

Responsive Supply Chain Management in Healthcare Industry: An Overview

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ABSTRACT

Purpose: To be competitive in healthcare sector, responsive supply chain management is essential. The Primary objective of responsive supply chain management is to provide the high quality of patient care at affordable cost. In order to fulfil aforesaid purpose, it is necessary to understand the healthcare supply chain management. This paper provides the insight of responsive healthcare supply chain management in developing countries. Present paper focuses the healthcare supply chain management key issues, barriers and enablers. It also provides challenges faced by the healthcare supply chain management. Responsiveness in healthcare supply chain management is very difficult to achieve because it requires the total involvement of every player of the chain. This paper also discusses the expected performance outcomes after achieving the responsiveness in healthcare supply chain management

Design/Methodology/Approach: Exhausted literature has been reviewed in order to identify the issues, barriers, challenges of responsive healthcare supply chain management

Findings: It is found that researchers still not focus on achieving responsiveness in healthcare sector. Therefore, it is necessary to understand key issues and challenges faces faced by the healthcare sector so that the patient oriented responsive supply chain management can be achieved.

Paper Type: Theme based paper focuses on the responsive supply change management in the healthcare industry.

KEYWORDS Healthcare Supply Chain Management | Responsiveness | Internet of Things

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Introduction

In today's competitive environment the primary focus of all organizations whether it is a manufacture company or Service Company is, to satisfy the customer requirement. Sustainability in market is the primary concern of every industry. (Ireland and Webb, 2007).

Management of supply chain is a continuous process in which goods, services, information and fund flows simultaneously among the different chain members. It is a set of decisions and activities which ensures the availability of the desired quantity of materials/products/services at the required place, at correct time at affordable cost and as per the customer's expectation. The purpose of effective and efficient supply chain management to increase the overall productivity and thereby improve the customer's responsiveness. This can be achieved by managing all the resources, products, and money and information flow. In a successful supply chain, the coordination and complete flow of information among the various stakeholders of the chain. By improving the efficiency of logistics and managing all the operations in a supply chain network effectively will enhance the responsiveness in the chain and create value to the customers.

It significantly improves the cost and added the value of the product or services while effective utilization of capital resources. Organizations are trying to integrate all the processes along the supply chain in order to get responsiveness. Other tools and techniques that can improved the responsiveness in a supply chain are the Internet of things , application of big data to maintain the record , use of RFID and e- commerce.

Responsiveness in any supply chain management will define its pace .Patient responsiveness can be achieved by providing the best method of treatment of patient at the right time. Identification of disease in the patient requires the accurate diagnosis and expertise of nurses and physician in their work.

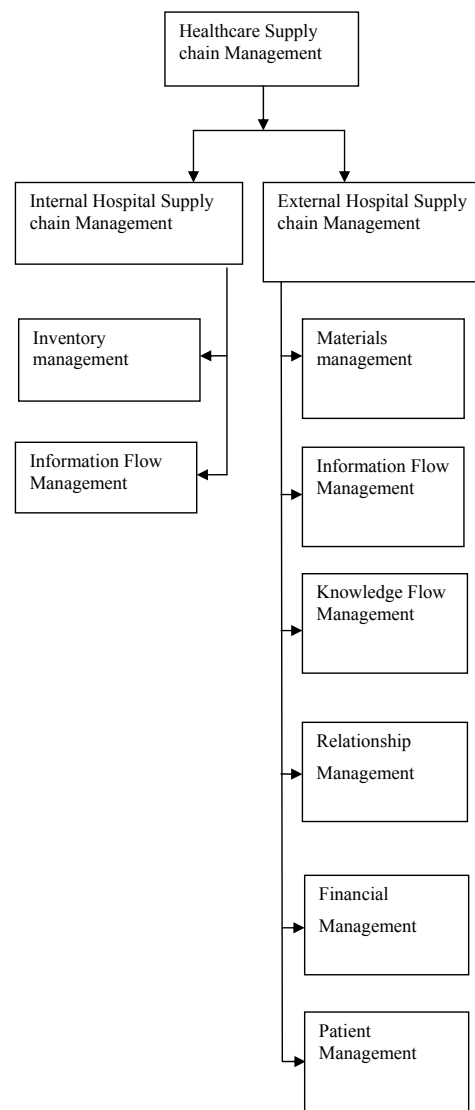
Healthcare Supply Chain Management:

The Healthcare Industry is one of the fastest emergent industries in every developing countries. Management of supply chain is very complex and difficult to achieve due to uniqueness of this industries as compared to other industries. The purpose of healthcare supply chain management is to provide best quality of patient care at affordable cost and it is very difficult to achieve as every patient have their specific requirement. It is a process of managing the medical supplies and integration of suppliers and hospital services effectively by optimizing the utilization of resources. The benefits of responsive healthcare supply chain management is to improve the quality of care, improve response time, enhancement of productivity, better utilization of resources, consistent patient staffing.

The healthcare sector has still not derived desired results from existing supply chain management practices. There is

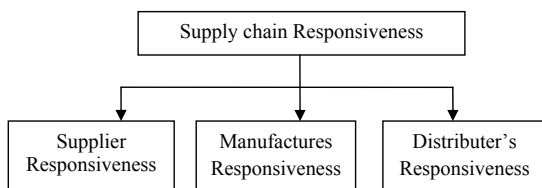
very slow rate of adoption, therefore it is generally known as highly fragmented and inefficient industry as compared to the manufacturing industry. Different supply chain members' work independently focuses only on their internal processes and hence involved in price hiking they have a lack of coordination between the other departments/members of the supply chain. Different programs are generally addressed in hospital to decrease the resource utilization and enhancement of the quality of care of patients, but these programs will not give better results for a long time. Internal health supply chain is the weakest link in the supply chain integration. Different medical workers are usually concerned with the internal logistics performance, frequently to reduce the time of patient care. Because of the advancement of technologies, involvement of multiple stakeholders and complex nature of health care sector enhance the difficulty of adopting the best the practices of supply chain in hospitals. Patient care and cost reduction can be achieved by proper selection of purchasing activities, inventory management techniques and distribution activities.

Figure 1.1: Classification of Healthcare Supply Chain Management



In short, healthcare supply chain management is the management of different medical instruments, medical tools like syringes, gloves etc. and management of manpower (doctors, nurses, supporting staff etc.). The overall purpose of healthcare supply chain management is to cure the patient completely with the maximum patient satisfaction in a shortest possible time without increasing the cost burden. The primary objective of any healthcare supply chain management is to fulfil the needs of the patients and hospital is the place which play a vital role in this regard.

Figure 1.2: Components of Supply Chain Responsiveness



Every member in supply chain should be responsive if overall responsive is to be achieved. Supplier responsiveness is very much required in this field because it fulfil the patient requirement directly. if patient get a particular medicines or drug due to slackness of the supplier it can be cost him a lot in terms of money or life. This requires the efficient medical service network and logistic management .Manufactures in healthcare supply chain is the pharma companies which makes the drugs and those industries which makes the surgical or clinical equipments . They also need to be responsive as the requirement. It requires the proper and complete information flow regarding the services or medicines. use of internet is essential now days in his regard. Distributor should also be responsive responsive as soon as they received the medicines or equipments to hospitals or service centres.

Literature Review

In literature, supply chain management has been considered from various perspectives by researchers. Here, we are focusing from the perspectives of the patient. Different studies shows that some portion of the cost can be significantly reduced in healthcare sector if the supply chain has been implemented properly .Still some important performance indicators shows that healthcare sector is lacking in implementing the best practices of supply chain management. This sector focuses the flow of materials and the flow of patient in chain [Beier, (1995)]. Some researchers focus on the role of e- business in healthcare sector (Siau et al., 2002). Some studies focus the problems while implementing the electronic patient record system (Boonstra and Govers, 2009). Seong No Yoon et al. (2016) discusses the effect of innovation and leadership and innovation in supply chain to obtain hospital supply chain efficiency. Mohamed Aboelmaged et al. (2018) use the RFID system in the management of patient and medical asset in TOE (technology, organization and environment) framework. Yousef Abdulsalam et al. (2018) discuss the role

and influence of physician-hospital integration on hospital supply management. SaraTolf et al. (2015) optimize design of organizational structures and processes to combine internal efficiency and external effectiveness of healthcare supply chain management. Vikram Bhakoo et al. (2015) focuses the practices and uses of collaborative management of inventory in Australian hospital supply chains. Amir M. Rahmani et al. (2017) does a unique study with the help of Internet of things and exploiting smart e-Health gateways in healthcare sector. Gunasekaran Manogaran et al. (2017) try to develop a new architecture of Internet of Things and big data ecosystem for secured smart healthcare monitoring and alerting system. Mahmud Hossain et al. (2017) use the Internet of Things for health prescription assistant and its security system design. TuangyotSupeekit et al. (2016) use the DEMATEL-modified ANP to evaluate internal hospital supply chain performance. Eko Budi Leksono et al. (2018) use the DEMATEL and Balanced Scorecard technique to develop the performance indicators on sustainable healthcare supply chain management. Although healthcare industry play an important role in developing the growth of any nation, very less attention has been focused on the responsiveness issue of healthcare sector. Therefore the purpose of this research paper is understand the healthcare sector its main issues, and challenges to bring responsiveness. This will assist the decision makers to improve the best practices in their hospital which will ultimately benefit the patients.

Challenges Faced by Responsive Healthcare Sector

Following are the major challenges faced by healthcare sector (Storey et al. 2006; Shah et al. 2008; Sinha and Kohnke 2009):

- 1) Lack of coordination among supply chain members.
- 2) Lack of coordination with government agencies.
- 3) Sustainable Supply chain management.
- 4) Waste Management.
- 5) Insurance Management.
- 6) Inventory Management.
- 7) Logistics Management/ Transportation Cost.
- 8) Operational issues (such as bottlenecks, low throughput, low resource utilization).
- 9) Performance management.
- 10) Advance adoption by supply chain members.
- 11) Population is growing in a rapid pace in developing countries. Due to this the demand of quality care of patients are also increased. Number of hospitals and hospital system infrastructure hospitals in developing countries did not increased in the same pace with



population and corresponding patient demand. This leads to longer waiting time of patients. Workforce planning and scheduling, Streamlining of patient flow.

- 12) Individual players in healthcare supply chain management generally divided way and give postponed reaction to the requirements of different individuals. They are working on their own profit and did not focus on the overall benefit of the supply chain. This tendency of different player of the chain badly affect the level of care of the patient. Patient will suffer as he depends on the responses provided by the different actors of the chain.
- 13) Another challenge faced by the healthcare supply chain management is the incomplete and inaccurate flow of information between the different actors of the chain. This will happen because they do not have trust and cooperation among them. The consequences of this problem is that the patient get the inferior care and they have to provide more money for these level of care.
- 14) Physician in healthcare supply chain management provides those the medicines to the patient for which they want. There is not any standard and quality norms has been followed. This will create the problem regarding the inventory of drugs/ medicines because accurate forecasting in this field is very difficult task. This will increase the level of uncertainties in the chain and ultimately patient were sometimes faces problems.
- 15) The involvement of more than one decision maker in the healthcare supply chain will create problem. For example decision of purchasing of any medicine or surgical equipment has been made by doctors as well as purchasing manger and owner of the hospital. These all increase the problems in the healthcare supply chain.

The common issues in the healthcare supply chain

Requirement and support of information technology and paperless flow of information technology has been emphasized. To cope up with the increasing cost, healthcare sector constantly work on inter and intra organizational network. In healthcare supply chain management various issues were identified by the researcher's are lack of sufficient and necessary knowledge of supply chain management, improper supply chain coordination, lack of taking responsibility etc. Some other important issues that were also observed in healthcare supply chain management are the accurate forecasting of patient arrivals which will definitely affects their quality service providing ability. It also suffers due to fragmented data and information sharing system and lack of standardization of the products.

table 1 : Selected Issues of Healthcare Supply chain Management Reported in Literature

S.N.	Authors (Year)	Issues of Healthcare Supply chain Management	Remark
1.	Rajendra Kumar Shukla et al. (2018)	Supply chain Coordination	Supply chain coordination has been improved in this paper by the application of ANP.
2.	Tummala, Rao, et al. (2008), Fawcett, et al. (2008), Wieser (2011) and	Information Technology	They provide the information technology is the base of internal supply chain integration in the healthcare.
3.	ZhiXiong (Thomas) Pan et al. (2007)	Logistic Management	Author discuss the role of information sharing for logistic management and it will reduce the inventory in the hospital.
4	Seong No Yoon et al. (2016)	Capacity Management	This study examines the effects of innovation leadership and supply chain (SC) innovation on SC efficiency in the healthcare organization. The structural equation modeling (SEM) technique with AMOS 17.0 was used to investigate the moderating effect of hospital size (more than 500 and less than 500 beds).
5.	Chandra and Kachhal (2004), Schneller and Smeltzer 2006)	Purchase Management	E purchasing and group purchasing is preferred to reduced the overall reduction of purchasing cost.
6.	Acharyulu et al. (2007) Bendavid and Boeck (2011)	Patient Safety	Patient safety is the primary concerned.
7.	Tutuncu and Kucukusta (2008) and Kumar, DeGroot, and Choe (2008)	Inventory Management	Computerized inventory program has been used by the author to reduce the drugs inventory.
8.	Christopher (2011) and Sweeney (2011)	Relationship Management	Patient relationship management and supplier relationship management is the primary focus of the author.

Developing and maintaining the Responsive Supply chain management

Development of responsive healthcare supply chain management requires the comprehensive review of barriers and enablers of healthcare supply chain management. Interpretive structure modelling can be used to model to barriers of responsive of healthcare supply chain management. Priority order of the barriers can be determine by the application of these techniques.

Researchers have used many tools and techniques like six sigma [14], BPR (Business Process Reengineering) [15] and TOPSIS (Technique for Order Preference by Similarity to the Ideal Solution), AHP (Analytic Hierarchy Process), and their combinations to develop and obtain solutions. The fuzziness in the these technique can provide the more realistic value of criteria. The cost incurred during the patient care is due to consumptions of different resources such as specific medical equipments / instruments people or staff. While developing the solutions the healthcare providers should be very cautious about the resource consumption of patients as it incurred cost.

Table 2.2: Analytical Method Reported in Literature

S.N.	Authors (Year)	Issues	Technique used
1	Rajendra Kumar Shukla, et al. (2014)	Modelling of supply chain coordination	Fuzzy AHP and Fuzzy TOPSIS
2	Mahesh Chand, et al.(2017)	Risk management in supply chain	MCDM Approaches
3.	Rajendra Kumar Shukla, et al.(2018)	Modelling supply chain coordination for performance improvement	Analytical network process-based Approach
4.	Kuo-Ping Lin, et al.(2018)	Sustainable supply chain management using approximate fuzzy DEMATEL method	Approximate Fuzzy and DEMATEL Method
5.	Eko Bu di Leksono, et al. (2018)	Sustainable Healthcare Supply Chain Performance Measurement	Balanced scorecard, DEMATEL
6.	Zahra Hosseinifard , et al. (2018)	The inventory centralization impacts on sustainability	Sensitivity analysis
7.	Tuangyot Supeekit, et al. (2018)	Evaluate internal hospital supply chain performance	ANP and DEMATEL
10.	Seyed Habibollah Mirghafoori, et al. (2018)	Sustainable Hospital Supply Chain Management	Delphi Method, Intuitionistic fuzzy cognitive map (IFCM)

S.N.	Authors (Year)	Issues	Technique used
11.	Roberto Casado-Vara et al. (2018)	To improve the security in healthcare supply chain	Blockchain Technology
12.	Umang Gupta, A. Ramesh (2018)	barriers of health care supply chain	Interpretative system Modeling (ISM)
13.	Rameshwar Dubey, et al. (2017)	Sustainable supply chain management: framework	Total Interpretive Structural Modeling, MICMAC Analysis
14.	Gilbert N. Nyaga, et al. (2015)	Intra- and Inter organizational Arrangements on Hospital Supply Chain Efficiency	Regression analysis
15.	Min-chih Hsieh et al. (2018)	human error factors in emergency departments	Human factors analysis and classification system(HFACS) (AHP) ,TOPSIS, (MCDM)
16.	M. Mousazadeh, et al. (2017)	Health service network design	Bi -objective mixed-integer nonlinear programming model, hybrid robust Possibilistic programming (HRPP) approach
17.	Hassan Heidari-Fathian, et al. (2078)	Green-blood supply chain network design:	Multi objective mixed integer mathematical programming
18.	B. Zahiri, et al.(2017)	Design of a pharmaceutical supply chain	mathematical model
19.	EB Leksono, et al.	Sustainable Service supply chain performance measurement	balanced scorecard (BSC), DEMATEL
20.	Z. Chorfi, et al. (2018)	Performance measurements	Balanced scorecard (BSC) and the (SCOR) model

Expected Performance Outcomes of Responsive Healthcare Supply Chain Management

Primary objective of responsive healthcare supply chain management is to provide high quality of patient care at affordable cost. Cost of care in the healthcare in developing countries like India is very high and it is not achievable in many parts of many areas.



A responsive supply chain management can be obtaining following performance outcomes:

1. **Streamlined workflow :** All the trading partners will work for the same objective and so the streamline the process , this will ultimately provide the quality of patient care at minimum waste and hence reduce the cost of care.
2. **Control over inventory:** Inventory management is essential in healthcare supply chain management which excessive inventory incurred huge cost burden on the patient while the shortage of medical equipments, medicines and services can cause the health of the human being. Responsiveness in healthcare supply chain management will automatically improve the materials management.
3. **Improvement in Suppliers relations:** Responsiveness brings the strong and healthy relationship between the service providers/ hospitals or nursing homes with the suppliers.
4. Responsive healthcare supply chain management empowered good relationship within the trading partners of the supply chain and a good healthy culture will be developed in the organization.
5. **Improvement in Patient management:** Responsive supply chain management will brings delight in patients as they get the value of their money and also satisfied with quality of care provided by the hospitals.

Result and Discussion:

Various actors of healthcare supply chain management are mostly works for their individual profit and lack of coordination and cooperation with other members of the supply chain. Responsiveness in healthcare supply chain management involves the fully contribution from the all members of the chain. sometime the members have conflicting objectives like patient wants the high quality of care at minimum cost while healthcare providers wants high profitability of hospital which will adversely affect the goal of responsive supply chain management.

Swinehart and Smith (2005) point out the significance of patient satisfaction in healthcare sector. While the Hwang and Christensen (2008) discusses the importance of all the employees and staff in healthcare sector. By the application of coordination in different supply chain activities , internal patient satisfaction brings the responsiveness in healthcare sector.

Conclusions and Scope for Future Scope:

This paper shows the insight of responsive healthcare supply chain management. Exhausted literature has been reviewed in order to identify the issues, barriers, challenges of responsive healthcare supply chain management. Various challenges which are not addressed properly in the field of

healthcare supply chain management are the lack of top management support, improper coordination and cooperation of supply chain trading partners, insufficient performance measurement and incomplete education and training about supply chain management.

This study focuses on identification of issues which can if resolved properly can bring the responsiveness in the healthcare sector. The effects of issues has been validated and discussed with the doctor and experts of healthcare sector. The paper also provide the expected performance outcome of the responsive healthcare supply chain management.

It can be concluded that researchers still not focus on achieving responsiveness in healthcare sector. Therefore it is necessary to understand key issues and challenges faces faced by the healthcare sector so that the patient oriented responsive supply chain management can be achieved. This study presents the healthcare sector in perspective of healthcare sector. Limitation of this study is that it has been conducted for developing countries. Future research is required in different field like integration of different processes, logistics, information flow, capacity management and inventory management to achieve the responsiveness. Modelling of barriers of responsive supply chain management by ISM can be done in future. AHP can also be implemented in order to obtain the weight of different criteria of responsive supply chain management. In future patient service index can also be calculated by the implementation of fuzzy AHP.

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**Reviewers
Comment****Reviewer Comment 1:**

Even the paper is short and crisp then also it covers various aspects of healthcare supply chain management such as key issues, barriers and enablers and also provides challenges faced by the healthcare supply chain management.

Reviewer Comment 2:

Authors made very well use of figures and tables to make the paper lucid to understand and presentable as well.

Reviewer Comment 3:

The topic of the manuscript is interesting and sector selected by the authors is appreciable because the Healthcare Industry is one of the fastest emergent industries in all the developing countries.

Reviewer Comment 4:

Manuscript seems to be successful in providing the insight of responsive healthcare supply chain management in developing countries. The flow of paper is fine across sections. Introduction portion clearly explains the need of the study. The paper has explained the various perspectives by researchers in literature review section. And also the challenges faced by responsive healthcare sector and issues in the healthcare supply chain are well explained by the author. The use of charts and tables make the paper more presentable and understandable. Future research is required in different field like integration of different processes, logistics, information flow, capacity management and inventory management to achieve the responsiveness.

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**Editorial
Excerpt**

At the time of submission, the paper had 10 % of plagiarism which is an accepted percentage as per the norms and standards of the journal for the publication. As per the editorial board's observations and blind reviewers' remarks the paper had some minor revisions which were communicated on timely basis to the authors (Shashank, Dixit & Ashish) and accordingly all the corrections had been incorporated as and when directed and required to do so. The comments related to the manuscript are related to the theme "**Supply Chain Management in Healthcare Industry**" both subject-wise and research-wise. The paper made a modest attempt to provide the insight of responsive healthcare supply chain management in developing countries. And it focuses the healthcare supply chain management key issues, barriers and enablers and also provides challenges faced by the healthcare supply chain management. The paper is well written and some important considerations are highlighted. Overall, the paper promises to provide a strong base for the further study in the area. After comprehensive reviews and editorials boards remarks the manuscript has been decided to categorise and publish under the "**Theme Based Paper (TBP)**" category

Acknowledgement

The data presented and analyzed in this paper by (Shashank, Dixit and Ashish) were collected first handily and wherever it has been taken the proper acknowledgment and endorsement depicts. The author is highly indebted to their co-authors and others who had facilitated in accomplishing the research. Last but not least endorse all reviewers and editors of GJEIS in publishing in a present issue.

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