

Valued Supply Chain for Integrated Hospital Management: A Conceptual Framework

Abu Raihan Bhuiyan Albarune^{#1}, Nazma Farhat^{*2}, Farzana Afzal^{#3}

School of Quantitative Sciences, University Utara Malaysia (UUM), Malaysia

Asian Institute of Management, Science and Technology (AIMST), Malaysia

National Institute of Ophthalmology and Hospital(NIO&H), Bangladesh

¹albaruneraihan@gmail.com

²nazmafarhat04@gmail.com

³Farzanahabib08@yahoo.com

Abstract This paper is based on secondary data, therefore, the authors constructed conceptual framework after thorough analysis of a numerous research papers. Due to scarcity studies on Service Industry Supply Chain Management (SCM), this paper would create a noble approach for the current health care managers of hospitals to review and apprise their operational and strategical objectives. This study highlight Supply Chain Management (SCM) concept for the hospital which representing a service industry. In addition, this study reveals the limited application of SCM in hospital. Consequently the authors describe recommendation and propose a model on valued supply chain management which could be applicable in integrated hospital management. Though this paper highlights in intensive analysis however, it unlocks further frontiers for the prospective researchers as well as practitioners in order to develop SCM model for hospital.

Keywords— *Hospital supply Chain Management, Valued Supply Chain, Clinical value, Healthcare, Integrated hospital management.*

1. Introduction

Now a days, business becomes more complex in managing service and profit as per standards. Both academia and corporate consultants are looking for solutions to maintain profitability and standard service expected by customers. Therefore, service becomes focus point in manufacturing and service industry as well. Gradually service industry faces competitiveness and complexities to render desired service to customers. Moreover in developed economy, the contribution in GDP by service industry is enhancing year by year. Healthcare industry is one of the emerging service sectors

where both public and government is making a trend of augmented spending day by day.

Both health care cost and new concept of integrated care pressures continue to drive supply chain for value addition among the trading partners through focusing on collaborative relationship.

Strategical movement from fee-for-service to risk sharing models of reimbursement, readmission penalties, value-based purchasing, meaningful use, the medical device tax and unique device identification compliance have led to the need for cost-cutting measures across the health care system, including supply chain, within a context of increased performance and outcomes [7].

1.1 Importance of SCM in Hospital

Healthcare managers strive for improving operational efficiency to make a positive impact on cost structure, quality of care and patient satisfaction. Administrator should focus on streamlining and optimizing the hospital's Supply Chain.

There is lacking of awareness about SCM in hospital, [2] thus healthcare managers are less efficient in supplying medication [1]. SCM might play a significant role for health care providers to ensure savings in this industry as going forward system. The healthcare executives can improve the bottom line figure through process improvement of core SCM process strategically [2]

The expenditure both in private and public sector has been increasing gradually. Therefore, the contribution of healthcare industry in GDP is growing both in developed and developing economics. Healthcare supply chain management (HCSCM) has promising opportunities to improve organization performance through addressing key

issues such as Supply Chain (SC) performance, SC innovation, quality and security etc [3]. Both practitioners and researchers emphasize on the importance of research on SCM in healthcare services which has been identified for improvement in this sector [36] HCSCM is identified differently as the objective is to respond efficiently and promptly to the patient care needs which might impact patient's lives [5]

The remainder of this paper is organized as follows: In section 2 a study on literature overview has been discussed. Methodology is mentioned in section 3 which is followed by section 4 that demonstrated a proposed valued model of SCM for hospital management after detail analysis of SC perspective issues in hospital management and the last section, section 5 concludes the paper with suggestion and marking the opportunities for further research.

2. Literature Review

SCM has been recognized as a competitive advantage as well as strategically applicable weapons of management that is most practiced and applied in manufacturing industries. However, researchers are eyeing on implication of SCM in different industries such as service, education, hospitals etc where SCM would play a significant role in non profit business administration [23,26]. The evolution of SCM demonstrates the mentioned trend in figure 1

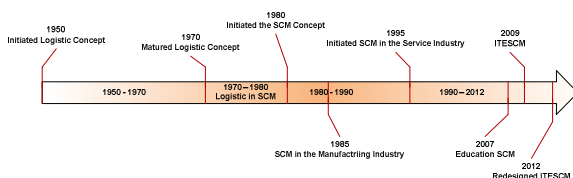


Figure 1. Supply Chain Evolution [26]

Researchers also have been illustrating the application of different tools, such as forecasting management, of SCM in other than manufacturing industries i.e. In tourism, service, education, environment and in hospital [31]. Forecasting is a mandatory part for efficient blood supply chain which can serve customer better [13].

Recently researchers demonstrate the effective model of SCM for educational institutions that is part of service industry. The efforts of researchers cement a milestone in application of SCM in service industry especially in universities. The integrated tertiary educational supply chain

management (ITESCM) model initially enrooted in 2010 and then redesigned in 2012 to make it further applicable effectively to implement SCM for academia [24], [25]. The researchers concluded the findings of the study as standard while applying the model in international universities, public and private universities [28], [29]. A detail guideline was depicted for the application of ITESCM model in universities in terms of harvesting both human resource and research beneficence for the well being of society [27], [30].

2.1 Application of SCM in Service Industry

This was a generalized idea that SCM could be only applicable in manufacturing industries and had no applicability, as a result not competitive advantage was expected, in service industry. The application environment and factors of SCM are not directly adaptable to service industry, only applicable with extension and omission in some functional areas, as it contains some unique characteristics which is irrelevant to manufacturing industry [35].

SCM could be applied in service industry as it has been applied in manufacturing industries. In service sector the opportunities of application of both efficient supply chain and responsive supply chain have existence [32]. Customer satisfaction is the most expected outcome of any business organization that operates a good number of service operations in a fashion of integrated, coordinated, and collaborative way to render the maximum customer satisfaction through service supply chain management (SSCM) which connects the activities of different players through an effective network [33]. SSCM is a combined services of different service providers, located in multiple locations to minimize the cost structure, who are capable and work under network to meet variable demands by accomplishing multitasks [34].

Now a days, the customer and customer satisfaction are the main focused points in business process which is designed and operated to meet customer satisfaction at the lowest cost. In this arena, most of the definitions did not identify the customer and customer needs rather than highlighted the process of service resources. Only a few mentioned the identification of customer as a triggering points which evolve the all functions in the chain.

Only a few researchers conceptualized the definition of service supply chain which must have integrated SCM approach, high involvement in SCM, close relationship with supplier and customer. [39] refers the service supply chain as the network of suppliers, service providers,

consumers and other supporting units that performs the functions of transformation of resources required to produce services; transformation of these resources into supporting and core services; and the deliver of these services to customers. The focused points derived from definitions of SSCM are described in table 1

Table 1. Focused points of SSCM

Authors	Focus points in the definition
Lau 2007	Rearrangement of existing work process through commodity, special requests and outsourcing SCM
Elaram et.al. 2007 [45]	Flow of information, money from original supplier to customer
Baltacioglu et. al. 2007 [39]	Network of SC partners to produce service
Li et al 2008	Service network of service organization to meet customer demand as starting point
Wu et.al 2009	Integration of entities to provide service
He et al. 2010	Balancing supply and demand through integration of service resources
Habib M. 2010 [24]	Customer and result oriented process from planning to strategic level
Song et al 2011	Integration of information and resources from supplier to customer.

Later on researcher conceptualized the health supply chain management as the management of information, processes, resources, and service performances from the origin supplier to ultimate supplier.

This definitions are based on goods flow and highlights the processor of goods such as service providers. As service industry is highly customer oriented, service is prime delivery issue in this sector. Thus identification of customer and planning and generating service as per target customer are crucial point in different industries of service sector.

Thus we propose the definition of service supply chain as following: Service supply chain is a continuous integrated process of customer identification and rendering customer expected value through value oriented supply chain process in service sector that consists of both tangible and intangible activities of customer, suppliers, service providers, society etc; at the economical way and within a desirable time frame.

2.2. Healthcare Supply Chain Management (HCSCM)

Healthcare industry is able to attract researchers, healthcare executives with due importance as the investment from public and private sector have

been augmented gradually from developed to developing countries. As a result, researchers have produced a good number of publications on HCSCM.

Table 2. Classification of literature topics

Hospital		Healthcare	
Topics	No	Topics	No
Data Synchronization	1	Provider	6
Purchase	2	Inventory	3
Product Delivery	2	Logistics	1
Blood SCM	1	Product delivery	3
Performance Measurement	3	Performance measurement	2
Performance improvement	5	Performance improvement	1
		Model development	3
Total	14		19

Among the 33 literature, 19 literature described the different issues regarding healthcare along with few models. On the other hand, no model was suggested in any literature regarding hospital.

2.3 Challenges Identified in Health Care Supply Chain Management

Healthcare industry consumes a good number of services and materials ranging from the most sophisticated (radioactive drugs, brain surgery) to the most basic (food, general health checkup). Hospitals have been worked with partners to optimize the SC efficiency.

2.3.1 Product Delivery

Medication delivery error becomes a common challenge in healthcare system especially in hospital's pharmacy. The sufferings of patients, doctors, nurses are so acute that they bound to face this error at least once in a day [6]. The imbalance between sophisticated drugs and diagnostic system; day to day operation in dealing with products in healthcare system is significantly high which appears in purchasing and inventory control [40].

Even in case of special items or in very special occurrence, such as cyclone the delivery of product faces numerous shortages. Aging population, active lifestyle, obesity are the driving factors for creating increasing demand in orthopedics devices SC. The control of orthopedic SC is different and complex due to its distribution problem to track [8]. The humanitarian agencies experienced quite a large number of failures to supply the necessary medicine and vaccines during different natural calamities. It was observed that the leanings or

mistakes from one disaster, the mistakes repeated during next disasters also [41].

2.3.2 Forecasting, Purchasing, and Inventory

Poor inventory control system contributes 28% of order mismatch in private hospitals in Malaysia [1] Planners find the forecasting for patients in terms of frequency, duration, and diagnosis types difficult which also impact the prediction of product demand. The product has multiple complexities such as shelf life, dosage form, combination type, long lead time etc [5].

Fragmentation of SC, lack of visibility of stock, in accurate forecasting, shortage of input materials, counterfeiting, patient profit conflict are the risk area in pharmaceutical supply chain which affect the patient safety in multiple way [19].

2.3.3 Performance Measurement and Improvement

Patient satisfaction, cost and quality are the few concerned issues that affect the SC performance in healthcare system [3]. SCM performance becomes concerning issue in hospital due to emphasis on patient satisfaction which has positive relation with SC performance [4].

Lack of inter coordination among the departments cause work disruption, repetition of work etc and leads to operational failures in hospital internal supply chain that is collaborative functions of all departments in a organization to deliver patient care [43]. It is observed that organizational culture and human resources policy also contributes to the failure in hospital internal supply chain [44].

2.3.4 Data management and information technology infrastructure

Data standardization, information sharing, business process re-engineering are areas to improve the healthcare SCM. This helps enhanced patient safety and service improvement [6].

2.3.5 Collaboration in Supply Chain

Virtual centralization of SC is example of collaborative approach among competitors to perform contracting, procurement, distribution, and logistics operations centrally overcomes the problem relating to staffing and budget limitations [7].

Blood SC depicts the efficient blood management for right patient through Supply Chain approach, such as forecasting, cost analysis, collaborative approach [13]

2.4. Overcoming Challenges in Healthcare Supply Chain Management

2.4.1 Efficient purchase management

SCM practiced in manufacturing industries could be good example for overcoming challenges in HCSCM. SCM is widely practiced in retail sector [31] which helps healthcare to reduce the cost from purchasing and inventory. Classification of healthcare items in different characteristics terms - commodity, OTC, Generic, Trusted on non brand items, non emergency, and sports medicine etc for setting the purchase strategy, bulk or volume purchase strategy, and internal supply chain designing to cope up these types of purchases pattern will reduce the substantial costs from healthcare supply chain [42].

The standard level experienced employee with a long term presence in pharmacy can reduce the medication delivery error. Moreover, balancing of job responsibility, accuracy of results must be maintained [22].

2.4.2 Information technology development

Data standardization, information sharing, business process re-engineering are areas to improve the HCSCM. This will help to enhancement of patient safety and service improvement [6].

Industry wide E Commerce could be one of the effective gateway to improve the data level and system integration both within and between partner organizations. Moreover, patient can be benefited by getting readily available medical reports, cost idea on patient care, billing information etc [20].

This system reduces the overall industry cost by elimination of engagement of people, EDI cost, disparate database cost, communication equipment cost, delay cost etc.

The innovative concept of RFID technology and supply utilization management are the emerging SCM competitive advantages that could bring sound savings and patient care in Hospital [8].

2.4.3 Internal SC efficiency

Re-engineering of existing SC of a hospital through purchasing efficiency, product (mock) test, integrated delivery network, outsourcing of supply data management can reduce the hospital cost for in-patient and out-patient [7].

Social capital is an untapped components in the form of both physical and informational resources which enhances the performances in internal

service supply chain [37]

There is hardly any opportunity to follow trial and error method for execution of any process in healthcare sector as this deals with human life and health. Thus simulation and modeling (SM) with proven validation and verification will contribute for decision making under numerous situations that are related to SCM challenges [5].

3. Methodology

The research represents based on the secondary data, includes interview with experts from the sectors of healthcare, online database, books, journals, conference papers etc. Widespread research papers and conference papers have been appraised from international journals such as PROQUEST, EMERALD, EBSCO, IEEE, ACM, JSTOR etc.

4. Discussion

The health care industry consists of several sectors that are dedicated for providing health care services and products through value addition. As a basic framework for defining the sector, the United Nations' International Standard Industrial Classification categorizes health care as generally consisting of hospital activities, medical and dental practice activities, and "other human health activities". The last class involves activities of, or under the supervision of, nurses, midwives, physiotherapists, scientific or diagnostic laboratories, pathology clinics, residential health facilities, or other allied health professions.

Health care is general assurance of health needs of a human which consists of curation, diagnosis, treatment, prevention, rehabilitation of diseases etc. Registered practitioners in medicine, optometry, dentistry, pharmacy, and allied health, and other care providers deliver health care through 4 types of healthcare organization such as primary care, secondary care, tertiary care and public health. [11]

A hospital is a health care institutions providing patient treatment by specialized staff and equipment. There are 4 types of hospitals: primary care, secondary care, tertiary care and public health hospital. This study will focus on the secondary care hospital and tertiary care hospital supply chain management.

Teaching hospital conducts formal educational programs or courses of instruction that lead to

granting of recognized certificates, diplomas, or degrees that are required for professional certification or license. Moreover, teaching hospital combines assistance to patients with teaching to medical students and nurses and often is linked to medical school, nursing school or universities. Patient, are recognized as prime customer of health care system, are two types - in patient and out patient. In patient are those who stay over night at hospital and out patient are those who do not stay at night.

Hospital logistics evolution can be described in four phases [9]

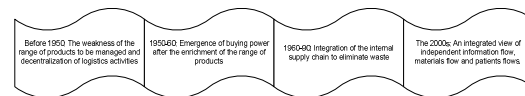


Figure 3. Evolution of Hospital Logistics [9]

4.1 Hospital Supply Chain Management

Hospitals are now under pressure of reducing the cost at an affordable price of patients along with improved efficient patient care. SCM, being major cost driver, is able to catch attention of healthcare industry. Since 90s researchers are giving effort for proper application of SCM in hospital management as operation to strategic perspective.

Hospital Supply Chain Management (HSCM) ensures control products flow through participation of three major stakeholders: Producers, Purchasers and providers.

[5] refers healthcare SCM is the process of delivering the right products in the right quantities to the right patient care locations and at the right time with satisfying service levels and minimized system-wide costs.

4.2 Value chain

Value Chains (VC) is the flow of addition or creation of value in a particular process. In other words, VC exists from the input of raw materials to output of final product consumed by end users [16] as some value adds to each original inputs. The value chain, defined by economist Michael Potter, is shown in figure 4. This value chain(VC) illustrates two streams of value creation - one within the company and another outside of the company. The value generates in every process, such as raw materials, labor, production, distribution, capital, services etc of manufacturing

of a product or rendering a service within a company. The output of a firm is input of another firm which also creates value across the firms which is mentioned as value stream of outside of the firm.

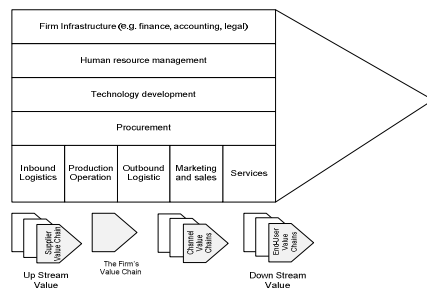


Figure 4. Porter's value chain [16]

Supply Chain is the continuous process of all functions performed directly or indirectly by all parties which objective is to meet customer demand [21]. The objectives of value chain is to manage contractual and strategical alliance among channel partners to create service and goods, establish powerful competitive chains, and develop the process with information technology infrastructure to maintain the collaboration.

4.3 Healthcare Value Chain

Value chain has existence in healthcare SCM which ensures maximum customer value at total lowest cost by doing coordinated effort among trading partners, widespread strategic alliance, knowledge sharing, inter firm trust, and competing value chains. The existence of value chain in trading partners of healthcare [42] proves the value chain is an inter firm collaborative approach. The healthcare value chain is depicted in figure 5

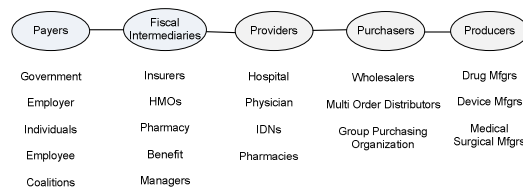


Figure 5. Healthcare Value Chain [16]

This healthcare VC has some challenging issues which need to be addressed properly to obtain maximum outcome from the value chain [17].

Technological investment in information system, developing leadership, shifting from non profit approach to cost effective positive patient outcome,

and efficient product forecasting [31] will ensure long term values from value chain. Value in healthcare is a long-term quest, and organizations must have the vision, strategy, execution discipline and strong governance to sustain change in the face of ingrained beliefs and process habits [8].

4.3 Valued supply chain management

A Supply Chain (SC) is a network among the supply chain partners such as suppliers, manufacturers, distributors, retailers, transporters etc. who shares information, deliver goods, ensure services and perform other intermediate activities to meet customer demand [21].

Value Chain has been mentioned as the process of links exists from input of raw materials to the output of final product where each links add some value to the original inputs. The VC performs within the organization and outside of the organization as a partner to other organization [10].

Few researchers, and industry executives think that VC does not exist in the healthcare industry due to the level of knowledge and lacking in information sharing link. Moreover, there is some agreement that SC acts more on goods concentric push flow rather that service oriented pull flow [17].

Product ordering by front line workers, non profit ownership attitudes, fragmented position of healthcare industry [12], less priority in technological investment are the identified reasons for fruitless performance of VC in healthcare.

Recent development in people hygiene, cost pressure on health service, budget squeezing by Government, enhancement of private level expenditure in treatment have been changing the view on VC existence in healthcare industry.

Valued Supply Chain Management (VSCM) means ensuring maximum value in each link of SCM against the paid value (money and service) provided by customer in order to get the ultimate satisfaction. The maximum value might be ensured through SC innovation, efficiency of SCM, redesigning of SCM flow within and outside the organization.

VSCM is an essential tool for hospital efficiency improvement as patient satisfaction through clinical outcomes is the ultimate objective of hospitals.

Hospital are engaged with a good number of partners and service performance where value is considered through visible service.

4.4. Proposed Model on Valued Supply Chain for Integrated Hospital Management

The authors propose the following model to ensure the implementation of valued supply chain management in the integrated hospital management. The model identifies the patient and medical student as input and focus point who will obtain value in each level through VSCM process.

There are few rationales for the development of the model which are: the healthcare industry is shifting to value to patient approach from cost to patient, increased input cost putting pressure on providing high quality service to patient at economical cost, supply chain is the one of the untapped competitive advantage for adding value in this sector, adoption of new rules, laws, and application method.

4.4.1 Input or prospective customer

This is the very unique situation in HSCM that input person (patient, student) is also part of both customer and input person. Both patient and student entered in HSCM process to obtain expected value from the process.

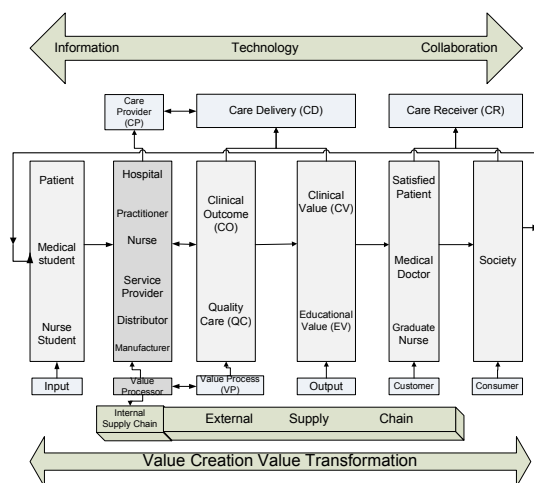


Figure 6: Proposed model on valued SCM for Integrated Hospital Management

4.4.2 Value processor

Value processor are different internal and external departments or/and firm who collectively generate values for the customers. Hospital (including

teaching hospital), practitioner (both academic and clinical), nurse, other service providers (in direct and direct materials, insurer, employer), distributor (GPO), and manufacturers are value processor players who perform both internal supply chain process and external supply chain process. Thus the value is transferring from internal to external chain.

4.4.3 Care Delivery

The care delivery for patient is clinical outcome and clinical value; and that of medical student/nurse student is Quality care and education value

Clinical outcomes means to the result of any healthcare treatment, including the entire range of activities performed in a care unit or in multiple care unit. This is classified in the perspective of Time (short time, long time), Perspective (stakeholders, society), Purpose (for research and audit) Society used to make a objective indices such as whether the patient was able to go back to work. But recently society eyes on subjective judgment as well as patient centered out come data.

Hospital outcomes age, underlying health status, severity of acute illness, timing and reasons for admission, timing and application of treatment and patient response to treatments. Patient will also be interested in the duration and quality of survival in the long run. Health managers, economists, politicians (society oriented outcomes) focus on distributive justice in order to maximize the well being for the whole society. The measures use to quantify the outcome of interest must be appropriate to the clinical perspective. All outcome measures have limitation. The most important clinical outcome measures are survival, functional outcome and quality of life. There are a good number of different models to measure the outcome.

Quality care: Quality care means a value addition process for learning to achieve education value. The value addition process might be supported by regulation (laws, rules, educational policy, and standard procedure), faculties, culture, fund, research facilities, environment, equipment, educational materials, knowledge bank facilities etc [46].

Clinical value: The clinical value is expression of mental, physical and economical satisfaction on clinical outcome against the incurred cost. At the end of each illness episode (or post treatment) the

patient or society can be described with respect to clinical status, functional status, and satisfaction against fundamental need of pre-treatment expectations.

The clinical value compass is an useful tools to determine and measure the quality of care in a comprehensive manner [49]. The clinical value compass enables physicians to analyze patients from numerous arena to determine the health plan. An appropriate care plan may not be suitable for patient, for multiple reasons, but physician can take decisions after analysis the patient situation through compass lens which is depicted in figure 7.

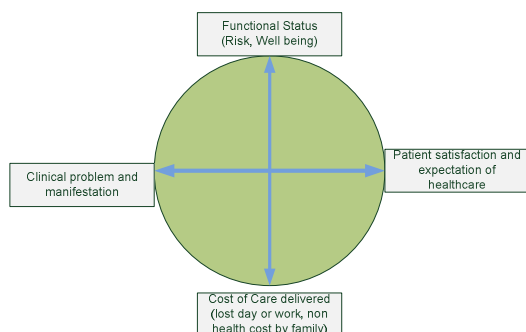


Figure 7 The Clinical value encompass [49]

Graduate with expected quality is one of the outcomes of Educational value. Bench marking an value enhancement are the process of institution to ensure graduates with desirable outcomes. Bench marking includes skills, moral values, capabilities, competence, ethics, career development and value enhancement includes wisdom, faculty capabilities, self funding, ICT, and research involvement etc [47],[48].

4.4.4 Care receiver

The care receiver are patient who might be satisfied or dissatisfied in terms of clinical outcome. The dissatisfied patient will again enter the process as input person immediately or in near future. The graduate doctors and nurses are other care receiver who also play role as service provider through rendering clinical support to patient as part of curriculum. The ultimate consumer is the society which consists of large population, economist, and politicians etc who indirectly receive the benefits from this process.

5. Conclusion

Integrated Hospital consists of both clinical and educational institution where patient care and education care are going together as complementary. SCM application in hospital management is imminent as competitive advantage of SCM is an effective tool for operation and strategical improvement. Healthcare sector is actively working for cost structure improvement and ensuring positive patient satisfaction simultaneously.

The authors consulted numerous literature, white paper and other related information from website to find out the gap in currently available literature. Both researchers and practitioners pay emphasis on different focus points of hospital and healthcare supply chain. The findings shows that a few model were proposed to find an efficient health care supply chain by enhancing productivity, reducing cost, and by reengineering the supply chain process. Patient, mentioned as common customer of all proposed model, receives service mostly from hospital and hardly from some other service providers such as pharmacy. Thus hospital and patient, the identified points of health care supply chain model, needs sufficient attention to improve overall healthcare supply chain.

Based on few rationales, the authors developed model ensuring highest level efficiency from hospital and rendering maximum service to patient. This model is divided into 3 parts: enabling environment such as information (data capturing, mining and sharing among the partners), technology (IT infrastructure, RFID, IT based process development), and collaboration (among the all partners to reduce the gap, cost, non value added job and enhance service, output, satisfaction) The next part consists of promising customer as input, process provider, value process, output, customer and finally consumer who performs in a team to generate value for each other which leads to the ultimate customer satisfaction. The last part is generation of value through internal and external supply chain value transferring process.

This model may attracts the educational supply chain in the integrated hospital which is forwarding through backward integration such as establishing educational institution. This part is attributed in hospitals supply chain management based on the experience from ITESCM model. This model could accommodate educational supply chain in hospital as complementary of service supply chain. Thus the academia, practitioners, healthcare managers, hospital authority would find a integrated guide line to propel the institution towards achieving goal. Simultaneously, society would be benefited

by having the skill, expert and healthy manpower who contribute for social well being.

Finally, as study is based on secondary data and authors expertise which represents the limitation of this paper. Moreover, the model is yet to validate properly which is an opportunities for the healthcare academia and healthcare managers to do further research. However, the authors shed a light on SCM model for hospital executives, and academic scholars in order to accomplish further investigation.

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