

## **The Study of Healthcare Supply Chain Management in United States: Literature Review**

Sung-Ho Kim

Director of St. Mary's Healthcare Foundation, Korea and

Visiting Professor of Supply Chain Management

Saint Louis University, USA

Email: sunghokim@slu.edu

Ik-Whan G. Kwon

Professor and Director

Center for Supply Chain Management Studies

Saint Louis University, USA

Email: kwoni@slu.edu

---

Received Sep. 22, 2015, Revised Nov. 25, 2015, Accepted Dec. 26, 2015

### **ABSTRACT**

*Deployment of supply chain management strategies in the healthcare field has been painfully slow in spite of calls by many scholars and practitioners to implement this strategy in healthcare. This paper attempts to critically review the status of supply chain operations in the healthcare field in an attempt to address what has been done in academics as well as the practitioner's field to gain insight where future research efforts should be addressed. Literature published within the past 10 years will be reviewed. Recommendations for academics as well as practitioners will be presented at the end of this paper.*

**Keywords:** Supply chain management, Healthcare supply chain management, GPO, Compliances, Supply chain tools, Provision management

## INTRODUCTION

The healthcare landscape has been rapidly changing in this country with the introduction of the Affordable Healthcare Act in 2014. Pressure on cost cuts and quality improvement put healthcare organizations in a tenuous position. Management has been forced to explore all avenues to achieve twin goals; reducing cost and improving quality. Achieving an optimum and even perhaps minimum profit level adds additional challenge to healthcare organizations. In response to such external pressure, healthcare organizations in this country look for help. Healthcare supply chain enters into the picture as one of the tools that administration can rely on. This paper explores what has been done in the healthcare supply chain area within the last 10 years.

In the field of healthcare, introducing new technology and management strategies is slower than other industries primarily because healthcare organizations have relatively conservative cultures reflective of their unique task; saving human life. Considered as a subcategory of general business management in academics, healthcare is not positioned to lead the new discipline. Hospital management, however, has to meet new challenges under the volatile environment and rapidly changing government healthcare policies. Only ten years ago, hospital management focused on strategies for profit maximization. But as it became clear attracting patients had its limits, hospitals started to strive for cost containment efforts. According to report by Pricewaterhouse's Health Research Institute, \$1.2 trillion out of

\$2.2 trillion total medical expenditure have been wasted (Kailanz, 2009). Supply chain cost in the healthcare field accounts for 38% of the total cost while the corresponding information in retail business is 5% and 2% in the electrical engineering business (Johnson, 2015). Lack of collaboration among players in the healthcare field is also cited as a major obstacle in achieving the maximum supply chain surplus (Duffy, 2009). A recent study by UPS (2015) seems to concur such findings (2015).

Accordingly, healthcare has begun to re-direct their strategies of improving profitability by reducing costs. Under such managerial change, the supply chain management discipline seems to be an attractive alternative achieving an acceptable level of profitability. The strategy seems to be feasible since the central premise of supply chain is to reduce or eliminate unnecessary expenses with efficient supply chain/logistics tools. Kwon et al. (2011) point out the need for scholarly discussions to re-conceptualize SCM in healthcare because the development stage in healthcare supply chain is far behind commercial supply chain in utilizing various supply chain tools. In spite of such a wide gap in supply chain applications between these two industries, there has been no sufficient research done on this topic in the healthcare field.

This study, therefore, aims at new directions for the research on SCM in healthcare based on an extensive and critical review of related literature. This paper is organized as follows; literature review is provided in Section 2 where overview of healthcare supply chain management in tabular format, comparative studies on commercial and healthcare supply chain management, major operational tools in healthcare supply chain management, and barriers of adopting healthcare supply chain management are presented. Summary and conclusion are

presented in Section 3 which is followed by managerial implications.

## LITERATURE REVIEW

This study initially considers literature on healthcare SCM published in the United States for the most recent ten years (2004-2015), which ranges widely from the hospital, pharmaceutical industries (cold chain), and public policy for healthcare, including reports both from academic and non-academic sources. This review covers about 43 works of which are divided into four areas according to the central themes as seen in Table 1. We admit that there are many works in this field that we excluded from review for obvious reason, limited space. We simply highlighted some of the major works that seem to have generated interesting debates.

### Overview of Healthcare SCM

Nothing seems more wasteful than investing resources in any strategic field with uncertain prospects. It is necessary, therefore, to look into the trends and prospects of healthcare SCM in order for management to decide whether it would be helpful to introduce the new management tools called healthcare supply chain.

In general, one can conclude that the majority of the studies consider healthcare supply chain in positive, promising management tools for healthcare operations. Elmuti et al. (2013) review the obstacles that the current American healthcare industry has to overcome with its own strategies and examines the significance of such tasks for successful SCM deployment and the organizational efficiency of the whole industry. But Elmuti et

al. (2013) admit that SCM can indeed increase productivity by reducing costs, enhancing qualities, shortening product/services cycles, and lowering inventory costs.

Table 1. Topics and Authors

Topical Areas	Author (Year of Publication)
Overviews of Healthcare SCM [5]	Elmuti <i>et al.</i> (2013), Lee <i>et al.</i> (2007), Ford <i>et al.</i> (2007), Kumar <i>et al.</i> (2009), Aston (2010)
Comparative studies on Commercial SCM and Healthcare SCM [7]	Carmody (2007), Dobrzykowski <i>et al.</i> (2014) Lo <i>et al.</i> (2009), Lisa <i>et al.</i> (2004), Sengupta <i>et al.</i> (2006), Vries <i>et al.</i> (2011), Agwunobi <i>et al.</i> (2009)
Major Tools Healthcare SCM [27]	Burns <i>et al.</i> (2008), Chandra <i>et al.</i> (2004), Smith <i>et al.</i> (2004), Kane (2007), Dooley (2009), Kwon <i>et al.</i> (2004), Kwon <i>et al.</i> (2011), Partidas (2015), Jarousse (2012), Kerry <i>et al.</i> (2005), Brown (2007, 2008), Parkinson (2014), Bendavid <i>et al.</i> (2010), Eric <i>et al.</i> (2007), Revere <i>et al.</i> (2010), Angela <i>et al.</i> (2010), Kumar <i>et al.</i> (2008), Kumar <i>et al.</i> (2009 : 3ea), Pazirandeh <i>et al.</i> (2011), Thomas (2008), Christian <i>et al.</i> (2010), Coleman (2012), Anna <i>et al.</i> (2012), Van Peteghen <i>et al.</i> (2015)
The Barriers of Adopting Healthcare SCM [4]	Kathleen <i>et al.</i> (2005), Nachtmann <i>et al.</i> (2009), Yokl (2011), Dejohn (2008)

Their argument seems to suggest that healthcare supply chain fosters more effective organizational integration. Internal organizational integration is known as a pre-condition for a successful supply chain execution (Lee, Kwon and Severance, 2007). Other studies similarly present positive prospects for using healthcare SCM. Ford et al. (2007) attempt to determine several ways to use healthcare SCM and its potential strengths and weaknesses in terms of cost and quality control, concluding that in the near future SCM will be ranked as a highly influential strategy in healthcare. These studies therefore seem to suggest promising outcomes that one can garner from a successful deployment of healthcare SCM.

Furthermore, there are studies arguing for prospect of the positive role healthcare SCM plays at the national level. Kumar et al. (2009), for example, suggest use of healthcare supply chain tools as a means of improving the living standard for less developed countries. On a similar note, Aston (2010) notes the fact that part of \$1.1 billion economic stimulus released in 2009 was invested in studying SCM for medicine, medical equipment and operating procedure attests to the federal government's view of and commitment to how supply chain can improve the flow of goods and information in the healthcare areas. In summary, it can be inferred from these studies that introducing healthcare SCM as a strategic tool can produce positive effects at organizational or national levels. In the following section, this article will examine the major reasons for introducing healthcare SCM, primary outcomes and challenges in deploying supply chain management in healthcare operations.

## Comparative Studies on Commercial SCM and Healthcare SCM

Much research has been done on the issue of applying SCM to commercial sectors. Indeed, one of the most cautious yet practical approaches to healthcare SCM seems to be that healthcare supply chain learned its operations from commercial SCM, which has already reached a maturity stage after a series of reforms that have been implemented based on previous successes and failures. Carmody (2007) proposes to think outside the box to improve hospital operation and cost management efficiency by introducing useful case studies practiced in commercial SCM. This implies, for obvious reasons, that healthcare needs to make sustained efforts to develop innovations and renovate the existing process, which would result in improved organizational productivity. The study argues that approaches taken by commercial SCM can be also applicable to the healthcare industry. Dobrzykowski et al. (2014) echo a similar point of view, classifying the existing studies on healthcare SCM under five categories; 1) information technology and new technology in services, 2) general aspects of strategy and objectives of operations in services, 3) selection and design of the service delivery system, 4) strategic quality issues in services, 5) capacity planning, scheduling, and control, they validated success of healthcare SCM that has been key elements in the service industry of SCM.

Lo et al. (2009) observes that provision management is drawing special attention as healthcare expands its own domain into other related areas and they argue that it is high time that the healthcare profession design a practical paradigm that could effectively support the productive coalition between healthcare industry and other commercial industries. Other authors, however, argue different approaches because any attempt to apply commercial SCM to healthcare will create various

challenges. Lisa et al. (2004), for example, compare the practices of SCM in the manufacturing industry and the service industry to which healthcare belongs. Although applying manufacturing SCM models to the service industry seems quite limited, the author also sees it possible to achieve a considerable growth of SCM in the service sector, particularly in the cost management area via controlling wasteful expenses. In other words, they argue that one could expect improvement in organizational performance only when fundamental characteristics of manufacturing SCM is adequately modified suitable for the healthcare SC operations. Sengupta et al. (2006) also compare the differences of supply chain operations between services and manufacturing industries in terms of supply chain management functional and financial achievements. They even propose to establish different strategies appropriate to the organizational performance. Therefore, successful adoption of SCM in healthcare industries requires an important precondition: a process of adaptation tailored to healthcare environments. Only through such a process of adaptation, the studies imply, can healthcare achieve its desired effects with the newly-introduced SCM tools. Vries et al. (2011) similarly argue that although it is not easy to directly apply what is being practiced in SCM in general industry to healthcare, SCM in healthcare is gradually evolving and expanding, and thus it is necessary to pursue further development in the field of healthcare SCM by adopting what it can learn from commercial SCM. From this review, one can, therefore, understand that despite the prevalence of bright prospects for healthcare SCM, many are still concerned about the challenging task of overcoming practical difficulties. Agwunobi et al. (2009), for example, examine whether the group purchasing practice in an effort to reduce costs that have been implemented in other fields could work for healthcare industries. Reviewing literature that Automatic Data



Identification and Data Capture (AIDC) is closely related with E-procurement, the article (Agwunobi et al.: 2009) argues that E-procurement could serve to enhance organizational efficiency, strategically playing a key part in SCM particularly in the face of various challenges in terms of logistics systems, expenses, and security. They further comment that with its own strategies, healthcare can also benefit from SCM, enjoying similar advantages that other industries have gained from deploying this tool; cost reduction from mass purchasing.

### **Major Tools Healthcare SCM**

As mentioned earlier, it seems quite useful to refer to other industries for the purpose of learning from and emulating SCM practices in the healthcare industry. In this section, cost reduction and increased management efficiency, and other aspects of healthcare operations are the major focuses of the study.

Alan et al. (2004) hold that automating operations in logistics and inventory management can save time and cost, contributing to maintaining and improving organizational competency and attaining managerial goals. In a similar vein, Burns et al. (2008) propose joint purchasing such as GPO to lower the transaction costs and prices of various supplies including medicines.

Chandra et al. (2004) emphasize the importance of standardizing informational technology and the decision-making process in healthcare SCM in order to boost efficiency and remove unnecessary expenses in logistics. This study suggests that with an effective use of SCM, healthcare is expected to reduce various elements of inefficiency and acquire resources that would enhance managerial performance.

Some studies attempt to determine primary factors for the successful establishment of healthcare SCM that affects the reduction of time and expenditure and performance enhancement. Addressing the importance of coordinating the relationships among interested parties, Kane (2007) argues that direct involvement in operations by all concerned parties is preferable to outsourcing in creating financially sound hospitals. They also argue that it is crucial to estimate costs and maintain service quality for the interested groups, such as sellers and buyers, to share profits and risks. In other words, for the success of healthcare SCM, all relevant information should be fully shared.

Dooley (2009) proposes a six-stage step for effective SCM implementation in the hospital and medical system, areas as individualized functional operation, the coordination of each function, enhanced visibility from shared information, functional cooperation and integration, and securing accelerated operation from sustained functional integration. From the same perspective, Kwon and Suh (2004) and Kwon et al. (2011) also maintain that for successful healthcare SCM, it is indispensable to sufficiently share information, risks, and rewards. A recent study on power of information sharing and collaboration in supply chain appears to validate their claims (Partidas, 2015). Jarousse (2012) similarly underscores the importance of effective communications and information sharing among partners in healthcare SCM. Taking one step further, along with the coordinated relationships, Kerry et al. (2005) list other elements for successful hospital management with SCM, such as efforts invested in proper performance assessment, quality enhancement, efficiency, and efficacy, and creating a positive experience for both inpatients and outpatients.

Other studies specifically put forth strategies, systems, and methods applicable to healthcare SCM when it comes to the

question of “automation” in SCM. Brown (2007) sees automation efforts including sharing barcode technology among systemically connected hospitals as contributing to protocol establishment, effective cost management, and even the enhancement of patient safety. In another study, Brown (2008) suggests that introducing an automatized process in all healthcare operations can help reduce medical malpractice cases. This assumes that healthcare SCM make every effort to automate and computerize operational processes.

Parkinson (2014) suggests that the use of UDI (Unique Device Identification) system can significantly contribute to tracking and managing hospital resource flow, and utilization. Because such a system can positively change supply expenses and patient care quality, the author points out that hospital management needs to analyze usage patterns and make adequate investments. Several authors suggest RFID as a technology for successful healthcare SCM. Bendavid et al. (2010) perform a demonstrable case study on nurse ward units, showing that logistics based on RFID technology enjoys the benefits of saving time and storage space. On the other hand, Eric et al. (2007) show that there are cases where CPC (Collaborative Product Commerce) technology can be applied to the healthcare area to manage cost and quality of care which deserves government support.

Revere et al. (2010) also refer to RFID technology as a venue for information exchange that could play a crucial role in securing patient safety and improving quality and efficiency, thereby contributing to reducing costs. Although adopting RFID for SCM is quite a recent development in healthcare with limited successes, the technology holds considerable potential as a tool for saving time and resources for healthcare organizations. However, some raise concerns about introducing RFID to healthcare operations. For example Angela et al. (2010) expressed concerns

about its side effects such as management's control of technology which may limit the value of its potentials.

Kumar et al. (2008, 2009: 3ea) have conducted extensive studies on healthcare supply chain. Their findings are summarized in Table 2 below.

Table 2. Review of Kumar's Healthcare SCM (2008, 2009)

<b>Major Points</b>
<ul style="list-style-type: none"><li>· After considering the potential benefits of packaging American hospitals' supply chains, the studies fail to identify any significant ones.</li><li>· Considering that the efforts to introduce efficient logistics to healthcare in America seems so far rather limited, the studies consistently emphasize the urgency of instituting healthcare SCM.</li></ul>
<ul style="list-style-type: none"><li>· The studies offer an overview of risk factors that could be posed for the patients when the DMAIC process should be applied to medicine logistics along with a move to clarify the positional differences between supplier and consumer.</li><li>· The studies also propose that proper direction medicine logistics should take after examining the characteristics of medicine business distinctive from other industries' that can directly affect the patient's health and safety.</li></ul>
<ul style="list-style-type: none"><li>· Employing 'e-kanban' RFID in hospital wards can save time needed for patients care and storage space in operational, functional terms.</li><li>· Introducing an automated system based on RFID in healthcare enables a harmonious coordination of products, human beings, concepts about the assets, location, and flow, in particular, cooperation between interested groups.</li></ul>

There are, however, some skepticisms of introducing healthcare supply chain tools in hospitals. Eric et al. (2007), for example, acknowledging the importance of SCM in healthcare for its role in reducing expenses and enhancing performance, raise the question whether such benefit is good enough to justify its expenses. Pazirandeh et al. (2011), on the other hand, conclude the importance of applying SCM tools in healthcare with more flexible strategies. On re-focusing strategies, Thomas (2008) addresses the importance of sustainability/environmental issues on purchasing supplies for hospitals, not just price and quality of products.

There are also studies on the consequences of using SCM to special, unusual sectors of healthcare. Christian et al. (2010) based on various interviews conclude that pharmaceutical industries would also benefit from using supply chain management as well. The study classifies the pharmaceutical industry's supply chain trends into eight categories, compensation methods, alternative distribution system, and the product brand name as determining factors. Coleman (2012) in another study on the pharmaceutical industry focuses on its wholesale distributors and it reaches a conclusion that attention to legal/compliance responsibilities becomes increasingly necessary and important, based on court records and corporation reports. Anna et al. (2012) did research on blood supply chains, applying many different standards, and strove to establish a valid system applicable to the field in question after considering how to reduce unnecessary expenses and create an optimized system.

Addressing many challenges in cold chain in the pharmaceutical supply chain, van Peteghan and Kabbaj (2015) argue that cost pressures are causing earlier patient discharges and they propose new models of care to meet the \$27 billion home healthcare market. They insist that it is vital to look at supply

chain as a whole, evaluating needs and opportunities from end to end to justify strategic opportunities.

The benefits from healthcare supply chain operations seems fairly obvious, reduced inefficiencies in operations thereby creating consumer surplus from which everyone in the supply chain benefits. For this purpose, information sharing is essential in providing support for introducing new processes, and develop automated systems.

### **The Barriers of Adopting Healthcare SCM**

This article so far has reviewed what benefits one can expect from adopting SCM to healthcare and what should be considered in such a process. Based on various research, it has become clear that there is room for healthcare SCM and that there are fundamental tasks that should be carried out to turn it into reality. Given that healthcare SCM is the last mover among various industries, however, there are also studies that describe the challenges that healthcare SCM has to face.

Kathleen et al. (2005) investigated the shortcomings of healthcare logistics and found a high entry barrier as the leading causes, such as lack of support from management, absence of general consensus over incentives, lack of data about performance assessment and information, and inconsistent relationships with Group Purchasing Organizations (GPO) and other supply chain partners. While the study is primarily concerned with organizational management, cost of adopting supply chain management is another barrier in adopting and deploying supply chain management concepts in the healthcare field. As Nachtmann et al. (2009) points out, healthcare SCM is still in its early stage revealing many of its own limitations, particularly its high operational costs and lack of shared information. The

researchers, therefore, suggest that developing strategies that could help bring cooperation among various interested parties, effective information gathering and management, enhanced visibility, reduced inventory, and streamlined processes as a way to popularize use of supply chain tools in healthcare. Yokl (2011), for example, emphasizes the difficulties involved in supply management in use of healthcare, citing eight primary causes: “standardization, over-specification, under-specification, too many hand-offs, missing the big picture, value mismatches, and new technology.” Dejohn (2008) points out that it is hard to practice SCM in smaller hospitals without considerable investment because automatizing technology employed for supply chain incurs high cost.

As mentioned, most studies express concerns over the high cost of introducing SCM to healthcare areas. For this reason, one cannot be overly careful about adopting this new strategic tool in hospital management focusing solely on what can be achieved by instituting healthcare SCM. If so, one can lose sight of other practical considerations and thus produce poor managerial outcomes. To reduce costs by tapping onto the economies of scale, the hospital has to have grown into one with considerable resources, when it should start to consider introducing a SCM system with a concrete road map including a proper timetable and strategies.

## **SUMMARY AND CONCLUSIONS**

This study reviews the most recent ten year’s of research and reports on American healthcare SCM in order to learn directions that various healthcare area, such as hospitals, pharmaceutical companies, and healthcare policy-making institutions, can consider and adopt. In doing so, the review has placed the

literature broadly under four categories; overviews of healthcare SCM, comparative studies on commercial SCM and healthcare SCM, major tools in SCM, and the barriers of adopting healthcare SCM.

This study has shown rather positive prospects for using supply chain management in the healthcare field . Because of healthcare SCM's short history, most research has been comparative studies in nature between healthcare supply chain and commercial supply chain. This is because many complex issues in healthcare logistics are specialized and peculiar in nature, and studies in healthcare supply chain attempt to derive solutions to these issues from case studies in commercial industries. Most of the strategic tools for organizational management and operation in healthcare have their origins in general management and SCM is not an exception. Nevertheless, many studies take exception at applying those strategic tools, methodologies, and processes that have been useful in SCM in other industries literally to healthcare SCM. As has been mentioned, most studies maintain that the healthcare field has its own unique traits, creating an unique tool supplementing the existing strategies so that they can work effectively for healthcare SCM.

Among the four categories that this study has reviewed, one that examines the positive potentials in healthcare SCM is how SCM in other fields can be applied to healthcare and what can be achieved in that process, given that the general conceptual paradigms and utility of SCM have been already known for other industries. Until now, however, it seems that we can only conjecture the potential benefits of introducing healthcare SCM. As mentioned in the introduction, individual branches in healthcare are making concrete efforts to reduce costs and the large body of literature examines the cost-reducing performance



of healthcare SCM while others underscore quality and managerial improvement through SCM. Most studies also emphasize models, tools, and strategies that can be considered for healthcare and many argue for the importance of coordinating relationships between interested parties for successful SCM implementation.

On the other hand, there are studies that highlight the pressing challenges that one has to overcome in introducing healthcare SCM. There is still much more work to be done in order to overcome difficulties such as obtaining governmental and managerial support, proper information management, adequate investment into the process, and establishing effective protocols. Nevertheless this review also confirms that most studies mention the positive aspects of introducing healthcare SCM, positioning for positive prospects. In conclusion, although there are considerable challenges that American healthcare SCM has to address with limited resources, SCM seems ready to serve as a useful strategic tool for successful healthcare management.

### **Managerial Implications**

Healthcare supply chain professionals are in their infant stage compared to other industries. This study reveals potential benefits from using supply chain management tools. Although research and case studies in healthcare industries are not as extensive as in other industries, a clear trend appears to be forming in that deployment of supply chain management indeed generates consumer and provider's surplus from which the entire society would benefit. Although advanced investment in deploying supply chain has been a major obstacle, the net revenue stream over the investment period should be positive in the long run. A danger is that under tremendous financial

pressure, the decision makers in healthcare industries may look for a quick and short term solution. Supply chain deployment is a long-term strategic decision and it is a complex and dynamic process.

Finally, the use of supply chain management tools in healthcare industries has been limited to strategic sourcing/contract management at best. It has been proven many times in commercial supply chain industries that other tools such as transportation, warehousing operations, strategic sourcing, supplier relationship management, and 3PL, etc. should provide measurable benefits for every participant (Kabbaj and Van Peteghen, 2015). It is time for healthcare supply chain industries to investigate these tools to maximize the return from investment. Along with tools, it is the right time for them to review talent they have who are managing supply chain operations. Are they a qualified supply chain professional, or just a contract manager?

Healthcare supply chain is a recent development that has a short history. As such there are few academic research papers for conversations and discussions. In addition, this research limits its scope for literature available in the United States for the last 10 years. The authors admit many worthwhile research papers from other countries are excluded from this study. Accordingly, we do not claim this study has global appeal. Perhaps that will be the next research topic for someone who is interested in this area.

## REFERENCES

- Agwunobi, J., & London, P. A. (2009). Removing costs from the health care supply chain: Lessons from mass retail. *Health Affairs*, 28(5), 1336.

- Angela, M. W., Jhon, K. V., & Li, S. (2006). Radio frequency identification applications in hospital environments. *Hospital Topics*, 84(3), 3-9.
- Anna N. et al. (2012). Supply chain network operations management of a blood banking system with cost and risk minimization. *Computational Management Science*, 9(2), 205-231.
- Aston, G. (2010). Comparative effectiveness: Federal government's push for more data to benefit supply chain. *Materials Management in Health Care*, 19(4), 22-25.
- Bendavid, Y., Boeck, H., & Philippe, R. (2010). Redesigning the replenishment process of medical supplies in hospitals with RFID. *Business Process Management Journal*, 16(6), 991-1013.
- Brown, S. B. (2007). Most wired survey: Innovators plug in systems to drive supply chain efficiency. *Materials Management in Health Care*, 16(8), 33.
- Brown, S. B. (2008). Most wired hospitals stay the supply chain course. *Materials Management in Health Care*, 17(8), 21.
- Burns, L. R., Lee, J. A. (2008). Hospital purchasing alliances: Utilization, services, and performance. *Health Care Management Review*, 33(3), 203.
- Carmody, M. T. (2008). Adopting supply chain best practices from across the industry. *Healthcare Financial Management*, 61(13), 72.
- Chandra, C. et al. (2004). Managing health care supply chain: Trends, issues, and solutions from a logistics perspective. University of Michigan-Dearborn.
- Christian, L. R., Handfield, R., & Dooley, K. J. (2010). Forces, trends, and decisions in pharmaceutical supply chain management. *International Journal of Physical Distribution & Logistics Management*, 41(6), 601-623.

- Coleman, J. J. (2012). The supply chain of medicinal controlled substances: Addressing the Achilles heel of drug diversion. *Journal of Pain & Palliative Care Pharmacotherapy*, 26(3), 233-250.
- DeJohn, P. (2008). A small ASC's automated supply chain. *OR Manager*, 24(11), 26.
- Dobrzykowski, D., Deilami, V. S., Hong, P., & Kim, S. (2014). A structured analysis of operations and supply chain management research in healthcare (1982 - 2011). *International Journal of Production Economics*, 147(2), 514-530.
- Dooley, L. (2009). Make logistics the focus of your supply chain plan. *Materials Management in Health Care*, 18(5), 26.
- Duffy, Mike (2009). Is supply chain cure for the rising healthcare cost? *Supply Chain Management Review*, September, 28-35.
- Elmuti, D., Houry, G., Omran, O., & Abou-Zaid, A. S. (2013). Challenges and opportunities of health care supply chain management in the United States. *Health Marketing Quarterly*, 30(2), 128-143.
- Eric, W. F., Hughes, J. A. (2007). A collaborative product commerce approach to value-based health plan purchasing. *Supply Chain Management: An International Journal*, 12(1), 32-41.
- Ford, E. W., Scanlon, D. P. (2007). Promise and problems with supply chain management approaches to health care purchasing. *Health Care Management Review*, 32(3), 192.
- Jarousse, L. A. (2012). Data standards in the supply chain. *United States: Health Forum, Inc.*
- Johnson, B. (2015). Intermountain Healthcare Supply Chain. The 2015 Healthcare Supply Chain Conference, New Orleans, Feb 21-25.

- Kailanz, P. (2009). Health cares' six money-wasting problems, August 10. CNN Money.com.
- Kabbaj W and Van Peteghen, D. (2015). Reinventing the cold chain in a high-stakes market. *Pharmaceutical Technology*, 39(2).
- Kane D. (2007). Supply chain. Strategies emerge to bring supply costs down. *Hospitals & Health Networks*, 81(8), 32.
- Kathleen, E.M., Paul, H., & Willis, S. B. (2005). The ailing healthcare supply chain: A prescription for change. *Journal of Supply Chain Management*, 41(1), 4-17.
- Kerry, D. S., Allen, E. S. (2005). Internal supply chain performance measurement: A health care continuous improvement implementation. *International Journal of Health Care Quality Assurance*, 18(7), 533-542.
- Kumar, S., DeGroot, R. A., & Choe, D. (2008). Rx for smart hospital purchasing decisions: The impact of package design within US hospital supply chain. *International Journal of Physical Distribution & Logistics Management*, 38(8), 601-615.
- Kumar, S., Dieveney, E., & Dieveney, A. (2009). Reverse logistic process control measures for the pharmaceutical industry supply chain. *International Journal of Productivity and Performance Management*, 58(2), 188-204.
- Kumar, S., Karl, C., & Honkanen, E. (2009). Developing a global health diplomacy supply chain- A viable option for the United States to curb extremism. *Journal of Health Communication: International Perspectives*, 14(7), 674-689.
- Kumar, S., Swanson, E., & Tran, T. (2009). RFID in the healthcare supply chain: usage and application. *International Journal of Health Care Quality Assurance*, 22(1), 67-81

- Kwon, Ik-Whan & Suh, T. (2004). Factors Affecting the Level of Trust and Commitment in Supply Chain Management. *Journal of Supply Chain Management*, 40(2), 4-14.
- Kwon, Ik-Whan & Hong, S. (2011). Health care supply chain management in the United States: New paradigm for roles of distributors. *International Journal of Health Management and Information*, 2(2), 73-82.
- Lee, C., Kwon, Ik-Whan & Severance, D. (2007). Relationship between Supply Chain Performance and Degree of Linkage among Supplier, Internal Integration, and Customer. *Supply Chain Management: An International Journal*, 12(6), 444-452.
- Lisa, M. E., Wendy L. T., & Corey, B. (2004). Understanding and managing the services supply chain. *Journal of Supply Chain Management*, 40(3), 17-32.
- Lo, W. (2009). A practical framework of industry-university for supply chain management of health-care industry with using distance health-care ICT platform. *International Journal of Electronic Business Management*, 7(4), 241-247.
- Nachtmann, H., Pohl, E. A. (2009). The State of Healthcare logistics: cost and quality improvement opportunities. *Association for Healthcare Resource & Materials Management*, 1-32.
- Parkinson, R. C. (2014). Tying supply chain costs to patient care. *Healthcare Financial Management. Journal of the Healthcare Financial Management Association*, 68(5), 42.
- Partidas, B. (2015). Closer Relationships lead to superior planning. *Supply Chain Management Review*, (May/June): 70-72.
- Pazirandeh, A. (2011). Sourcing in global health supply chains for developing countries. *International Journal of Physical Distribution & Logistics Management*, 41(4), 364-384.

- Revere, L., Black, K., & Zalila, R. (2010). RFIDs can improve the patient care supply chain. *Hospital Topics*, 88(1), 26-31.
- Sengupta, K., Heiser, D. R., & Cook, L. S. (2006). Manufacturing and service supply chain performance: A comparative analysis. *Journal of Supply Chain Management*, 42(4), 4-15.
- Smith, A. D., & Flanegin, F. R. (2004). E-procurement and automatic identification enhancing supply chain management in the healthcare industry. *Int. J. Electronic Healthcare*, 1(2), 176-198.
- Thomas, S. (2008). Advertised sustainability practices among suppliers to a university hospital operating room. *Journal of Hospital Marketing & Public Relations*, 18(2), 135-148.
- UPS (2015). Embracing the risk: it is the time to capitalize the untapped opportunities. The seventh annual pain in the (supply) chain survey.
- Vries J.D., Huijsman R. (2011). Supply chain management in health services : an overview. *Supply Chain Management : An International Journal*, 16(3), 159-165.
- Yokl, R. T. (2011). The future of supply chain expense management. *Healthcare Financial Management: Journal of the Healthcare Financial Management Association*, 65(3), 1-3.

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.