MIT Center for Transportation and Logistics

Transforming the Global Health Care Supply Chain

July 28, 2006

This introductory report was prepared by Dr. Mahender Singh, Director of the Supply Chain 2020 Project at the MIT Center for Transportation and Logistics (CTL), with assistance and input from James B. Rice, Jr. and David Riquier also of CTL. This represents a brief synthesis of input received by a number of leading practitioners across the health care industry. Please contact Jim Rice (617.258.8584 or e-mail jrice@mit.edu) if you have any questions or if you would like to discuss this proposal.

1 Introduction

A group of researchers at MIT Center for Transportation and Logistics solicited input from leading practitioners across the health care industry, interested in learning more about the dynamics and challenges within the health care supply chain. In particular, the researchers inquired about the way the respondents perceived the structure of the industry, as well as the current set of issues. With the intent of identifying some common themes that cut across the various types of health care supply chains, the researchers prepared this document as a synthesis of the input along with some preliminary observations. Hopefully this provides adequate content for subsequent and deeper discussion among industry leaders.

To serve that purpose, the researchers will convene leaders on August 29, 2006 for preliminary discussion on this subject. Industry leaders and practitioners are welcome. For additional information, please contact David Riquier at riquier@mit.edu

2 Current State of Health Care Supply Chains

The performance of healthcare supply chains today leaves a lot to be desired. Ironically, the healthcare supply chain is itself extremely sick and needs immediate attention. A majority of the problems observed in the healthcare sector are results of the complex interaction between numerous very powerful stakeholders that have divergent objectives and scope. For example, in the United Sates alone, the healthcare supply chain involves more than 650,000 different organizations including manufacturers, distributors, carriers, GPOs, hospitals, users and patients. Additionally, the peculiar nature of the medical profession e.g., the unavoidable entanglement of products and services that are interwoven during the course of treatment, an uncertain demand pattern due to unique treatment for each patient, and a lack of standardization among the providers, has made the situation worse. A sample list of drivers, factors, issues and challenges faced by the healthcare industry are highlighted in figure 1.

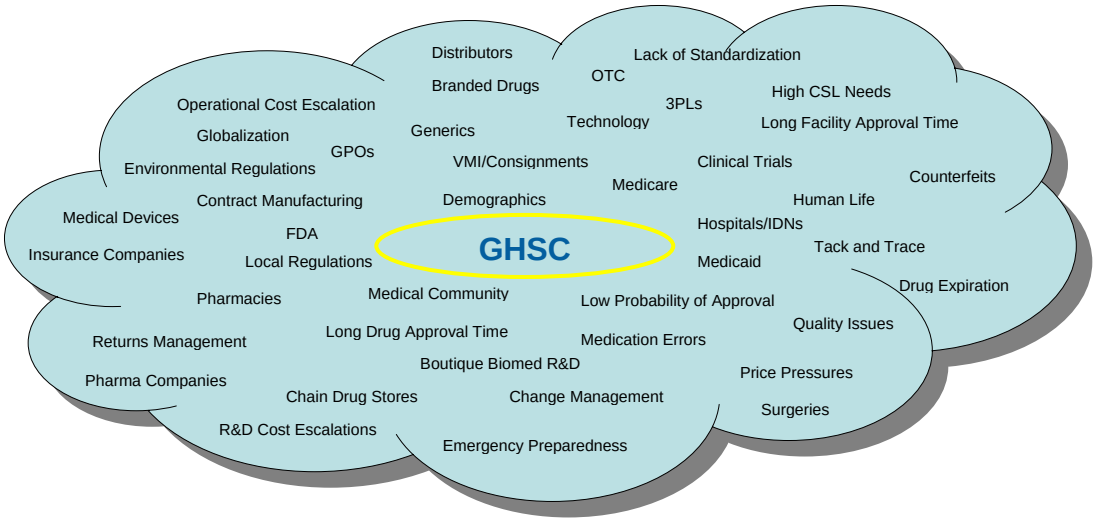

Figure 1: The Healthcare Puzzle

Due to the convoluted interactions between a very diverse set of stakeholders, the healthcare sector is unique in many ways and it is difficult to compare it with any other sector or industry. But more importantly, a failure in this sector has life and death implications that can't be adequately compensated in monetary terms. Consequently, efficiency and cost concerns are trumped, often unjustifiably, by the diktat for superior patient care.

This tendency is, however, counterproductive as efficiency and cost controls are not necessarily detrimental to patient care. In fact, if applied judiciously, efficient processes can help improve patient care. This situation is similar to the previously long held belief in various industries that low cost and high quality are contradictory values, suggesting that a company must make a strategic choice between the two. Of late, companies have come to realize that there is a very strong positive correlation between cost and quality. Now, companies avoid unnecessary costs by focusing on quality improvements. In a similar manner, the healthcare sector may be able to improve its patient care performance by focusing on efficiency and cost reduction objectives.

The complexity of the healthcare sector becomes apparent if we try to estimate its clockspeed[1]. Overtime, the healthcare sector has evolved into an intricate enterprise, in a way reflecting the complex nature of the human body itself. Latest treatments for various

[1] Charlie Fine, CLOCKSPEED, 1998.

diseases are developed by combining innovative technologies as well as centuries old conventional wisdom. Innovations in pharmaceuticals and medical devices are primarily driven by cutting edge computer technologies among others. And yet, in many other areas, the healthcare sector remains unchanged and far behind the developments in comparable industries. Rationalizing such a diverse environment is a serious challenge as different areas of the healthcare sector have drastically different clockspeeds. As a result, it is not easy to evaluate and analyze the overall performance in an objective manner and streamline performance.

3 Role of Healthcare Supply Chains

Although supply costs do not constitute a major portion of the direct overall healthcare bill, the importance of supply chain management can't be overemphasized. An effective supply chain will not only bring the direct cost of providing customer care down, but it will also offer a number of other important benefits, such as help ensure high availability, reduce counterfeits, increase responsiveness, increase resilience, increase choices, reduce waste, increase drug utilization[2], and play a role in reducing medication errors (an efficient supply system will relieve the caregivers of the duties and stress associated with this function allowing them to focus on what they do best i.e. patient care).

Unfortunately, in most organizations in the healthcare sector, the supply chain is treated purely as a role player that has no place in the overall strategy of the organization. Consequently, supply chain related decisions are tactical at best and focus primarily on supporting or delivering organizational performance objectives. On the other hand, if the role of supply chain is elevated and incorporated in the overall strategy, then it can be used to enhance the overall performance by improving the effectiveness of available assets and resources. At the same time, balancing the needs of the clinical staff that are at the core of the healthcare sector with the needs of supply chain function is not an easy task. This task has become all the more challenging in recent years due to the rapid changes and innovations in the medical field as well as the supply chain domain. Therefore, to ensure that supply chain issues won't be overlooked and to leverage the

[2] A formal metric to capture the percentage of drugs actually consumed by patients and not destroyed should be an important measure of the effectiveness of the healthcare sector in the final analysis and a key driver of performance improvement initiatives.

recent developments in this field, it is imperative for organizations to make supply chain an integral part of their overall strategy.

4 Framing the Business Opportunity

At present, the healthcare industry is undergoing a rapid transformation on multiple fronts. As a result, the whole space seems to be in a state of constant flux and shrouded in uncertainty. Due to the prevailing confusion, it is not unusual to treat current trends and predictable events as uncertainties too and miss out on precious opportunities in the bargain. Thus, a better understanding of the overall environment will help decision makers discern between hard constraints, uncertainties, and breakthrough opportunities offered by the new environment. From a strategy perspective, this is an opportune time to develop competencies that will guide this sector over the next few years.

4.1 Characterizing Healthcare Domain

An inevitable problem faced by a broad research initiative in the healthcare sector is the basic definition the healthcare sector itself. Naturally, without a clear cut definition, it is hard to define scope, identify components, key players etc. that are essential for planning and conducting research. In general healthcare means different things to different people, for example it is not unusual to expand its scope to include nutritional products as they can be argued to prevent illness and hence relevant to the discussion.

The relationships shared by various players in the healthcare sector are very unique and complex. Each stakeholder is consumed by a very different set of concerns and driven by often divergent objectives and problems. As a result, there is a lack of appreciation of each others situation and mutual understanding which encourages short term decisions. Confused by the presence of multiple layers of seemingly unrelated activities and feedback delays, these players impose artificial constraints on each other, unintended consequences of myopic thinking. Unless structural changes are made to basic architecture of the overall healthcare enterprise, it will be almost impossible for constituents to think globally and collaborate across the sector to improve the effectiveness of the value chain.

Another critical aspect of the healthcare sector is the ambiguity vis-à-vis its end customer and the complexity of the demand creation process. Due to the presence of numerous regulations, multiple parties with vested interests, and a high level of expertise required to make these decision, the ultimate purchasing decision is not in the hand of one party. In this case, the end consumer of the product, namely the patient, has a limited say in the decision making process unlike any other industry. The final decision involves a series of complicated steps that take into account various interests and constraints which effectively separates the end consumer and the end customer into two independent entities.

The healthcare sector presents additional unique challenges since products and services have to be highly customized to perfectly match patient needs in most cases. Unlike other industries, the desired and preferred degree of customization is not under the direct control of the customer (patient.) It is thus difficult to sway the customers to select a particular configuration over others, otherwise referred to as demand shaping. This peculiar feature further compounds the highly unpredictable demand patterns making it almost impossible to plan efficient supply of products and services in this environment.

4.2 Characterizing Healthcare Supply Chains

Typically, a supply chain deals with three types of flows namely, physical product flow, information flow, and financial flow. In most cases, the supply chain design is primarily driven by the physical product flow requirements and associated constraints and opportunities. The healthcare sector is different in that sense as financial and information flows play a critical role in key supply chain design decisions. For example, the facility location decisions in the pharmaceutical industry are heavily influenced by the tax incentives offered by various countries and regions, such as Ireland. The prevalence of charge-backs has a dramatic effect on the product flow decisions and its physical ownership at various stages of the supply chain. In some segments of the healthcare sector, it is important for the manufacturers to be in direct contact with the clinician due to various reasons, such as when manufacturer possess critical product knowledge that is necessary for optimal use of the product. As a result, a manufacturer sells directly to the providers and avoids distributors, which in turn affects the structure of the underlying

supply chain. The restrictions imposed by HIPPA also limit the ability of various partners to share information freely and may affect the design and management of the supply chain.

To obtain a better understanding of the ground realities and develop a comprehensive description of the healthcare sector from a supply chain point of view, we carried out an informal survey of a few key stakeholders in the healthcare sector. We sent a short questionnaire to a select group of companies involved in various aspects of the healthcare sector to obtain their respective opinions. As expected, the responses portrayed the healthcare sector in a variety of ways reflecting respondent's unique perspective. Based on the survey responses and a quick review of the extant literature, we have developed a framework to map the flow of demand for various products and service in the healthcare sector as shown in Figure 2.

This description attempts to overlay products and services with key players in the healthcare sector for various supply needs triggered by the complex demand patterns. These players are instrumental in shaping the principle interactions and wield enough power to influence the supply chain design. As shown in figure 2, there are six key areas within the healthcare sector where supply chains play a critical role, namely

- Health Aids
- Pharmaceuticals
- Medical Devices
- Medical-Surgical supplies
- Radiology and Lab supplies
- Capital Equipment

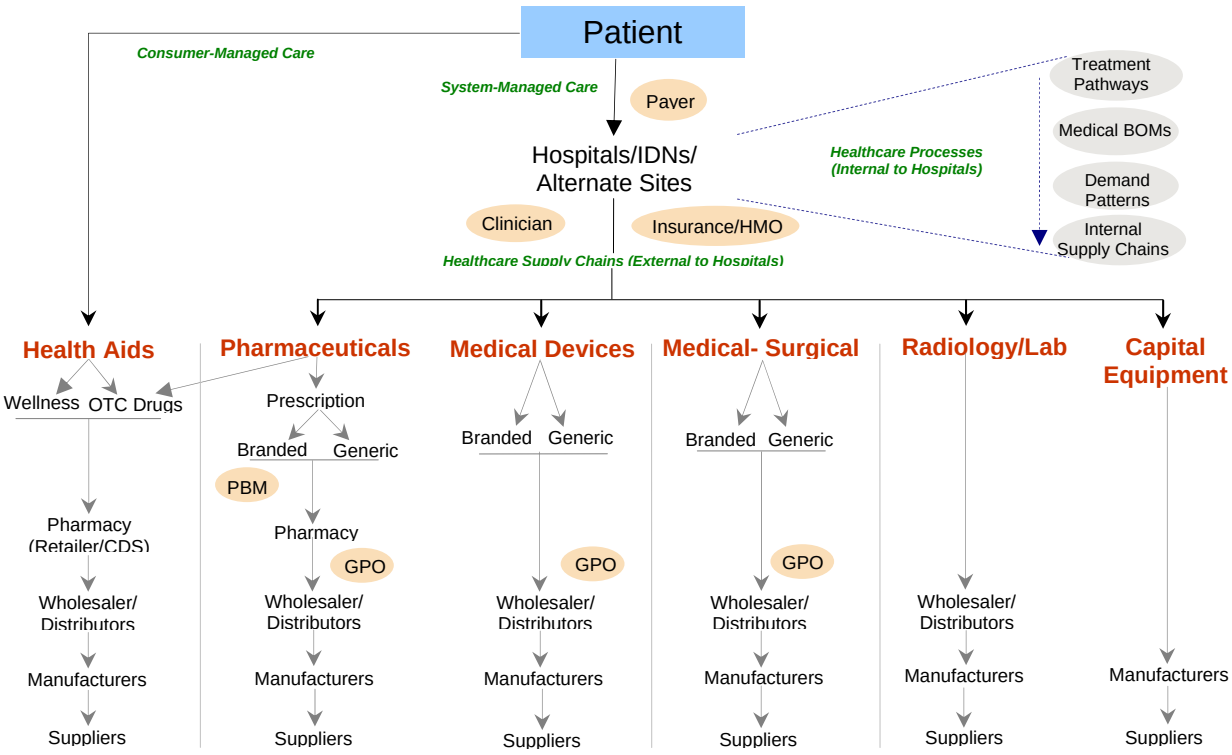

Figure 2: Demand Flow in the Healthcare Sector

4.3 Key Supply Chain Challenges

While the demand flow for health care supply chains can possibly be segmented into six (6) distinct flows, they are not unique in that there are some common elements/parties in several of the flows. Understandably, each distinct demand flow will likely entail a distinct set of issues and challenges. Similarly, the issues may be distinct for each but not unique. One may therefore find some value in considering the common elements of these chains when analyzing the various sets of issues that affect each chain.

An important analysis therefore entails delving deeper into each supply chain identified above to note their unique challenges and define the scope. It should be pointed out that, in addition to the challenges faced by the supply chains due to the involvement of multiple parties, the activities which are purely inside the hospital domain are equally complex. Specifically, the number of steps involved in moving inventory from the central warehouse of a hospital to its point of use involves more steps and hand-offs than the rest of the supply chain itself! The same can be said of the ordering process as it involves a variety of personnel and skills that place an order. In short, every single aspect of the

healthcare supply chain is a source of problem. It can also be argued that since there are problems close to the point of use, it is not a surprise that compounding issues come together as problems reverberate through the system and make it almost impossible to manage.

At this point in time, this synthesis offers a preliminary brief bullet listing of the issues that may be associated with two of the six chains. These may provide some useful insights when compared, and will likely provide other useful insights when compared across all six issue sets when they are fully fleshed out in subsequent work.

a. Pharmaceutical Supply Chain

A preliminary set of unique key issues associated with this supply chain include:

- Multiple categories of medicines/drugs and a variety of end objectives – biotech products, clinical study etc
- Statutory requirements for track and trace capabilities (e-Pedigree)
- Highly regulated environment requiring extensive data collection and information exchange to ensure chain of custody and monitoring of various controls[3]
- Management of product expiry – for safety, error prevention, reassignment, safe disposal
- Cold chain required for temperature controlled product movement
- Dynamic business environment (new channels, regulations, global opportunities)
- Globalization and outsourcing
- Complex demand patterns
    - ◊ Predictable pattern for mid-life cycle products
    - ◊ Highly unpredictable for new introductions
    - ◊ Low volume high mix spread over a large area needing quick response for Clinical trials
    - ◊ Sudden changes due to introduction of competitive products (new therapies or me-too drugs)
    - ◊ High value density products (specially the branded drugs)

[3] It is possible that information needs may become the bottleneck and determine the structure of supply chain as supply chains deal with the movement of product/information/money.

- ◊ High value low volume products in general
- ◊ Controlled products (prescription drugs – branded or generics) requiring a high level of constant management

- o Varying regulations across global markets
- o Increasing use of outsourcing and off-shoring opportunities resulting in new dynamics due to the reasons listed so far and longer and risky supply chains
- o Discovering new markets that will present new unique challenges
  - ◊ New environmental requirements and idiosyncrasies of new markets such as China, Africa
  - ◊ Possible need for low cost supply chains
- o Product life cycle management (especially the transition from patent to off-patent)
- o Drug recall management
- o Elimination of counterfeits
- o Deal with Gaming (hockey sticks are prevalent due to quarterly targets)
- o Deal with data accuracy and related problems
- o Highly ineffficienct order management
- o Lack of process standardization in purchasing, inventory management etc
- o Lack of collaboration across players

b. *Medical Device Supply Chain*

A preliminary set of unique key issues associated with this supply chain include:

- o Prevalence of consignments
- o Availability of complete information on product specifications
- o Poor operation/surgery schedule management and ordering practices
- o Myopic or local decision making process to address issues that have significant inter-company impact
- o Highly specialized nature of the product requiring close interaction between provider and supplier
- o Poor procurement practices and capabilities on part of ordering group (mainly medical professionals)
- o Limited shelf life

- High returns
- Very fragmented demand patterns
- Globalization and outsourcing

Note: Issues surrounding Health Aid, Radiology/Lab, and Capital Equipment will be developed shortly.

5 Summary and Next Steps

Cleary more work is required to fully understand the dynamics within and across the different health care supply chains, as well as the opportunities for improvement and the challenges faced when attempting to achieve improvements. This synthesis hopefully presents a useful early step towards understanding those dynamics and identifying those benefits.

Comments and input are welcome – and needed. In the spirit of research, this will be a process of discovery which can be accelerated with active involvement and leadership from industry. Hopefully this will be achieved in a collaborative effort among industry and academia to find ways to improve the health care supply chain, and in the process extend valuable health care benefits to a broader community in sore need of broad health care.