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Healthcare supply chain management: literature review and some issues

Healthcare supply chain management

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Abstract

Purpose – The purpose of this paper is to examine the causal linkages among supply chain practices, effectiveness of supply chain performance (SCP) and organizational performance (OP) in Indian healthcare industries.

Design/methodology/approach – This paper is helpful in developing a framework for linking a healthcare supply chain practice to its OP, and thus identifies how such a linkage can be connected to the effectiveness of SCP. Such effort also enables the authors to derive a set of recommended supply chain practices for SC performance.

Findings – From the literature review, this paper finds that, in the context of Indian healthcare industries, efficient SC performance may play a critical role for overall OP improvement, as there is a close interrelationship between supply chain management (SCM) practices and SCP that may have a more significant effect on OP improvement.

Research limitations/implications – The principle limitation of the paper is that it is performed only in a particular industry and with a questionnaire survey which could be extended in future for other industries also. Another limitation of the paper is that it is focused only on the SCP of medical device and equipment supply chain which is a small portion of the whole healthcare supply chain, and therefore requires further research covering various other domains of healthcare supply chain. Another limitation of the study is that the sample survey has been taken from only one respondent per company at one point of time which may create biasness in the results. Thus, future research should collect data through multiple members from the organization.

Practical implications – This study contributes to know the effect of SCM practices on healthcare SCP and provides a practical and useful tool to evaluate the extent of effectiveness of SCP and finally their impact on the healthcare OP. Finally, this study provides conceptual and descriptive literature regarding SCM practices that leads to improvement in healthcare performance.

Social implications – This study adds to the knowledge on healthcare SCM performance by exploring the relationship between supply chain practices, healthcare SCP and healthcare OP and by developing and testing a research framework thus help in improving patient satisfaction.

Originality/value – This study attempts to show how the potential benefits of supply chain practices can no longer be ignored in healthcare supply chain.

Keywords Supply chain performance, Supply chain management, Healthcare supply chain practices, Inventory visibility, Supplier integration

Paper type Literature review

1. Introduction

Supply chain management (SCM) has been broadly practiced by many organizations. Over past decades healthcare sector is continuously facing challenges of increasing costs. Both researchers and practitioners have been increasingly focusing on various supply chain



practices for SCM to cope with the continuous changes in their nature, context and requirements (Agami *et al.*, 2012). Therefore, there is a need for a comprehensive review to reflect performance in healthcare environments. According to de Vries and Huijsman (2011), there is a fragmented interest in supply chains in health services as shown in the literature. As an indispensable management tool and the vehicle to achieve success, supply chain practices enable healthcare system to strategically manage and continuously control the desired objectives. Effective SCM can lead to lower the total amount of resources required to provide the necessary level of customer service and to improve customer service through increased product availability and reduced order cycle time while reducing costs (Banomyong and Supatn, 2011). The relative importance of SCM is on the rise, as it includes coordination and collaboration with channel partners, which can be suppliers, intermediaries, service providers and customers. Hospital supply chains are unique and different from the typical industrial supply chains in many aspects. It is a complex system that requires the flow of products, and services in order to satisfy the needs of those who serve patients (Schneller and Smeltzer, 2006). Further Zheng *et al.* (2006) discussed the importance of supply chain of healthcare products as different products are traded and distributed differently in a healthcare system.

This paper reviews SCM practices, models and frameworks developed in certain databases, from 2000 to 2016, and surveys the applied approaches and techniques. The purpose of this study is to investigate:

- (1) the relationship between supply chain practice and supply chain performance (SCP) in the healthcare industry;
- (2) the influence of supply chain practice on healthcare SCP; and
- (3) the impact of supply chain practice on healthcare organizational performance (OP).

The organization of this paper is as follows: the next section presents various connotations given by various researchers; about SCM, frameworks of SCM then a literature classification scheme is explained and a research agenda is suggested after identifying the gaps and finally develop a conceptual framework to show the effect of supply chain practices (SC) on healthcare OP.

2. Literature review

The supply chain is an integrated process that involves the transformation of raw material to final product and finally to customer delivery. The complete process is divided into four levels – suppliers, producers, distributors and customers. McKone-Sweet *et al.* (2005) studied that the concept of SCM is expanding rapidly in industries in order to satisfy customers in effective and profitable manners. Further, the concept of SCM has also gained momentum in the field of healthcare as a tool for increasing productivity and improving quality (Jarret, 1998; Radnor *et al.*, 2006; Doerner and Reiman, 2007). SCM is more complex in the healthcare industry as it directly deals with patient care (Mustaffa and Potter, 2009; Turhan and Vayvay, 2009). The purpose of this study is to determine the different dimensions of SCM practices and propose a framework identifying the relationships among SCM practices, SCP and SC OP in the Indian healthcare industry.

2.1 SCM

“Supply Chain Management (SCM) is the integration of key business processes from end user through original suppliers that provides products, services, and information that add value for customers and other stakeholders” (Lambert *et al.*, 1998; Cooper *et al.*, 1997). Christopher (1998) defined SCM as: “Supply chain is a network of organizations that are involved, through upstream and downstream linkages, in the different processes and

activities that produce value in the form of products and services in the hands of the ultimate customer.” It can be defined as a network of facilities and distribution options that performs the functions of procurement of materials, the transformation of these materials into intermediate and finished products, and the distribution of these finished products to customers. For survival in competitive market, Turhan and Vayvay (2009) explained that effective coordination along the supply chain plays an important role in innovation, flexibility and speed of an organization. Further, understanding and implementation of SCM are important to remain competitive in the global market. The concept of SCM has received significant attention as businesses across different industries have witnessed the values created through the integration and coordination of supply, demand and relationships (Simatupang *et al.*, 2004; Wong *et al.*, 2005). Further it is studied that supply chain is a movement that includes both financial and information flow of products and services from raw material stage to final products. Further, in order to enhance the overall OP SCM requires a close relationship between suppliers and manufacturers so as to continuously improve the coordination and integration. Hence, SCM has significant importance that calls for serious research attention for acquiring the right product, at the right price, at the right time. Further, according to Council of Supply Chain Management Professionals, the supply chain is considered to be an essential element to improve the organizational efficiency. Hence, there are considerable number of studies on this concept conducted in many different sectors including manufacturing, medical missions, disaster relief operations and other kinds of emergencies, culture evolution which could improve quality of life (Christensen *et al.*, 2007; Sha *et al.*, 2008; Sila *et al.*, 2006; Stevenson and Spring, 2009). There are number of papers that describe about SCM. Some of the definitions of SCM according to literature review are shown in Table I.

The supply chain of the healthcare industry is different from the manufacturing sector in terms of the level of customization of services provided, the degree of participation of a partner or consumer and the uncertainty underlying the basic process (Pitta and Laric, 2004). All these make the healthcare value chain more dynamic and complex (Evans and Berman, 2001) and this significantly impacts on the performance of the healthcare organizations. Thus, this paper deals with a complete literature review on the supply chain of the healthcare industry and measures for performance measurement of the supply chain.

3. Review methodology

Many papers on SCM have been published in the past decades. However, we consider only those papers that regard with SCM for healthcare as a whole entity in the review. The literature survey has been undertaken using online databases relating to publishers such as Emerald, Elsevier, Taylor & Francis, Springer, Inderscience and some reputed conference proceedings. In this regard some keywords and sentence strings, such as “SC performance measurement,” “SCM,” “SC metrics,” “HCSC” and “SCOR (Supply chain operations reference),” “SC management and BSC (Balanced scorecard based model)” and so on, were queried in the above-mentioned databases to acquire a list of papers fitting into our research objective. Non-referred articles, such as editorial notes, prefaces, industrial reports and book reviews, were excluded from the preliminary search process.

To ensure the holistic view to SCM we further filtered the preliminary search results by screening titles and keywords of the identified articles. At last, 181 journal articles have been selected as the base of this review from esteemed scholarly journal outlets in the healthcare SCM field – *Decision Sciences*, *International Journal of Operations & Production Management*, *International Journal of Production Economics*, *Journal of Operations Management*, *Journal of Supply Chain Management*, *European Journal of Operations Research*, *Health Care Management Review*, *Journal of Management and Strategy*, *Science*

Author	Year	Definitions
Mentzer <i>et al.</i>	2001	Supply chain management is, "a set of three or more entities (organizational or individuals) directly involved in the upstream and downstream flow of products, services, finances, and/or information from source to customer"
Kuei <i>et al.</i>	2002	Defines SCM as a holistic and a strategic approach to demand, operations, procurement and logistics process management
Benton and Maloni		Supply chain management involves the strategic process of coordination of firms within the supply chain to competitively deliver a product or service to the ultimate customer
Li <i>et al.</i>	2006	SCM is the key to building sustainable competitive edge for their products and/or services in an increasingly crowded marketplace
Chopra and Meindl	2007	Supply chain management as a set of decisions involving design, planning and operation in a multi-organizational environment
Cuthbertson and Piotrowicz	2008	Supply chain practices are the initiatives that influence the whole supply chain, its parts or key processes
The Council of Supply Chain Management Professionals (CSCMP)		Supply chain management is an integrating function with primary responsibility for linking major business function and business process within and across companies
Schniederjans <i>et al.</i>		Supply chain management as the coordination of supply chain partners to achieve the objectives of a business firm. Such objectives may include cost reduction, adding value to the product or service and maintaining a quick response, among others
Wieland and Wallenburg		The supply chain is an integration of business partners to advance the level of efficiency and productivity of their company bringing them significant return of investments
Estampe <i>et al.</i>		Supply chain management is defined at the strategic level of a company, and aims at coordinating operational tasks within a chain
Global Supply Chain Forum		Supply chain management is the integration of key business processes from end user through original suppliers that provide products, services and information that add value for customers and other stakeholders

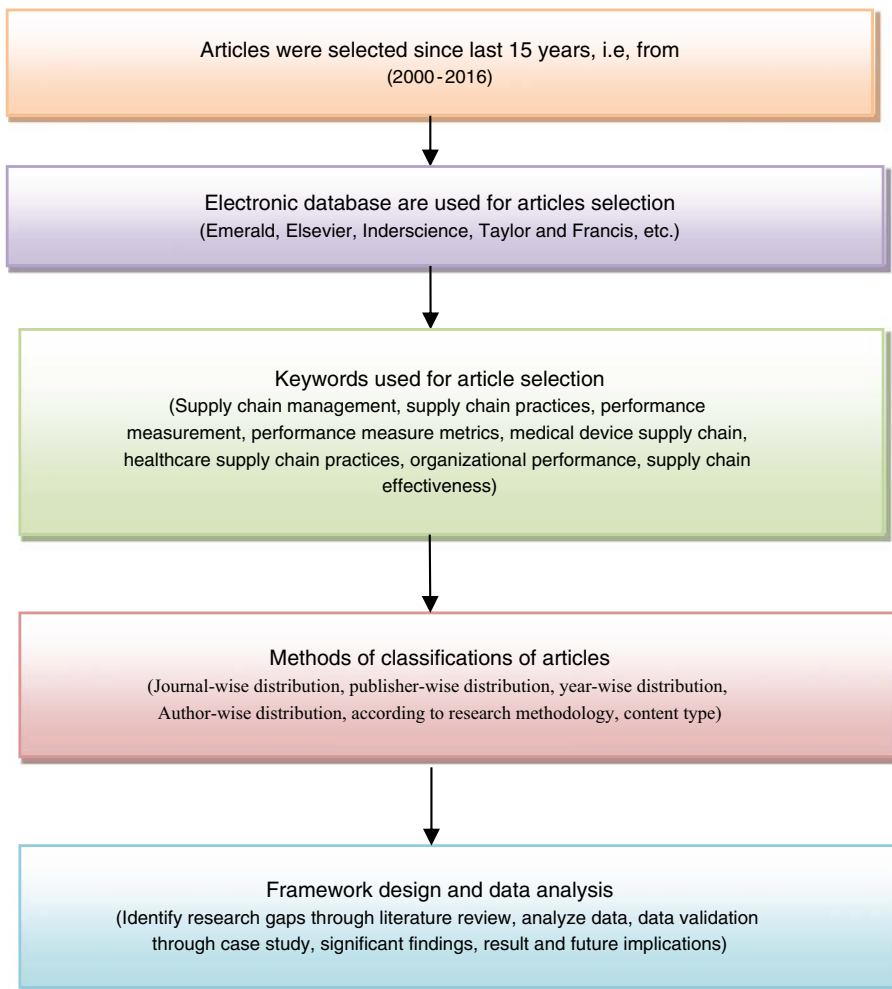
Table I.
Supply chain management definitions

Journal of Business and Management and *Production and Operations Management Society*. The review methodology is illustrated in Figure 1.

A plethora of research papers on SCM and its practices have been published in the past decades, but the SCP in the healthcare industry is still under study. Thus, we have reviewed various literature published in various referred journals and conferences regarding SCM and performance measurement. In this regard, around 540 papers have been collected from various databases; however, on screening only those papers that regard with SCM for healthcare as a whole entity has been considered in the review. Around 181 references are thus considered for the research.

3.1 Journal-wise distribution of research papers

It is clear from Table II that from 181 journal papers from 59 refereed journals, the maximum number of paper is from *Supply Chain Management: An International Journal* and is about 26 papers (14.37 percent), followed by 24 papers (13.26 percent) from *International Journal of Operations & Production Management* while *International Journal of Productivity and Performance Management* contributing 11 papers (6.07 percent). Other active journals related to the field are *Journal of Operations Management*, *International Journal of Supply Chain Management*, contributing nine papers each with approximately 4.98 percent. Further there are two active journals *Operations Research for Health Care* and *International Journal of Production Economics* that contribute 8 (4.42 percent) and 7 (3.87 percent) papers. Further, there are two



Healthcare
supply chain
management

Figure 1.
Review methodology

journals *Computers & Industrial Engineering* and *Journal of Production, Planning and Control* having five papers each contributing 2.78 percent. There are 8 journals having 2 papers each whereas 33 journals contributing 1 paper each. There are 12 leading journals that together contributed to about 64.1 percent of the total selected articles in the review. It is further to be noticed that there are six, five and ten journals directly related to SCM, performance measurement and healthcare, respectively, contributing 42 (23.2 percent), 15 (8.2 percent) and 25 papers (14.1 percent), respectively, of the reviewed papers. Thus, it is clearly denoted from the database collected for the review papers that this research is directly related to the supply chain and performance measurement of supply chain with a special context to healthcare sector. Thus, this research contributes to the benefit of healthcare industry for an efficient supply chain.

3.2 Publisher-wise distribution of research papers

The major publishers of the 181 considered literature review papers are Emerald, Elsevier, Taylor & Francis, Springer and Inderscience. Apart from these, there are other

S.No.	Name of journal	No. of papers	%
1	<i>Supply Chain Management: An International Journal</i>	26	14.37
2	<i>International Journal of Operations & Production Management</i>	24	13.26
3	<i>International Journal of Productivity and Performance Management</i>	11	6.07
4	<i>Journal of Operations Management</i>	9	4.98
5	<i>International Journal of Supply Chain Management</i>	9	4.98
6	<i>Operations Research for Health Care</i>	8	4.42
7	<i>International Journal of Production Economics</i>	7	3.87
8	<i>Computers & Industrial Engineering</i>	5	2.78
9	<i>Journal of Production, Planning & Control</i>	5	2.77
10	<i>Health Care Management Review</i>	4	2.20
11	<i>Engineering Management Journal</i>	4	2.20
12	<i>International Journal of Business Performance Management</i>	4	2.20
13	<i>Benchmarking: An International Journal</i>	3	1.66
14	<i>Technology Forecasting and social Change</i>	3	1.66
15	<i>Leadership in Health Services</i>	3	1.66
16	<i>International Journal of Physical Distribution & Logistics Management</i>	3	1.66
17	<i>Health Care Financial Management</i>	3	1.66
18	<i>Health Policy</i>	2	1.10
19	<i>Operations and Supply Chain Management</i>	2	1.10
20	<i>International Journal of Production Research</i>	2	1.10
21	<i>Procedia Economics and Finance</i>	2	1.10
22	<i>The International Journal of Logistics Management</i>	2	1.10
23	<i>European Journal of Purchasing Supply Management</i>	2	1.10
24	<i>International Journal of Health Care Quality Assurance</i>	2	1.10
25	<i>Journal of Supply Chain Management</i>	2	1.10
26	<i>International Journal of Logistics Systems & Management</i>	1	0.55
27	<i>International Journal of Critical Accounting</i>	1	0.55
28	<i>International Journal of Health Planning and Management</i>	1	0.55
29	<i>Industrial Management & Data Systems</i>	1	0.55
30	<i>The International Journal of Accounting</i>	1	0.55
31	<i>Computers & Operations Research</i>	1	0.55
32	<i>Health Care Purchasing News</i>	1	0.55
33	<i>Health Services Management</i>	1	0.55
34	<i>International Journal of Services, Economics and Management</i>	1	0.55
35	<i>International Journal of Business Excellence</i>	1	0.55
36	<i>International Journal of Business and Social Science</i>	1	0.55
37	<i>International Journal of Management</i>	1	0.55
38	<i>International Journal of Management Science</i>	1	0.55
39	<i>International Journal of Manufacturing Technology</i>	1	0.55
40	<i>International Journal of Quality Innovation</i>	1	0.55
41	<i>Journal of Management and Strategy</i>	1	0.55
42	<i>International Journal of Academic Research in Accounting, Finance and Management Sciences</i>	1	0.55
43	<i>SAGE Journal</i>	1	0.55
44	<i>Service Industries Journal</i>	1	0.55
45	<i>Social and Behavioral Sciences</i>	1	0.55
46	<i>International Journal of Globalization and Small Business</i>	1	0.55
47	<i>Logistics & Operations Management</i>	1	0.55
48	<i>Procedia Manufacturing</i>	1	0.55
49	<i>Management Research Review</i>	1	0.55
50	<i>E-Commerce and Web Technologies</i>	1	0.55
51	<i>Journal of Global Business Advancement</i>	1	0.55
52	<i>Decision Support System</i>	1	0.55

Table II.
Journal-wise
distributions of
research papers

(continued)

S. No.	Name of journal	No. of papers	%
53	<i>Decision Sciences</i>	1	0.55
54	<i>International Series in Operations Research & Management Science</i>	1	0.55
55	<i>Journal of Purchasing & Supply Management</i>	1	0.55
56	<i>Omega</i>	1	0.55
57	<i>Procedia – Social and Behavioral Sciences</i>	1	0.55
58	<i>Computers in Industry</i>	1	0.55
59	<i>Business Process Management Journal</i>	1	0.55
	Total refereed journals	181	100
	Papers from international/national conferences/book review/thesis	16	
	Total	197	

Table II.

publishers also who published articles on performance measurement, SCM and supply chain practices. According to the literature review, the contributions of these publishers to publish research papers on performance measurement and supply chain are shown in Table III. It is clearly shown from Table III that the maximum research papers are from Emerald who published 85 papers (46.97 percent) followed by Elsevier who published 48 papers (26.52 percent). There are other publishers also having research articles on the related field of my research such as Taylor & Francis who published 12 papers (6.63 percent), Inderscience who published 10 papers (5.52 percent), Excelling Technologies who published 9 papers (4.97 percent), Springer who published 4 papers (2.20 percent) and Wiley Online who published 2 papers (2.20 percent). There are also other journals that are contributing to publish research paper who published 9 papers (4.97 percent).

3.3 Year-wise distribution of research papers

Year-wise distribution of research papers under consideration in the literature review for a period between 2000 and 2016 regarding performance measurement and supply chain practices has been tabulated in Table IV. It is clearly indicated from the table that earlier there was a little research papers in the literature regarding healthcare SCP, i.e. between years 2000 and 2005, but during last few years between 2006 and 2016 and still in 2017 significant amount of research work about (78.8 percent) has been taken in this regard by various researchers. This shows a vast scope for the research in the field of healthcare SCP.

3.4 Classification according to research methodology

The research papers are further classified according to the type of research article as per the classification scheme shown in Table V. Distribution of research papers reviewed in the

S. No.	Publisher	No. of papers	Percentage
1	Emerald	85	46.97
2	Elsevier	48	26.52
3	Taylor & Francis	12	6.63
4	Inderscience	10	5.52
5	Excelling Technology Publication	9	4.97
6	Springer	4	2.20
7	Wiley online	4	2.20
8	Others	9	4.97
	Total	181	100

Table III.
Publisher-wise
distribution of
research papers

JAMR

S. No.	Year	No. of papers	Percentage
1	2017	6	3.31
2	2016	13	7.18
3	2015	21	11.60
4	2014	11	6.07
5	2013	14	7.73
6	2012	14	7.73
7	2011	13	7.18
8	2010	10	5.52
9	2009	9	4.97
10	2008	8	4.41
11	2007	12	6.62
12	2006	13	7.18
13	2005	11	6.07
14	2004	5	2.76
15	2003	5	2.76
16	2002	5	2.76
17	2001	5	2.76
18	2000	6	3.31

Table IV.
Year-wise distribution
of research papers

S. No.	Research paper type	Description
1	Case study	8
2	Conceptual	44
3	Descriptive	13
4	Empirical	58
5	Exploratory	36
6	Review	22

Table V.
Classification scheme
for the type of
research paper

research according to the type of paper is shown in Figure 2. From the table, it is clear that the literature consists of case study, conceptual, descriptive, empirical, exploratory and review papers.

3.5 Content analysis

A content analysis helps to determine the nature of content, identify the patterns and estimate the relationships between the research papers being analyzed. Content analysis

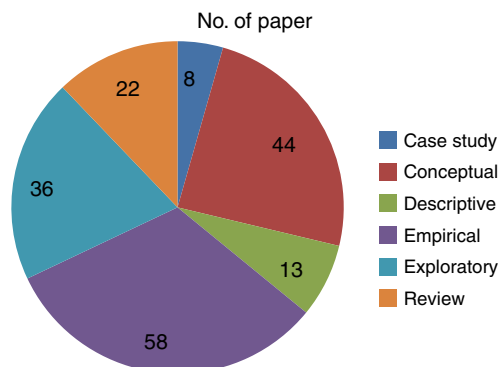


Figure 2.
Distribution of
research paper
according to
methodology

helps to code and classify reviewed papers in different categories related to the research. The content analysis of this research has categorized the review papers in eight categories and tabulated in Table VI. Descriptions for each topic category were then assigned appropriately. The table provides a useful categorization for future researchers in examining the various elements of performance measurement and SCM with a particular context to healthcare industry.

The eight categories used in this research are healthcare SCM, healthcare supply chain practices, healthcare OP and healthcare SCP. The distribution of the papers according to the content is tabulated in Table VII and Figure 3.

4. Healthcare SCM

Supply chain practices provide a set of activities undertaken in an organization that helps the organization in the effective management of its supply chain by integrating its

S.No.	Content of paper	Description
1	HC Supply Chain Management	Healthcare supply chain involves the flow of different product types through participation of various stakeholders to deliver products in a timely manner at a right quantity and quality in order to fulfill the needs of the providers
2	HC Supply Chain Practices	SCM practices are the set of activities that organizations undertake to promote effective management of the supply chain
3	HC Organizational Performance	Organizational performance refers to how well an organization achieves its goals and objectives while satisfying its social responsibilities
4	HC Supply Chain performance	Supply chain performance investigates performance from supply chain perspective through business process to create efficiency to the supply chain as a whole

Table VI.
Detailed description of content type

S. No.	Content of paper	No. of paper	%
1	HC Supply Chain Management	12	6.67
2	HC Supply Chain performance	59	32.5
3	HC Supply Chain Practices	61	33.7
4	Organizational Performance	17	9.40
5	HC Performance	32	17.6
	Total	181	100

Table VII.
Distribution of research paper according to content type

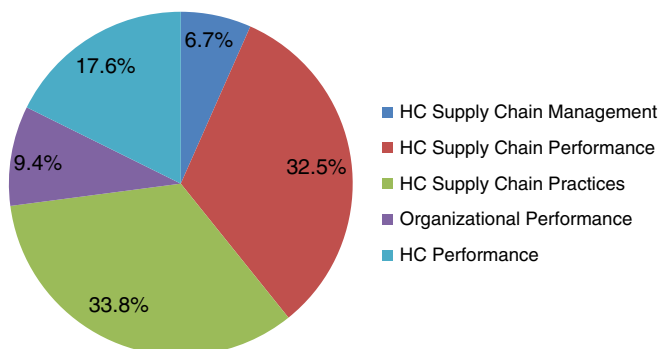


Figure 3.
Content-wise
distribution of
research paper

stakeholders such as manufacturers, distributors, suppliers and customers. Thus, helps in increasing the effectiveness of SCP and overall OP.

SCM is the backbone of healthcare delivery. This arises from the fact that the quality of healthcare delivery is dependent on the availability of medical supplies, at the right time and in the right quantities to the patients, lack of which may create customer dissatisfaction. Several research works have been done in literature, about healthcare supply chain practices to improve the performance of healthcare supply chain. Gowen *et al.* (2008) proposed that healthcare practices, employee commitment and control initiatives are critical for healthcare supply chain. Chong *et al.* categorized SC practices into demand management, customer relationship management, supplier relationship management, capacity and resource management, service performance, information and technology management, service supply chain finance, and order process management.

In the literature before, different researchers defined supply chain practices in different ways. Tan (2002a), Chow and Koh *et al.* (2007) coined supply chain practices as “A set of activities helps to promote the performance of whole supply chain”. Tan *et al.* have given various important dimensions for effective SCM such as quality management, supply chain practices and just-in-time (JIT) production. Further, Otto and Kotzab studied SC practice as a special form of strategic partnership between retailers and suppliers. Li *et al.* (2005) assessed the performance of the overall supply chain and validated six dimensions of SCM practices (strategic supplier partnership, customer relationship, information sharing, information quality, internal lean practices (LP) and postponement). Zhou and Benten further pointed out that effective information sharing and effective supply chain practice are critical to achieving good SCP. Johnston *et al.* (2004) identified supplier relationships as a dimension of supply chain practice that link supplier’s level of trust to the buyer’s perception in improves overall SCP. Further, Koh *et al.* (2007) categorized SC practices from the following aspects: supplier integration (SI), customer integration, JIT supply, strategic planning, few suppliers, holding safety stock and sub-contracting, e-procurement, outsourcing and many suppliers.

Further, Jones *et al.* explained that RFID technology ensures better customer satisfaction by appropriate handling and maintaining reasonable safety stock of crucial equipment and surgical items in hospital by integrating RFID into an ERP system.

It is identified that supply chain practices have a significant influence on the OP (Bayraktar *et al.*, 2009). Sahay and Mohan (2003) focused on the four major supply chain dimensions, i.e., supply chain strategy, supply chain integration, inventory management and information technology and recommended that organizations must align supply chain strategy with business strategy in order to achieve organizational excellence.

Again, Burgess *et al.* (2006) conceptualized SCM and identified SCM practices which include leadership, intra-organizational relationship, inter-organizational relationship, process improvement orientation and information systems which help in improving SCM performance.

According to Kritchanchai *et al.*, the inventory management in hospitals should be fitted according to equipment categories and demand characteristics, which are quite unique in the healthcare supply chain and that a single inventory management system cannot be effective for healthcare supply chain and thus could be done by its value and clinical importance.

Performance excellence can be achieved through LP by benefiting healthcare administration, medical staff and patients. Kollberg *et al.* found that lean thinking is applicable in healthcare settings, and that the flow model is a suitable tool that measures changes toward lean thinking in healthcare.

Further, Kollberg and Elg (2011) concluded that the BSC is used as a tool for improving internal capabilities and supporting organizational development. As studied by Prajogo *et al.* (2016), lean processes have a positive effect on internal supply performance.

Further, Li *et al.* (2006) concluded that supply chain practices is a multidimensional construct that encompasses upstream and downstream sides of supply chain. Lee (2004) focused on five practices of supply chain, i.e., outsourcing, strategic supplier partnerships, customer relationship, information sharing and product modularity that are key to create supply chain responsiveness. Again, Lyson and Farrington pointed out that SCM can be summarized to mean the management of all activities, information, knowledge and financial resources associated with the flow and transformation of goods and services up from raw-materials suppliers, components suppliers and other suppliers in such a way that the expectation of the users and the organizations is met. Stock and Boyer (2009) pointed out that supply chain practices provide a framework that integrates various supply chain stakeholders, thus results in overall OP.

Further, Sandberg and Abrahamsson (2010) revealed that top management commitment (TMC) plays an important role for the effectiveness of supply chain. Further, Singh identified coordination and responsiveness factors which consist of TMC, organizational factors, mutual understanding, flow of information, relationship and decision making and responsiveness.

Various supply chain practices are proposed by Zeng *et al.* that include top management leadership, strategic planning, quality information, process management, work force management and product design process to improve SCM.

Thus, it is clearly depicted from the literature that the supply chain practices have a goal of improving SCP, thus, improving OP of a firm. Although, there are various supply chain practices in literature depending upon the type of organization; still there are commonalities among practices. This research work thus intends to focus on identifying a framework for improving SCP and ultimately overall OP in special context to Indian healthcare industry. This also reveals from the literature that there are number of research works done in the field of performance supply chain practices and its performance, but most of them are focused on general forms of SCM that are applicable mostly on manufacturing organizations and there are very few research in the service industry's SCM practices particularly for the healthcare industries. Further, there is no study found to describe the effect of supply chain practices on medical device supply chain in a particular context to the Indian healthcare industry.

5. Healthcare supply chain practices

With the extent of literature review, this study discusses four supply chain practices (TMC, SI, LP and inventory visibility (IV)) in healthcare industries which have shown a close relationship with the performance of healthcare organization.

5.1 TMC

The extent of healthcare care performance depends mostly on the attitude of top management toward the internal and external supply chain of the healthcare. Human factors such as TMC have been successfully linked to healthcare service delivery and hence to the HSCM. Important empirical studies also linked and revealed that TMC and customer satisfaction are important for success of supply chain initiatives. This means that they are also important for HSCM deliverables as customer satisfaction come in the domain of HSCM operations (Gowen *et al.*, 2008).

5.2 SI

SI describes a long-term relationship between a firm and its suppliers that aims at enhancing operational and strategic capabilities of participating firms to help them attain considerable ongoing benefits (Li *et al.*, 2004). SI includes different aspects such as coordination, schedules, integrated processes, shared information, shared technology, long-term contracts, reinforced quality improvements, improved supplier's overall capabilities and shared risks and rewards (Dyer and Singh, 1998). SI encourages mutual planning and problem-solving efforts (Gunasekaran *et al.*, 2001), and is critical in operating a leading-edge supply chain. Azar *et al.* (2009) have investigated the impact of SI on the performance and have found that effective SI is directly related to higher level of performance conformance.

5.3 LP

LP can be considered as a philosophy, a work culture, a technique, a management concept, a value, a methodology or an ethos that improve all the processes at each level of an organization (Womack and Flowers, 1999). According to Manrodt and Vitasek, LP directly link upstream and downstream flow of products, services and information that reduce cost by reducing wastage by providing right quantity of right product at right time according to the need of customer. Lean principles include a set of strategies and tools with the aim of reducing costs, both internally and externally to increase customer satisfaction through value creation in its products and services.

5.4 IV

Inventory insight and IV help in providing the real-time data of the stock and goods to make informed decisions and helps in complete inventory at faster pace, increase accuracy of data, update ERP system and improve client satisfaction with real-time information by controlling remote inventory. Maintaining the right inventory is a challenge for any healthcare organization. It is believed that a hospital could reduce its total expenses by at least 2 percent through better inventory management and distribution of finished medical materials (Schneller and Smeltzer, 2006). It is nearly impossible to easily track which medications should be used and in what quantities.

6. Healthcare SCP

Improving hospital SCP is increasingly important as organization strives to improve customer satisfaction at reduced cost. Chen *et al.* (2003) delineate trust, knowledge exchange, IT integration and SI as the major factors that influence hospital SCP. Lenin (2014) studied that the optimization of effective coordination and integration between all the supply chain partners will help to improve SCP. Bakar *et al.* (2009) discussed on the importance of the dimensions of Doctor's satisfaction and supply chain inputs for better SCP. Dey *et al.* studied that a combination of outcome, structure and process-based critical success factors helps in managing performance of healthcare services. Kritchanchai (2012) developed a framework showing factors such as standardized drug coding, operational re-engineering and implementing information technology that help in performance improvement of healthcare supply chain. Further, Aptel and Porjalaji (2001) advocated that JIT philosophy applied to hospitals results in inventory cost reduction and improved performance of the supply chain. In spite of vast literature available on the different ways to measure the SCP, researchers still found the need for continued studies in this area due to lack of clarity and competence in measurement of SCP in the field healthcare industry. Thus, this research tends to fill this gap by identifying measures of SCP for medical device supply chain in the context to the Indian healthcare industry.

7. Healthcare OP

Healthcare OP is the final outcome of the supply chain process. It refers to “How well an organization achieves its targeted goal as well as financial goal” (Deshpande, 2012). There is large number of research works in the literature discussing about OP but still no standardized definition has been evolved (Ou *et al.*, 2010). Cao and Zang (2011) studied that supply chain practices improve collaborative advantage and indeed have an influence on firm performance; and collaborative advantage is an intermediate variable that enables supply chain partners to achieve synergies and create superior performance. Liu *et al.* (2013) found that operational coordination is positively associated with operational performance and OP. Giannakis (2007) argued that OP measures can be considered from various aspects in terms of the relative importance of the performance measures to the organization.

8. Development of framework

Based on the research gaps, a conceptual model for the relationship of supply chain practices (SC), SCP and OP in healthcare industry is developed as shown in Figure 4. In this study, four major healthcare supply chain practices are considered: TMC, LP, SI and IV.

9. Contributions, limitations and future implications of research

SCM practices play an important role in reaping and retaining customer satisfaction in the healthcare industry. As evident from the literature, SCM has been the topic of interest for both academicians and researchers in recent past. This study adds to the knowledge on healthcare SCM performance by exploring the relationship between supply chain practices, healthcare SCP and healthcare OP and by developing and testing a research framework.

Further, this study contributes to know the effect of SCM practices on healthcare SCP and provides a practical and useful tool to evaluate the extent of effectiveness of SCP and finally its impact on the healthcare OP. Finally, this study provides conceptual and descriptive literature regarding SCM practices that leads to improvement in healthcare performance.

The principle limitation of the paper is that it is performed only in a particular industry and with a questionnaire survey which could be extended in future for other industries also. Another limitation of the paper is that it is focused only on the SCP of medical device and equipment supply chain which is a small portion of the whole healthcare supply chain, and therefore requires further research covering various other domains of healthcare supply chain. Another limitation of the study is that the sample survey has been taken from only one respondent per company at one point of time which may create biasness in the results. Thus, future research should collect data through multiple members from the organization.

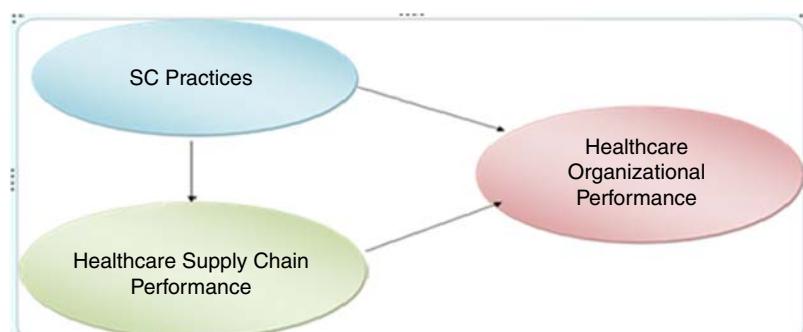


Figure 4.
Conceptual framework

10. Conclusion

The relationship between supply chain practices and SCP has been the subject of many studies. Indeed, there have been a considerable number of researchers that show a clear link between different supply chain practices and its impact on OP, and relationship between SCP and OP. However, there is no study on impact of supply chain practices on SCP and, in turn, its impact on OP particularly in the Indian healthcare industry. This has been identified as the research gap for the proposed study. The aim of the literature is to develop a conceptual framework to fill these gaps.

This paper presents a review of the literature on the relationship between supply chain practices and SCP, and is based on the premise that more the efficiency of the supply chain, the better the performance of organization. The chapter presents a review of literature of various supply chain practices to improve the performance of the Indian healthcare industries. Based on the literature review and research questions framed a proposed framework has been developed that includes four major supply chain practices (TMC, SI, LP and IV) that have their impact on efficiency of SCP and, in turn, impact on OP.

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