

Inside the Healthcare Supply Chain: How Owners and Operators Create a Global Network for Medical Products

Introduction

The healthcare supply chain serves as the backbone for global access to medical supplies, and in turn, patient access to medical care and services. However, despite the healthcare supply chain serving such a critical role, it remains a mystery to many people. From research and development to raw material production and acquisition, through manufacturing and distribution, and eventually to the end user, the healthcare supply chain consists of intricate processes with various vendors, moving parts, and obstacles that can make it hard to decipher the full picture.

The purpose of this paper is to make this full picture clearer by explaining:

1. The products within the scope of the healthcare supply chain;
2. The components of the healthcare supply chain and their functions; and
3. Obstacles that can impact the supply chain

Since 2020, the world has been combatting the COVID-19 pandemic, which has created a multitude of problems for supply chain owners and operators. However, the pandemic has also shined light on the global healthcare supply chain. Now, more than ever, every nation across the globe is reviewing and analyzing their own supply chains, both in comparison with the global supply chain and to assess dependencies to ensure they can mitigate against future major disruptions.

Defining the Scope of the Healthcare Supply Chain

Healthcare Ready defines¹ the healthcare supply chain as “an extensive network of systems, components, and processes that collectively work to ensure medicines and other healthcare supplies are manufactured, distributed, and provided to patients.”

This network is defined by many different supply chains that can be grouped by the type of products they develop, including:

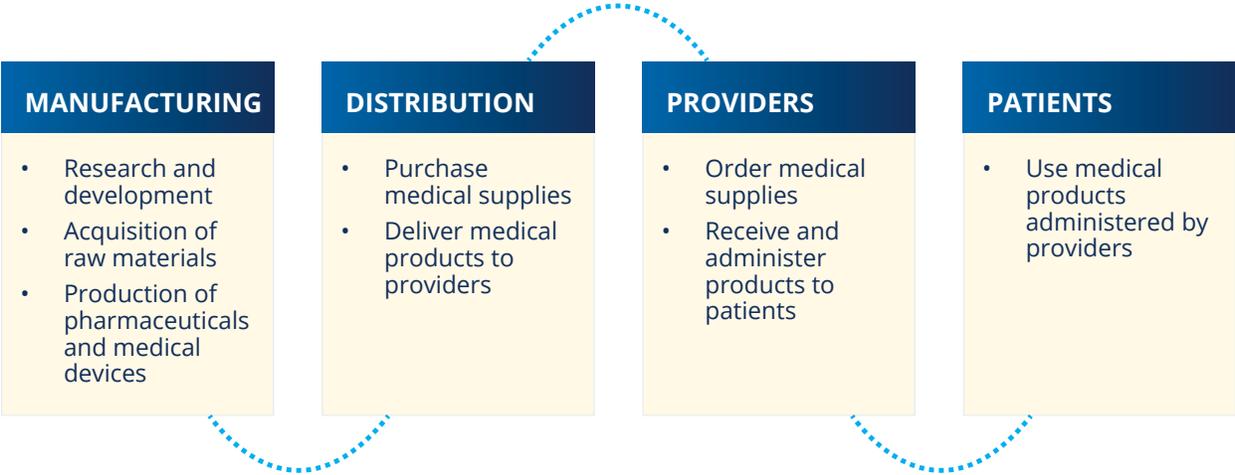
- Pharmaceuticals (medications) such as antibiotics, vaccines, and chronic disease treatments
- Non-pharmaceutical products (medical devices and medical-surgical products) such as pacemakers, personal protective equipment (PPE), bandages, and equipment like wheelchairs
- Medical gases such as oxygen, carbon dioxide, and helium

The overarching components of the supply chain are similar across these product types, but the companies and processes involved in producing and delivering products often differ. This paper focuses primarily on the pharmaceutical and medical device supply chains and does not specifically address medical gases.

Components of the Healthcare Supply Chain

The healthcare supply chain encompasses the entire lifespan of a product; starting from an idea (i.e., research and development) and continuing all the way through final delivery or administration of the product to a patient. It extends across the globe from manufacturers, to distributors, to healthcare providers, and finally to end users.

Figure 1. A simple model of the healthcare supply chain



Manufacturing

Research and Development

Most product manufacturing begins with research and development, and healthcare product manufacturing is no exception. The fundamentals of research and development are generally the same across the pharmaceutical, medical-surgical, and medical devices supply chains, but differ in their methods and complexity. However, they all have the same goal in mind – to create a more effective product for the end-user.

The definition of research and development² is “two intimately related processes by which new products and new forms of old products are brought into being through technological innovation.” In healthcare, research and development is essential³ to the discovery of new drugs, treatments, and medical devices, and involves the clinical trials, laboratory testing and patenting. Funding⁴ for research and development can come from a variety of avenues, but some of the most common funding opportunities come from government agencies, hospitals and universities, philanthropic organizations, and pharmaceutical companies.

Research and development provides various benefits – the main being providing the public with more effective drugs and devices. For example, since 2020 the healthcare sector has been combatting the COVID-19 pandemic – to do that, new vaccines, therapeutic treatments, and medical devices have been and continue to be innovated. In addition, continuous research helps create variation in the products and approaches available for prevention or treatment of diseases. For example, ongoing research into vaccine platforms⁵ ensured there was more than one strategy to utilize in developing the COVID-19 vaccine – while more traditional vaccine platforms were not viable in clinical trials, others, like messenger RNA (mRNA) platforms, proved incredibly effective in protecting against the coronavirus. If existing research into the mRNA platform was not as robust, it is possible that the development of some of the leading COVID-19 vaccines would have been delayed, or not occurred at all.

Acquisition of Raw Materials and Starting Materials

Following research and development, manufacturers must acquire inputs used to manufacture products. The differences between the pharmaceutical, medical-surgical, and medical device supply chains become even clearer at this step, since different product types require different materials. The raw materials needed in the pharmaceutical supply chain can be divided into three categories⁶: active pharmaceutical ingredients, inactive ingredients, and packaging. Active pharmaceutical ingredients (APIs) are the part of medications that produce the intended⁷ health effects. Inactive ingredients, or excipients, help deliver the active ingredients to a patient's system. Finally, packaging is the paper, plastic, and other materials needed to safely package products.

The raw materials and inputs needed to produce medical devices and medical-surgical equipment differ depending on the product. For example, PPE like gowns or a respirator requires inputs such as plastics and fabric. Durable medical equipment like a walker or wheelchair usually requires a combination of plastics, metals, and rubber. More complicated medical devices, such as pacemakers, require these materials as well as more advanced inputs such as semiconductor chips. Inputs like semiconductor chips are often manufactured in other supply chains and purchased for use by healthcare product manufacturers.

Production

Once raw materials are acquired, manufacturers are able to begin production. Many pharmaceutical and medical surgical companies maintain manufacturing plants across the globe. Manufacturers may maintain a global manufacturing footprint due to cost considerations, proximity to end-users (many international companies produce their final products near the markets in which they are sold), and to build redundancy in case of an issue in one geographic location.

Especially in recent years, the global length of supply chains – in which raw materials may originate in one part of the world, with production and/or delivery elsewhere – has raised questions about their security. For example, before the COVID-19 pandemic, the US relied heavily on foreign sources for medical-surgical supplies such as nitrile gloves and masks. Since the onset of the COVID-19 pandemic, the US government has developed policies aimed at increasing the concentration of production of critical supplies and drugs in the US to ensure that the US is not totally dependent on singular or foreign sources.

Manufacturing Highlights

- Research and development are essential to the discovery of new drugs, treatments, and medical devices through clinical trials, laboratory testing, and patenting.
- Manufacturers will then acquire raw materials for production of approved products and drugs.
- Manufacturers produce those products and drugs at their facilities, which may be located across the globe. Then those products are packaged for distribution.

Distribution

Purchasing Medical Products

In the United States, some healthcare facilities purchase products directly from manufacturers. More frequently though, healthcare facilities and providers often rely on distributors⁸ to purchase products from manufacturers in bulk. From there, distributors store the product and distribute supplies to healthcare facilities based on the customers' individual orders. Distributors purchasing medical products are an essential part of the healthcare supply chain because many healthcare facilities and providers are unable to manage the logistics of direct purchasing at a grand and long-term scale. Distributors are able to provide⁹ ample stockpiling space, product rotation, and data analytics to support their customer's needs.

Delivering Medical Products

When medical products and drugs are moving through their normal distribution channels, products are getting to where they are needed the most. As manufacturers sell directly to major distributors, those medical products and drugs are going directly to the hospitals, health systems, pharmacies, primary care physicians, and other provider types. Ensuring ample supply at these facilities via existing distribution channels is critical because during health emergencies, much like COVID-19, hospitals, pharmacies, and primary care physicians are where patients will first go to access healthcare. When these facilities are inadequately stocked with supplies, or experience spot shortages, then the delivery of healthcare and services will be disrupted, ultimately impacting patient's health.

In the United States, distributors sell 92% of all prescription drugs¹⁰, making them experts in delivering products to where they are needed. During times of crisis, this expertise must be leveraged to understand 1) where product is critically needed and 2) how disruptions to product availability can be mitigated to ensure providers have ample supply to continue delivering healthcare and services.

Third Party Logistics Providers

In addition to maintaining their own fleets of trucks and delivery drivers, distributors use third party logistics providers (3PLs) as intermediaries¹¹ in the supply chain process by providing local transport and delivery of critical products and drugs. Use of 3PLs can minimize costs for distributors and allow for local companies who are familiar with the communities to distribute medicines and products with greater efficiency. It also enables more frequent deliveries from regional or local distribution centers. The use of 3PLs is critical when it comes to the "last mile," which is the final movement of medicines and products from facilities (e.g., warehouse, distribution center) to providers, and ultimately patients.

Distribution Highlights

- Distributors purchase medical-surgical supplies, medical devices, and pharmaceuticals in bulk and deliver those products to providers and healthcare facilities.
- They will also repackage, relabel, ensure special handling, manage temperature, and maintain other conditions for safe transportation of medicines and products.
- GPOs create relationships between healthcare providers and suppliers by negotiating prices of medical-surgical Distributors often use 3PLs as local transport to help deliver medical products to communities.

Healthcare Providers and Patients

Receiving and Administering Medical Products

The final components of the supply chain are provider and the patients they serve. Hospitals, pharmacies, dialysis centers, urgent care centers, assisted living, and long-term care facilities are all examples of providers that receive medical-surgical devices and drug products from healthcare distributors and manufacturers. Once they have received those products and medicines, they are able to use and prescribe them to patients.¹² The relationship between suppliers, providers, and patients is extremely important and codependent. Without demand from patients, providers are not able to relay accurate demand forecasts back to suppliers. Without this data, manufacturers are not accurately informed on the need for production numbers, or research needs for further innovation. Conversely, without the steady supply of medicines and medical products from manufacturers, providers would not have sufficient supplies to meet demands from their patients.

Health Equity and Supply Chain

Because medical product availability is vital to maintaining individuals' health, there is a clear connection between supply chain and community health and well-being. Furthermore, some provider types are more likely to serve medically fragile or vulnerable populations. Ensuring those facilities can source and maintain access to quality medical supplies is critical to providing care to those populations and fostering health equity. For example, community health centers (CHCs) are the primary source of medical care for more than 30 million patients in the US.¹³ 91% of CHC patients are low-income, two-thirds of patients are minorities, and 42% of health centers are in rural communities. Similarly, around nine of every ten US resident¹⁴ live within five miles of a pharmacy. Many manufacturers and distributors recognize the importance of these facility types in serving their communities and work closely with them to deliver them the products they need.

Provider and Patient Highlights

- Healthcare providers and patients are the last piece of the puzzle for the healthcare supply chain.
- Providers submit orders to distributors and then receive medicines and medical products from them. The providers are then able to use the medical products on patients or prescribe medicines to them.
- Because providers are working with patients on a day-to-day basis, they can identify shortages in supplies and critical drugs due to potentially increased usage rates.
- Patients are able to influence the demand of certain products and medicines.

Group Purchasing Organizations

Group Purchasing Organizations (GPOs) have become a major part of the healthcare supply chain in recent years. While they do not directly fill any of the core supply chain roles (manufacturers, distributors, and providers) GPOs maintain relationships across those stakeholders.¹⁵ A GPO's membership consists of health systems and hospitals. They pool together the purchasing power of those hospitals and health systems to negotiate lower prices with supplies, manufacturers, and distributors.¹⁶ They do this by building a relationship between their health systems and suppliers and ensuring that both ends benefit while emphasizing patient care. Additionally, GPOs aim to make purchasing more efficient as healthcare organizations can centrally manage purchasing and standardize products used throughout the organization. Because GPOs work closely with distributors and manufacturers, they often have insight on critical materials and products in the healthcare supply chain space and can forecast possible shortages to healthcare providers.

Obstacles that Impact the Healthcare Supply Chain

There are many factors that can compromise the functionality and resiliency of all parts of the supply chain. Among those factors are notice and no-notice emergency events.¹⁷ Theoretically, notice events, which are events that are known about in advance of their occurrence, afford the supply chain the opportunity to build in redundancies to mitigate expected impacts because they allow for preparation. Notice events can be either natural (like hurricanes) or man-made (like worker strikes). Impacts across notice and no-notice events are largely similar and can range from worker shortages, to damage to infrastructure (e.g., facilities, roads, transportation, etc.), to shortages of input materials.

No-notice events are those that occur with little or no forewarning. A recent example of a no-notice event that has caused widespread and lingering impacts on the global supply chain is the COVID-19 pandemic.¹⁸ Country-wide shutdowns around the world, specifically in China, restricted the workforce in country and compromised the delivery of input materials for critical manufacturing. Months of sustained workforce shortages in manufacturing and logistics caused bottlenecks in the supply chain, fostering longer lead times and sustained shortages for end users.

The invasion of Ukraine is an example of a man-made disaster that can be considered both a notice and no-notice event. Specifically, the extraction, processing, and transport of oil and natural gas from Russia has contributed to rising gas prices globally and downstream impacts to several industries. This has caused lasting implications for the manufacturing of products reliant on plastics.

There are many other obstacles that can cause disruptions throughout the healthcare supply chain, but it is important to note that public and private stakeholders are working together and separately, every day, to ensure that there are processes in place to mitigate those disruptions.¹⁹

Endnotes

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- ¹⁸ Dadmun, Ryan. "What is the Healthcare Supply Chain?" Healthcare Ready. 2022. <https://healthcareready.org/what-is-the-healthcare-supply-chain/>.
- ¹⁹ For more information on how the components of the healthcare supply chain plan for and respond to disasters, see Healthcare Ready's Factsheet on the Disaster Healthcare Supply Chain. https://healthcareready.org/wp-content/uploads/2020/02/HCR-FACTSHEET_disaster-supplychain_V2_021820.pdf

Healthcare Ready leverages relationships with government, nonprofit, and medical supply chains to build and enhance the resiliency of communities before, during, and after disasters. Learn more at HealthcareReady.org.

