Patient Centered Medical Home: An Example of Healthcare Supply Chain Integration

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Abstract

The rising healthcare cost has urged the industry to make significant changes in an effort to offer affordable care to patients. The broad consumer base and policy makers also believe that it is possible to deliver high quality of care, contain cost and improve population health simultaneously. It is under this environment, increasingly, the healthcare industry starts to explore and implement some of the successful supply chain practices that have helped U.S. manufacturing and retailing industries gain efficiency through a plethora of strategical and tactical restructuring and refocus. In this paper, we visit some successful development in the supply chain field that are less communicated in the health care industry. We also review some of the supply chain integration attempts that have been done in the upstream of health care supply chain. Moreover, we introduce the Patient Centered Medical Home (PCMH) model that currently has been implemented in many states of the united states and examine how the practice fits the supply chain principles. We also address some of the challenges this practice facing and offer possible solutions for addressing those challenges. The main contribution of the paper is to offer supply chain perspective on the healthcare innovative practice in PCMH.

Key words: Patient Centered Medical Home; Supply Chain; Integration

Introduction

U.S. healthcare is the most expensive one among the developed countries. Yet, it does not deliver the best result. According to the latest available data from the Center for Medicare and Medicaid Services (CMS), U.S. national health expenditure in 2016 is $3.3 trillion. It has increased from 5.2% of GDP in 1960 to an estimated 18.5% in 2018. Another report from the Organization for Economic Co-operation and Development (OECD), an international economic group comprised of 34 member-nation, the average among OECD countries was almost half that of the U.S., about 9.5 percent of GDP (Kane, 2012). More and more communications from various sources address the concern about the rising health care cost (Rand, 2013). The urgency of curbing the health care cost and improving the care quality has led the Institute for Healthcare Improvement (IHI) to propose the Triple Aim framework, which simultaneously pursue improving the patient experience of care, improving the health of population and reducing the per capita cost of health care. Various attempts of health care cost reduction have been proposed and piloted by government agencies, policy advisory groups. For example, State of Vermont adopted all-payer model in 2015, which consists of setting the same prices for given services among all third parties and all payers at a particular hospital. This practice offers more regulation for state governments without having an actual universal healthcare system. It is also believed that the model will help reduce the speed of increasing healthcare cost.

The rest of the paper is organized in such format. We first review some of the supply chain management concepts and explore the supply chain implementation in healthcare industry. Moreover, we introduce the patient-centered medical home model and discuss each key characteristic from the supply chain perspectives. We then discuss the current stage of patient-centered medical home model and its challenges. In the end, we extend from our study and propose future research direction in patient centered medical home implementations as well as in broad healthcare supply chain integration.

Supply Chain Management and Some Development in Healthcare Industry

In the last 20 years, an era of expanding public health challenges and decreasing resources, the healthcare industry and the field of supply chain management (SCM) have both experienced significant changes (Ford and Scanlong, 2006). Supply chain management, as a business field, its potential of bringing competitive advantage to businesses through cost reduction, efficiency increase, better strategic alignment is well documented. However, the healthcare industry has been extremely slow to embrace those practices (McKone-Sweet et al., 2005). The current state of supply chain management (SCM) includes a collection of various principles, with influences from logistics and transportation, operations management and materials and distribution management, marketing, as well as purchasing and information technology (Jain, Dangayach, Agarwal and Banerjee, 2010). The cross-disciplines nature of the field has cultivated some very powerful and effective practice and business-world examples, such as the success of Walmart and the Spanish apparel retailer Zera. The overall focus of the supply chain management is to efficiently integrate suppliers, manufacturers, warehouses, and stores, so that merchandise is produced and distributed at the right quantities, to the right locations, and at the right time, in order to minimize system-wide costs while satisfying service level requirement (Simchi-Levi, Kaminsky and Simchi-Levi, 2003). Different from the traditional cost reduction, efficiency boost and quality improvement focus in the process and operational management, research and practice in the supply chain field extends beyond the traditional corporate boundary to include the interactions with up-stream suppliers and down-stream retailers. Among those interactions, the efficient flow of information, merchandise, and finance were underscored as the epitome of well managed supply chain.

It worth emphasizing that SCM is based on a system approach and the essence of SCM is about solving the problems of functional division (silos) that occur within and between organization and to create seamless processes (Aronsson, et. Al 2011). Under this overarching focus, Christopher and Towill (2001) suggested that the importance of supply chain by stating that it is supply chains compete not companies. Lee (2004) proposed the Triple-A supply chain, which focuses on agility (quick response to short-term changes in demand or supply); adaptability (adjusting design to accommodate market changes) and alignment (improvement of the entire chain). Total cost of ownership (TCO) is a concept that often used in supply chain management to fortress the system thinking. The TCO is developed to determine the total cost of ownership of a product or service provided by a particular supplier, through a complete investigation of the different cost items which composed the real cost of buying from a specific supplier (Afonso, 2013). TCO aims to determine the true cost of buying a particular good or service from a particular supplier, accounting for it all costs, including transactional cost, implementation cost etc., associated with the purchasing activity (Degraeve et al., 2005), using the monetary quantification of all financial and non-financial attributes (Morssinkhof et al., 2011). TOC is commonly used in the supplier selection stage to determine the most cost-effective choice. Because it is processed before the actually incurred, many costs are estimated.

Another important development in supply chain management is to draw the attention to down-stream integration. Chopra and Meindl (2016) underscored that consumers' buying behavior drives the underlining supply chain. Fisher's (1997) avant-garde article profoundly influenced the literature in the field by suggesting a framework which matches product type, which alludes to the buying behavior, with supply chain strategies. While focusing on the down-stream integration, the supply chain coordination and integration tends to be initiated on the end consumer side. However, without right information flow to support the process, supply chain tends to be plagued with bullwhip effect. Lee et al. (1997) documented bullwhip effect in the ordering process of Hewlett-Packard (HP) and Procter and Gamble (P&G) and stated that distorted information from one end of a supply chain to the other can lead to tremendous inefficiencies: excessive inventory investment, poor customer service, lost revenues, misguided capacity plans, ineffective transportation, and missed production schedules. The bullwhip effect refers to the ordering patterns in different supply chain players, that the variabilities of an upstream site are always greater than those of the downstream site. Many supply chain coordination schemes have been proposed to alleviate the bullwhip effect. One of the salient approaches is Vendor Managed Inventory (VMI). Traditionally associated with the grocery sector, VMI has been successfully implemented in a number of other areas, including the steel and electronics industries (Kuk, 2004). A key element in VMI implementation is that the supplier is in control of the customer's inventory to ensure that predetermined service levels are maintained. In this setting, the vendor makes all replenishment decisions, dispatching a quantity of product that may be fixed or variable according to the control system used (Waller et al., 1999).

Zachariassen (2014) through extensible literature review and an empirical study concluded that certain decisions in a VMI setting may be perceived as unbeneficial when looking merely from a focal perspective, but prove to be beneficial for the supply chain in general when taking an inter-organizational perspective on VMI. He also suggested that both financial and non-financial performance drivers to be used to create satisfying solutions for both parties in the VMI cooperation.

Health care industry is a service industry, with patients actively participate in the production of the final service product. Another unique idiosyncrasy of the healthcare is that the concept of customer is nebulously defined. Very often the buyer of the product or service is not the consumer, nor is the payer, which furtively prompts conflict of interest among supply chain players, adding complexity of innovative initiatives. Despite the complexity and unclear definition of some concepts, many researchers explored the possibility to analyzing health care industry through the supply chain perspective with a focusing on pharmaceutical industry or hospital industry. Jia and Zhao (2017) studied the generic injectable drug supply chain. Burns et al. (2002) analyzes the key elements and developments in U.S. healthcare value chains. Ahuja and Birge (2016) investigated the inventory issues in clinical trials, but not from supply chain perspective. Ball et al. (2016) investigated the links between inspector experiences and product recall in the medical device industry. Clearly, these researches still focused on the physical delivery and distribution nature of the supply chain. The supply chain nature that involves patient decision, patient participation was not reflected. Many researchers also investigated cases of process redesign in healthcare supply chain focusing on hospital operations. Ford and Scanlong (2006) discussed the utilization and evolution of SCM principles in healthcare and identify specific elements of the supply chain being targeted through purchaser initiatives. Shah et al. (2008) studied process improvement and work design in healthcare setting. It also examined and discussed lean production and its application in healthcare.

The end consumers in the healthcare supply chain are patients, even though most patients don't directly pay for the service they received. And the ultimate goal of the healthcare system is to keep patients healthy, so it is inevitable to focus on patients while considering a system-wide health care supply chain integration. In the United States, patients first contact with the health care system usually is their primary healthcare doctor's clinic or urgent care clinic. Once the primary doctor determines the patient needs further examination and evaluation from a specialist, the primary doctor would set up the referral. If the condition requires hospital stay, the patient would be admitted to a hospital. In a figurative description, the primary care clinics are the retail stores in a traditional consumer-oriented supply chain. To truly harness the cost saving opportunity and enhance the quality care and patient experience, researchers and practitioners would gear the attention to clinics. One of the health care innovations that has been implemented many states of the United States is focused on the patient side of healthcare supply chain integration. The supply chain community and healthcare industry ought to pay a close attention and observe the evolution of the model.

The Patient Centered Medical Home (PCMH) Model and Its Supply Chain Linkage

Patient Centered Medical Home (PCMH) is a model that started in the 1970's as a way to improve healthcare. With the renewed interest in revamping primary care, Patient-Centered Primary Care Collaborative (PCPCC) formed to promote "a philosophy of health care delivery that encourages providers and care teams to meet patients where they are, from the simplest to complex conditions." The patient centered medical home transformation has seen an increase from 18 states in the United States in 2009 to 44 states in 2013 (NCQA, 2015). At the core of PCMH model are the five functions and attributes: *comprehensive care, patient-centered, coordinated care, accessible service, and quality and services*.

Comprehensive care is accountable for meeting the large majority of each patient's physical and mental care needs where it is team focused. The emphasis on team focus means linking physicians, nurses, and outside entities related healthcare such as food banks and dieticians. With comprehensive care, it is also important to build virtual teams linking themselves and their patients to providers and services in their communities.

Supply Chain Management Principle in Action: Team based operation is broadly used and well documented in the Toyota production systems. Team approach can significantly increase the system efficiency by introducing the comprehensive response to the varying condition of patients. Effective communication through physically separated but operationally connected organizations (medical home) could solve some of the root causes of the patient health condition, such as lack of shelter or food. The practice also enables the type of consideration as in total cost of ownership (TOC). From the holistic care point of view, the clinicians can work with the patients to reach the best care with contained cost level.

Patient-centered means relationships based with an orientation toward the whole person. They focus on partnering patients and families through an understanding of respect of culture, unique needs, preferences, and values. Coordinated care takes and coordinates care across all elements of the broader health care system (specialty care, hospitals, home health care, and community services and supports) with an emphasis on efficient care transitions.

Supply Chain Management Principle in Action: As commonly discussed in the push-pull production environment, end customer's decision drives the whole supply chain activities in a pull production/service system. Focusing on patient needs aligns the overall health care supply chain goal of keeping patients healthy, with the detail oriented operational and tactical goals. By recognizing the cultural and preferential differences, the healthcare supply chain can be more adaptive to each patient's unique needs, which reflects the Triple A (agile, adaptive, alignment) focus of supply chain operation.

Accessible services are about delivering accessible services with shorter waiting time for urgent needs, enhanced in-person hours, around the clock telephone or electronic access to a member of the care team and alternative methods of communication. It requires being responsive to patient's preferences regarding access.

Supply Chain Management Principle in Action: Accessible services focuses on the service availability and extended service hour and geographical locations. By extending the service operating hour, with same physical location and resources, more service capacity is generated through the longer operating hour. Extending the service electronically, new version of service capacity was introduced. With more service capacity better matched with patients' needs, a more responsive healthcare service supply chain system can be established. If the population can be assumed as the relative fixed number, the increase clinical operating hour and electronical based service venue lead to more service capacity per capita.

Quality and service is through ongoing engagement in activities such as using evidence-based medicine and clinical decision support tools. It is important to engage in performance measure and improvement with measuring and responding to patient experiences and patient satisfaction. While practicing population health management and sharing robust quality and safety data and improvement activity publicly.

Supply Chain Management Principle in Action: Since 1970s, the discussion of quality has been constant in the industry. The idea of total quality control, the concept of cost of quality have been broadly adopted in U.S. manufacturing and supply chain field. The newly introduced the evidence-based medicine in the healthcare industry underscores that quality is a sound management practice that deliberately and systematically applied. In business practices, very often, the subject of quality conformance, customer satisfaction and delivery reliability were conveyed as the consensus of quality. Augmented by the right data set, the quality focused practice will enhance the customer experience, contain cost and deliver the desired health result.

Some Early Result and Challenges of PCMH

Some of the early adoption states have reported savings in some areas. In Michigan, after treating more than 1 million patients, the plan found PCMH to achieve a reduction in emergency room visits (10% for adults; 13.5% for children) compared to non-PCMHs (6.5% for adults; 9% for children) and a 22% reduction in adult ambulatory care (Bujold, 2015). In Louisiana, one of the study of the implementation of PCMH effect on Medicare enrollees reported the emergency department visits go down as well as significant effects tied to the portion of chronically ill patient (Cole, 2013). A small PCMH practice in North Carolina noted that the implementation of PCMH improved team commitment (Bujold, 2015). PCMH's coordinated care also increase efficiency of care. The model increases preventive care such as mammograms and colonoscopies. It also encourages other care from mental health to dental practices and receiving community services such as food from the food bank (Worth, 2012). An article also reported that "There is growing evidence that PCMH saves money, while improving the quality of care – an irresistible opportunity for states." A recent comparison of seven large, mature PMCH programs across the US found annual savings between $71 and $503/patient. Extrapolated to all the state's coverage groups, potential savings could reach $300 million/year or more. The study also found that emergency room visits were reduced by as much as 20% and hospitalizations by 5 to 40 (Idaho Parents Unlimited, 2017)

The implementation of PCMH encountered some challenges. At the policy level, the murky future of the Accountable Care Act imposes tremendous uncertainty in terms of the sustainability PCMH model. Department of Health and Human Services could receive a $15.1 billion budget cut with the proposed budget (Melloni, 2017).

Another challenge that clinicians facing is that due to the slower than expected payment model reform, additional efforts that clinician devoted to care coordination and patient satisfaction were not sufficiently reimbursed. To facilitate the continuous improvement in the practice, timely data gathering at the inter-organizational (clinics, hospital and medical home organizations etc.) level is necessary. Yet, due to lack of standardization in Electronical Health Record (EHR) system, the progress in the cross organizational data exchange is less satisfying. Healthcare industry significantly affects economies and the quality of our daily livings. It is also a highly complex, compartmentalized, fraught with different regulations and policies. With the unsustainable rising rate of healthcare cost, fundamental reforms on care delivery, patient-physician relationship, payment model are necessary. Patient centered medical home is a great example of service supply chain integration which has shown the potential in cost containment and care quality improvement. Yet, there are many questions unanswered. What will be the right payment model to reimburse additional care that clinicians provide, such care coordination? How can the healthcare service address the patient focus via increasing the patients' perception of control? How to measure value of the downstream service supply chain integration? Healthcare industry provides a fertile research field for scholars and academics. The subsequent research result can make a long lasting impact in our social lives.

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