecasting, inventory optimization	AI adoption remains nascent but shows strong potential
Circular economy & reverse logistics	Waste management, closed-loop flows	CE largely compliance-driven, strategic reverse logistics underdeveloped

Table 2. Thematic synthesis of sustainable hospital logistics literature

V.DIGITAL TECHNOLOGIES AND ARTIFICIAL INTELLIGENCE

5.1 Digitalization of Hospital Supply Chains

ERP systems, barcoding, RFID, and health information systems are all widely considered as tools for increasing openness and coordination. Evidence points to improved inventory accuracy and service responsiveness.

5.2 Artificial Intelligence and Advanced Analytics

Artificial intelligence applications in Indian hospitals are still in their early stages. Current research focuses on demand forecasting, inventory optimization, and decision support. The empirical validation of AI-driven SCM performance outcomes is limited.

5.3 Barriers to Adoption

Financial constraints, a lack of qualified human resources, data integration issues, and organizational opposition to change are all major impediments.

VI.CIRCULAR ECONOMY PRACTICES IN

Healthcare Supply Chains

The principles of the circular economy (CE) reduce, reuse, recycle, and recover are increasingly being recognized as avenues to healthcare sustainability. CE practices in Indian hospitals include waste segregation, non-hazardous material recycling, medical equipment reprocessing, sustainable packaging, and green procurement strategies. Evidence suggests that CE adoption is scattered and primarily policy-driven, rather than strategically anchored.

Concerns about patient safety, regulatory compliance, quality assurance, and liability continue to impede widespread implementation. The literature emphasizes the importance of established protocols, certification methods, and lifecycle assessment tools for scaling CE activities while maintaining clinical outcomes.

VII.THEORETICAL INTEGRATION

Dynamic Capability Theory

The Dynamic Capability Theory (DCT) provides a strong lens for interpreting SLR data. Hospitals that effectively detect environmental changes, capitalize on digital and sustainability opportunities, and reorganize supply chain resources display improved resilience and performance. In sustainable HSCM, dynamic capabilities are formed by combining leadership, learning processes, and technical infrastructure.

VIII.CONCEPTUAL FRAMEWORK AND RESEARCH AGENDA

Building on SLR findings, this study provides a logistics centric conceptual framework that connects leadership and supply chain competencies to dynamic logistics capabilities made possible by digital technologies and AI. Circular economy methods, which are operationalized through reverse logistics and closed-loop supply chains, serve as a bridge between capabilities and sustainability.

The concept enhances healthcare logistics theory by emphasizing dynamic capacities as mechanisms for hospitals' resilience and sustainability.

IX,DISCUSSION AND IMPLEMENTATIONS

9.1 Theoretical Implications for Logistics and SCM Research

This SLR contributes to the logistics and SCM literature by combining disparate healthcare supply chain research and incorporating it within a dynamic capacity framework. It takes sustainability and digital logistics research into an underserved emerging economy healthcare context.

9.2 Managerial Implications for Healthcare Logistics

Logistics managers should invest in digital infrastructure, analytical skills, and leadership-driven integration mechanisms to improve coordination, cut waste, and increase service reliability.

9.3 Policy and System-Level Implications

Policy interventions must encourage standardized logistics methods, green reverse logistics infrastructure, and data-sharing platforms throughout the healthcare supply network.

Research Gaps and Future Research Directions

The SLR finds multiple deficiencies, including inadequate numbers of theory-driven studies, minimal empirical testing of AI and CE techniques, a scarcity of longitudinal research, and an insufficient emphasis on social sustainability outcomes. Future study should use blended techniques, advanced analytics, and cross-country comparisons.

X.CONCLUSION

This research conducts a thorough literature evaluation on hospital supply chain and logistics management in India. Using a logistics-focused dynamic capacity viewpoint, the study synthesizes previous research to identify important enablers, practices, and performance outcomes associated with sustainable healthcare logistics. The report presents a conceptual framework and a future research agenda to enable theory development and practical advances in healthcare supply chain and logistics management.

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