

E-Commerce in Healthcare Supply Chain: A Pathway towards Affordable, Accountable & Available Healthcare Services

Sanjay Kumar, Rajesh Kumar*, Amit Mittal

***Abstract---** Standardization and integration of healthcare supply chain is must to explore and execute substitute ways of preventive and critical care reaching them through non-conventional methods improving its performance. Use of e-commerce in healthcare supply chain leads to partner relationship, information sharing and supply chain integration. Supply chain integration has the highest standardized total effect on supply chain performance improving flow of information, material and funds. This study reviews how implementation of e-commerce in healthcare supply chain has made healthcare services affordable, accountable and available for all.*

***Key Words---** Supply Chain; e-commerce; standardization; integration; performance*

I. INTRODUCTION

Healthcare industry is under tremendous pressure to improve patient care, managing input cost, technology, quality services and operating margins. Rapid change in technology, government rulings, stiff competition and new advancements has made patients more concerned and demanding. Not only are developing countries, developed countries also struggling to make healthcare affordable, accountable and available for masses.¹ Healthcare executives are under tremendous pressure and finding IT and e-commerce as tools to explore and execute different ways of preventive and critical care reaching them through non-conventional methods to make it affordable, accountable and available. Patients are also accepting and opting for substitute modes of care e.g. telemedicine, mobile healthcare, home healthcare, remote healthcare, clinics at pharmacy stores and many under hub and spoke model. These facilities are helping healthcare service providers to reach and serve masses, optimizing cost, adding comfort and values to patients. Use of technology for such services are helping governments, service providers and patients to save on GDP, time and out of pocket expenses. E-commerce could help healthcare service providers towards better prognosis and treatment, disease management, patient segmentation, evidence-based medicine, multi resource planning, real time critical patient monitoring, on line appointment and patient planning, remote monitoring, optimization of resources, better patient turnover, prevention of claim delay and rejections, prevention of fraud and abuse and many more. E-commerce could help to improve quality of healthcare service, optimizing multi-disciplinary care management, clinical and administrative efficiency, maintaining high levels of transparency, mutual trust and interpersonal relationship by improving interpersonal information sharing and transparency. Standardization and integration of healthcare supply chain is must to explore and execute substitute ways of preventive and critical care reaching them through non-conventional methods improving its performance making it

Sanjay Kumar, Research Scholar, Chitkara Business School, Chitkara University, Punjab, India.

Rajesh Kumar, Associate Professor, Chitkara Business School, Chitkara University, Punjab, India. E-mail: kumar.rajesh@chitkara.edu.in*

Amit Mittal, Professor, Chitkara Business School, Chitkara University, Punjab, India.

affordable, accountable and available for all. Use of e-commerce in healthcare leads to partner relationship, information sharing and supply chain integration.

Supply chain integration has the highest standardized total effect on supply chain performance.² E-Commerce has potential to bridge this gap by creating atmosphere of transparency, mutual trust and interpersonal relationship, standardizing and integrating flow of information, flow of material and flow of patient with in internal and external supply chain optimizing performance, minimizing bottle necks and waste.³Humphreys et al were of the view that use of e-commerce in upstream and downstream operations helps to generate 5% to 10% extra revenue.⁴McAfee et al concluded that peers using e-commerce for their internal and external operations posts 5% to 6% higher returns to their counterpart.⁵ HFMA (2008) Healthcare Financial Management Association- USA, reported that 1% to 3% increase in profit margin is possible by 5% to 15% saving in healthcare supply chain which is 40% to 50%, where other industry costs 2% to 8%. The report further concluded that poor data sharing and managing costs 3% to 5% to healthcare services. Considering all, e-commerce in healthcare supply chain could help generating up to 15% extra operating profit, standardizing and integrating supply chain by optimizing flow of information, material and patient improving performance minimizing bottle necks and waste making healthcare affordable, accountable and available for all.

II. LITERATURE REVIEW

Present study is based on secondary data which has been collected from Journals, E-journals, books and other publications. Literature from 2003-2018 has been studied to understand and analyze how e-commerce improves performance of healthcare supply chain making healthcare affordable, accountable & available for all in India. Researcher has used the keywords for searching the data like logistics, supply chain, healthcare supply chain, e-Commerce in healthcare, role of e-commerce in standardization and integration, role of e-commerce in flow of information, material and patients.

E-commerce in healthcare supply chain: a discussion

Bicheno and Holweg concluded that waiting (trackability and traceability of inventory hampers patient response time and hospital efficiency), transportation, motion (personal update to domain expert), doubling of work (manual and automated), inventory (poor information sharing among associates), defects (wrong receiving and issues because of poor data standardization) and over production (doubling of work doing manual and automatic) are seven waste of healthcare supply chain affecting the patient response time and hospital outcome. Rapid changes in legislation and policies, chronic diseases, lifestyle & demography and patient's demand for sophisticated, accountable, available, affordable, tailored healthcare services and poor trust putting pressure on GDP, healthcare institutions and service providers.⁶Johnson concluded that healthcare supply chain contributes 38% of cost, where it is 2% in electrical and 5% in retail business. Level of wastage in healthcare that out of \$2.2 trillion, \$1.2 trillion was wasted (Pricewaterhouse's report on Health Research Institute).⁷Duffy was of the opinion that poor association among healthcare associates is biggest reason of highest healthcare supply chain cost. Supply chain transparency and effectiveness could be improved using e-commerce.⁸Lin et al suggested that e-commerce in healthcare can help to improve operational process and multidirectional interaction with internal and external associates.⁹Elmuti et

aladvocated that supply chain has potential to improve productivity optimizing cost, qualities, product/ service cycles and inventory costs. Innovations and e-commerce in healthcare supply chain provides flexibility of operations and change management and helps optimizing cost, response time, lead time, improving quality and business environment.¹⁰Law et al concluded that high level of internal and external operational correlation is possible encouraging high spirit of efficiency and self confidence among management of supply chain partners.¹¹

Logistics expenses and efficiency could be optimized by standardizing healthcare supply chain information technology and decision-making process. Know et al opined that improved productivity, efficiency & effectiveness and behavioral uncertainties is possible by enhancing information sharing among internal and external associates. To deal with customer needs effectively, internal and external supply chain has to deal with flow of goods, information and funds.¹²Won Lee et al were of the opinion that pre-condition for the success of healthcare supply chain is internal integration of the organization.¹³Leewas of the view that healthcare innovation consists of three basic components. The patient-oriented innovation concentrates on patient turnover, ease of operation and healthcare cost. The technology-oriented innovation concentrates on healthcare supply chain (internal and external) improving delivery system providing high quality care introducing innovative treatment process to prevent diseases, optimizing product, services quality and delivery time. The use of IT and e-commerce can help to integrate entire operations optimizing efficiencies of flow of information, material and patient. Healthcare supply chain consists of three type of flow; flow of material, flow of information and flow of funds. Healthcare supply chain have internal supply chain which includes patient care management, material management, patient management and external supply chain includes vendors, original equipment manufacturer, distributors etc. Associating with best performing market leader upstream partners, organizations like Zara, Wal-Mart, P&G, IKEA etc., managed to optimize their cost, quality and customer satisfaction.¹⁴Dooleyadvocated that individualized, coordinated & integrated functional association and operation supported by dynamic information sharing are six steps for the successful and accelerated execution of healthcare supply chain.¹⁵Astonopined that introduction of e-commerce in healthcare supply chain has potential to improve flow of good, information and operating procedures. In 2009, developed countries (e.g. US Federal Government) diverted part of \$1.1 billion economic stimulus for the study of healthcare supply chain specific to the flow of medicine, medical equipment and operating procedures to enhance flow of goods and information making healthcare affordable, accountable and available at organization and national level. Healthcare supply chain carries ample opportunities of improvements as is unique and complex in nature. They further elaborated that improvement in operating cost, service level and efficiencies in internal and external supply chain is possible by creating atmosphere of dynamic collaboration, cooperation, information sharing, data collection, analysis, evaluation and sharing.¹⁶ Harvard business review(2014) concluded that sharing accurate and dynamic information among internal and external supply chain associates helps to minimize healthcare cost and quality services. Kim and Know elaborated that optimizing cost and quality are two major goals management is exploring in healthcare. Scholars and practitioners are of the view that implementation of innovations and e-commerce strategies in healthcare supply chain is painfully slow and needs to be implemented. They further elaborated that for the success of healthcare supply chain all associates to be well informed with relevant information.¹⁷Partidas et al concluded that affordable, accountable and available healthcare is possible by improvising information sharing, communication, functional

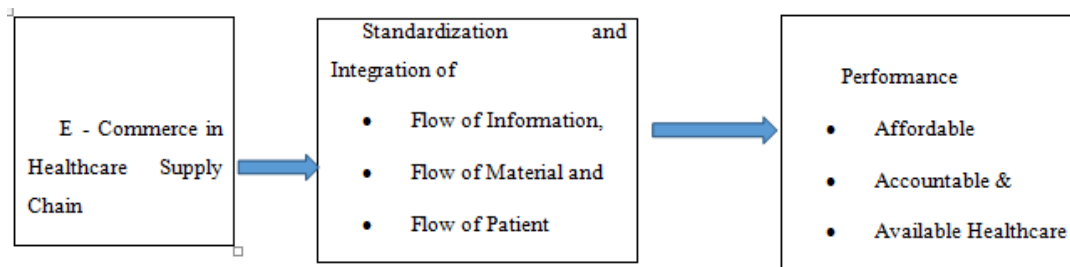
integration, accelerated operations and mutual collaboration among internal and external collaborators including inpatient and outpatients.¹⁸

Brown was of the view that automation and e-commerce have potential to minimize medical malpractices in healthcare.¹⁹ Gowen et al elaborated that medical errors, patient safety and higher medical costs are the major issues entire world is facing in recent years. Healthcare supply chain being second highest cost contributor, supply chain is under tremendous pressure of managing cost meeting user requirements. Healthcare supply chain has potential to enhance the bridge of affordable, accountable and available healthcare for under developed countries.²⁰ Shih et al were of the view that supply chain influences hospital performance by optimizing waste, medical errors, quality of care & healthcare services to patient and improving operational efficiencies.²¹ Lee et al emphasis that data optimization, dynamic response to patient care and medical error minimization is possible using supply chain innovation. It can further impact customer value creation and organizational performance.²²

III. PROPOSED MODEL

The model proposed for this study is shown in the Figure 1 and is mainly adapted from the supply chain integration model of Siau K and Tian Y.²³, inter-organizational e-commerce model in healthcare services of Kalyanpur et al.²⁴ and e-procurement and supply chain performance model of Hsin Chang et al.²⁵ Proposed model is modified considering variables of e-commerce role in Healthcare Supply Chain standardization and integration and on its performance.

Figure 1: Proposed Model



IV. FINDINGS AND CONCLUSION

The findings of the study conclude that implementation of e-commerce in healthcare supply chain has potential to provide dynamic information sharing, improved level of communication, end to end functional integration, accelerated response time and improved mutual trust and collaboration among internal and external collaborators including inpatient and outpatient to make healthcare available, affordable and accountable for all by optimizing all medical and non-medical errors, wastages and seamless flow of patient, improved patient care and patient management. These collective efforts of all associates help healthcare organizations to provide quality healthcare service with more transparency winning the trust of end user and regulators at economical cost maintaining their operating margins.

V. IMPLICATIONS OF THE STUDY:

The finding of the study will help healthcare professional in standardization and integration of healthcare supply chain which has the highest effect on healthcare supply chain performance. It can help to overcome healthcare demand and supply problem by the utilization of technology using hub and spoke model reaching masses. Standardization and integration helps continuous evaluation of supply chain process improving performance rectifying nonvalue addition in process to make the process more dynamic and responsive. It helps proper utilization of resources towards improving patient safety and making available healthcare infrastructure thereby reducing demand supply gap.

VI. AVAILABILITY OF DATA AND MATERIALS

The data generated during the research are available from the corresponding author on reasonable request

Acknowledgements

Not Applicable

Authors Contributions

SK collected all reviews and scrutinized and framed in to artical format

RK carried out the design of the study alignment and drafted the manuscript.

AM design and coordination and helped to draft the manuscript

SK, RK and AM read and approved the final manuscript.

Ethical Clearance

N/A (Review article)

Source of Funding

The author(s) received no financial support for the research, authorship, and/or publication of this article.

Conflict of Interest

Nil

REFERENCES

- [1] Lee SM, Lee D, Schniederjans MJ. Supply chain innovation and organizational performance in the healthcare industry. *International Journal of Operations & Production Management*. 2011 Oct 18;31(11):1193-214.
- [2] Hsin Chang H, Tsai YC, Hsu CH. E-procurement and supply chain performance. *Supply Chain Management: An International Journal*. 2013 Jan 18;18(1):34-51.
- [3] De Vries J, Huijsman R. Supply chain management in health services: an overview. *Supply Chain Management: An International Journal*. 2011 May 3;16(3):159-65.
- [4] Humphreys P, McIvor R, Cadden T. B2B commerce and its implications for the buyer-supplier interface. *Supply Chain Management: An International Journal*. 2006 Mar 1;11(2):131-9.
- [5] McAfee A, Brynjolfsson E, Davenport TH, Patil DJ, Barton D. Big data: the management revolution. *Harvard business review*. 2012 Oct 1;90(10):60-8.

- [6] Bicheno J, Matthias. Holweg. The Lean Toolbox, 4th edition, London PICSIE. 2009.
- [7] Johnson B. Intermountain Healthcare Supply Chain. The 2015 Healthcare Supply Chain Conference, New Orleans. 2015: 21-25.
- [8] Duffy M. Is supply chain the cure for rising healthcare costs?. Supply Chain Management Review. 2009 Sep;13(6).
- [9] Lin C, Lin HC, Huang YA, Jalleh G. The fit between organizational B2B e-commerce policy, IT maturity and evaluation practices on B2B e-commerce performance in Australian healthcare organizations. African Journal of Business Management. 2011 Mar 4;5(5):1983-2005.
- [10] Elmuti D, Khoury G, Omran O, Abou-Zaid AS. Challenges and opportunities of health care supply chain management in the United States. Health marketing quarterly. 2013 Apr 1;30(2):128-43.
- [11] Law KM. How schedule issues affect drug logistics operations: an empirical study in hospitals in China. Industrial Management & Data Systems. 2016 Apr 11;116(3):369-87.
- [12] Kwon IW, Suh T. Factors affecting the level of trust and commitment in supply chain relationships. Journal of supply chain management. 2004 Mar;40(1):4-14.
- [13] Won Lee C, Kwon IW, Severance D. Relationship between supply chain performance and degree of linkage among supplier, internal integration, and customer. Supply chain management: an International journal. 2007 Oct 2;12(6):444-52.
- [14] Lee SM, Lee D, Olson DL. Health-care quality management using the MBHCP excellence model. Total Quality Management & Business Excellence. 2013 Feb 1;24(1-2):119-37.
- [15] Dooley L. Make logistics the focus of your supply chain plan. Materials management in health care. 2009 May;18(5):26-9.
- [16] Aston G. Comparative effectiveness. Federal government's push for more data to benefit supply chain. Materials management in health care. 2010 Apr;19(4):22-5.
- [17] Kim SH, Kwon IW. The study of healthcare supply chain management in United States: Literature review. Management Review: An International Journal. 2015 Dec 1;10(2):34.
- [18] Partidas B. Closer Relationships lead to superior planning. Supply Chain Management Review,(May/June). 2015:70-2.
- [19] Brown SB. 2007 Most Wired Survey. Innovators plug in systems to drive supply chain efficiency. Materials management in health care. 2007 Aug;16(8):33.
- [20] Gowen Iii CR, Stock GN, McFadden KL. Simultaneous implementation of Six Sigma and knowledge management in hospitals. International Journal of Production Research. 2008 Dec 1;46(23):6781-95.
- [21] Shih SC, Rivers PA, Hsu HS. Strategic information technology alliances for effective health-care supply chain management. Health services management research. 2009 Aug;22(3):140-50.
- [22] Lee SM, Lee D, Schniederjans MJ. Supply chain innovation and organizational performance in the healthcare industry. International Journal of Operations & Production Management. 2011 Oct 18;31(11):1193-214.
- [23] Siau K, Tian Y. Supply chains integration: architecture and enabling technologies. Journal of Computer Information Systems. 2004 Mar 1;44(3):67-72.
- [24] Kalyanpur A, Latif F, Saini S, Sarnikar S. Inter-organizational e-commerce in healthcare services: the case of global teleradiology. InGlobal Information Technologies: Concepts, Methodologies, Tools, and Applications 2008 (pp. 1743-1758). IGI Global.
- [25] Hsin Chang H, Tsai YC, Hsu CH. E-procurement and supply chain performance. Supply Chain Management: An International Journal. 2013 Jan 18;18(1):34-51.