

Pharma Supply Chain Resilience: Lessons from the COVID-19 Pandemic

- Prof Arun Sehgal, Visiting Faculty, JBIMS, University of Mumbai, Chairman and Managing Director Chempro Pharma Private Limited



Indeed, the COVID-19 pandemic has seen unprecedented disruptions across an entire range of industry sectors. The most severely impacted sector was pharmaceuticals, where globally spreading supply chains were severely tested. Indeed, the pandemic opened the lid on vulnerability in these supply chains, making essential medicines unavailable, besides letting the development and distribution of vaccines go awry. This article will explore lessons from the COVID-19 pandemic. This essay focuses on how it disrupted pharmaceutical supply chains, but mainly shows strategies that may be employed to build an even more resilient system in the future.

Impact of COVID-19 on Global Pharmaceutical Supply Chains

The worldwide pharmaceuticals business essentially operates through a convoluted and highly connected supply chain of suppliers, producers, logistics operators, and regulatory authorities. Many events contributed to the unprecedented disruption inflicted upon this intricate system by the COVID-19 pandemic, including lockdowns, transportation issues, export bans, and increased need for essential medicines.

a) Manufacturing Disruptions

COVID-19 significantly impacted the worldwide pharmaceutical manufacturing capacity. China and India, being two of the world's major API-producing countries, saw factory shutdowns and stoppages in their early stages of the pandemic. In China, where the pandemic had its origin, there was extensive shutdown of manufacturing hubs across the nation with total lockdown. India is famously known as the "pharmacy of the world," but lockdowns brought it to a very low point in API production. The reduced availability of APIs did not only trigger a knock-on effect downstream in all pharmaceutical formulation plants but also exaggerated the shortages of drugs.

b) Supply Shortages and Increased Demand

All this coupled together with a sudden unprecedented leap of demand for categories of drugs used in respiratory diseases, antivirals, and sedatives for use in critical care, made overnight hydroxychloroquine, remdesivir, and PPE in high demand. This rapid increase in demand was higher than what supply chains had to offer, resulting in shortfalls in most countries. For instance, at the height of the pandemic, ventilators and oxygen

cylinders became critically inadequate, especially for developing countries.

c) Export Bans and Trade Interruptions

Export restrictions on essential medicines and other medical supplies were enforced by governments all over the world as they competed frantically for a slice of the pie to meet the resource needs of their respective citizens. This protectionist behaviour created ripples throughout the global supply chain, prevented countries from receiving needed drugs and APIs, and effectively created shortages for regional areas that relied heavily on imports for pharmaceutical supplies. For instance, India banned exportation of hydroxychloroquine temporarily, and the European Union capped the export of PPE. Such curbs in the flow of material created a worsened condition of shortages of regions heavily dependent on imports.

d) Logistics and Transportation Bottlenecks

Even the pharmaceutical industry was not immune to the challenges that came with the pandemic, as it relies heavily on efficient and timely good movement. High-value pharmaceutical products were almost exclusively airfreighted and consequently significantly constrained because few flights were undertaken. Moreover, passenger flights that mostly carry pharmaceutical goods were not flown thereby resulting in a significant drop in airfreight capacity. The rigorously applied border controls and quarantines also slowed down the movement of goods, causing delays and disruptions. This had a ripple effect, causing damage to the overall supply of drugs and slowing down the entire chain.

e) Failure in Supplies and Safety

Apart from the knock-on effects to the health care sector, shortages in the workforce became a concern both in pharmaceutical manufacturing and distribution points during the pandemic. The spread of the disease resulted in the infection or inability to report to work for many who were confined due to lockdowns and social distancing. In phases like manufacturing, quality control, packaging, and logistics within critical periods of pharmaceutical supply chains, labor shortages led to inefficiency in production operations, products being delayed in delivery, and lower output generally.

Important Summary

The disruptions brought about by the COVID-19 pandemic showed that pharmaceutical supply chains are fragile. However, they also provided valuable lessons that can inform strategies to build a more resilient system for the future.

a) Diversification of Supply Chains

One of the most critical lessons learned during the pandemic is the importance of supply chain diversification. The pharmaceutical industry depends very much on certain regions-mainly China and India-for APIs and raw materials. This is what brought that whole global supply chain to a grinding halt. To prevent this in the future, pharmaceutical companies should diversify their suppliers to other regions. It is often capable of reducing its dependence on one location and achieving more confidence in a supply chain by the expansion of its manufacturing capabilities to more than one location.

b) Local and Regional Manufacturing Capabilities

The governments and various organizations realize that now it is very important to develop local and regional manufacturing capabilities to reduce dependability on global supply chains. The ones who suffered the most were countries that relied heavily on imported crucial drugs and medical supplies during the pandemic. This led to new focus on developing pharmaceutical manufacturing infrastructure at the local level to minimize dependence on foreign sources. It entails developing "near-shore" or "on-shore" production facilities to respond fast in times of crisis.

c) Building Strategic Stockpiles

During the pandemic, most countries found inadequacy in the reserves of essential drugs, APIs, and medical supplies. The pandemic has already taught both the governments and companies a lesson by building strategic stockpiles of critical pharmaceuticals and medical supplies. These stockpiles can serve as a buffer at times of increased demand or supply chain disruptions. A few countries, including the United States, have started investing in building or replenishing national stockpiles of essential drugs and equipment.

d) Strengthening Supplier Relationships

Good relations with suppliers are the need of the hour at this juncture of the pandemic. Those who have built a sound relationship with the suppliers were better placed for getting essential raw materials and APIs than those who have not. Pharmaceutical firms, going forward, need to build more collaborative long-term relations with suppliers for more reliable supply chains. More frequent communications, having contingency plans in place, and developing trust relations with suppliers can support such an effort.

e) Digitisation Improves Supply Chain Visibility

The highest innovation aspect during the pandemic has been digital technologies enabled to improve supply chain visibility. The value addition has been through applying use cases of blockchain, AI, and IoT solutions that can track inventory, monitor supplier performance, and predict demand surges. Including advanced analytics and real-time monitoring can make pharmaceutical companies respond more quickly to disruptions along their supply chains. For instance, applying blockchain technology to pharmaceutical products can improve traceability and eliminate the possibility of counterfeit drugs in the supply chain.

f) Investment in Cold Chain Infrastructure

In fact, ultra-cold vaccines, which include those produced by mRNA by Pfizer and Moderna, demand storing and transporting under ultra-cold temperatures, which created a bigger logistical challenge for many regions. Therefore, the pandemic became an eye-opener for increased investment in cold chain infrastructure, especially ensuring temperature-sensitive pharmaceuticals will reach and be stored with safety. Going forward, pharmaceutical companies need to invest in more robust cold chain logistics solutions to enable the timely distribution of vaccines and other temperature-sensitive products in even the most remote parts of the region.

g) Public-Private Partnerships

The era underscored the need for cooperation among the governments, pharmaceutical firms, and logistics companies. PPPs played a central role in having massive production and rapid delivery of the COVID-19

vaccines. For example, the Pfizer partnership between that firm and the US government, as well as logistics providers, UPS and FedEx was critical in ensuring swift delivery of the Pfizer vaccine. Moving forward, it must be the collective responsibility of governments and the private sector to continue to strengthen the supply chain and make contingency preparations for future crises.

Strategies to Build a Resilient Pharmaceutical Supply Chain

To make companies better prepared for the disruptions that will arise in the pharmaceutical industry during the next crisis, strategies for building supply chain resilience need to be initiated by companies and government. Some of the major strategies include;

a) Risk Assessment and Contingency Planning

Furthermore, pharmaceutical companies' risk assessment frameworks should be comprehensive, within which risks can be identified in the supply chain. With regular risk assessment, an organization can provide a prediction of possible disruptions and outline contingency plans that would safeguard related damage.

While undertaking contingency planning, organizations should consider identifying their alternative suppliers, ascertain backup production sites, as well as have an access to the logistics networks in the time of emergencies.

b) Use of Advanced Analytics for Demand Forecasting

The effective demand forecast is critical for a dynamic pharmaceutical supply chain. Advanced analytics, AI, and machine learning enable companies to measure the surges in demand, and they make the necessary shifts in their production lines. Pharmaceutical companies that had better predictive models reacted in time when the demand for drugs and medical equipment skyrocketed during the pandemic. The future of pharmaceutical companies lies in increasing their investments in predictive analytics to optimize their overall inventory management and planning of their production processes.

c) Improved Cold Chain Capacity

It is in the COVID-19 pandemic when the lack of the cold chain infrastructure worldwide, especially in developing countries, has been unveiled. Such pharmaceutical manufacturing firms should, therefore, come to realize a need for upgrading their cold chain capacity so as to ensure that vaccines and other drugs prone to temperature compromise are stored and transported under proper conditions. High on the list of recommendations is the adoption of more energy-efficient refrigeration systems, which increase the supply of cold chain transportation, as well as enhancing temperature monitoring technology.

d) Versatile Manufacturing and Supply Chains

Another area of research would be the concept of "flexible" or "agile" supply chains, meaning those that adapt more quickly to changing circumstances. Such examples are modular manufacturing systems, which quickly change over between different products as demand requires. Others include a more distributed manufacturing network that can be activated in a time of crisis. Companies can respond much more efficiently to disruptions by taking a more flexible approach.

e) Regulatory Harmonization and Collaboration

One of the bottlenecks during this pandemic included varying regulatory frameworks by country, which slowed down the approval and distribution of drugs and vaccines. Today, regulatory harmonization throughout the globe will be what helps have supply chains that are faster and more efficient. Harmonizing procedures and reducing various bottlenecks among different international regulatory agencies, including the U.S. FDA, the European Medicines Agency (EMA), and many others, may promote expedited critical approvals of drugs required in an emergency involving medicine.

Effects of these changes on Asian and African Emerging Markets' policies regarding imports:

The COVID-19 pandemic has severely affected the import policy of emerging markets, particularly in Asia and Africa. These regions are highly dependent on imports of pharmaceuticals and raw materials; hence they were confronted with more acute challenges compared to others because of broader global supply chain disruptions. Hence, governments in these emerging markets weigh up a review and

readjustment of policies in a way that they reduce dependency on external sources and ensure secure availability of essential drugs.

a) Local Manufacturing Started Getting More Emphasis

One of the most significant policy changes is the focus on building local pharmaceutical manufacturing capacity. Governments in India, South Africa, and Nigeria, which are emerging markets, have developed policies to support local production of APIs and finished drugs. For example, India introduced the PLI scheme to increase local API production at the cost of imports from China.

b) Import Substitution Policies

Several developing countries implemented import substitution policies due to supply chain vulnerabilities of global supply chains and focused on the reduction of dependence on imported medicines. They target promotion of local producers and reduction of tariffs for importation of intermediate goods to be used in drug production. The practice is most prevalent in African nations, such as Kenya and Ethiopia, where governments are encouraging domestic production of core drugs.

c) Diversification of Source Imports

It is also diversifying import sources away from reliance on one country or region. The pandemic highlighted the risks of relying on one or two countries for APIs and essential drugs, notably China and India. Countries in Asia and Africa are asking whether options should be secured in Europe, Latin America, or even other parts of Asia to create supply chains that are more resilient and less dependent on a single source.

d) Strengthening Regional Trade Agreements

The pandemic has also spurred the evolution of regional trade agreements that will encourage intra-regional trade in pharmaceuticals. For instance, going into effect in 2021, the African Continental Free Trade Area should further pharmaceutical trade between African countries and reduce dependence on imports from outside the continent. There is a similar case in ASEAN countries working towards furthering regional cooperation to strengthen supply chains in Southeast Asia.

e) Regulatory Reforms to Expedite Import Clearances

Emerging markets have also learned the lesson of reducing bureaucratic regulatory requirements to speed up the importation process of life-saving medicines during an emergency. Several countries initiated reforms to accelerate clearances at customs and alleviate bureaucratic inefficiencies involving pharmaceutical importations. In Africa, policy action by South African and Ghanaian policymakers, amongst others, was taken to fast-track imports of priority drugs and other critical medical supplies in event of a health crisis.

In conclusion, the pandemic made emerging markets in Asia and Africa take a step back and rethink their import policies. It is evident that they should be strengthening their local manufacturing to minimize the importing and look out for other trading partners more than these traditional partners of trade.

Policy changes are integrated to make the resiliency of the pharmaceutical supply chain so the future reoccurrence would not happen.

Conclusion

The full spectacle of the global pharmaceutical supply chain debacle played out in high definition with the COVID-19 pandemic, revealing deficiencies in manufacturing capacity, logistics, and relationships with suppliers, but this is a guide for developing a more resilient system for the future. Diversification of supply chains, investment in local and regional manufacturing, and the development of strategic stockpiles of life-saving drugs will prove crucial in ensuring that the pharmaceutical industry is resilient enough to survive potential future shocks.

Furthermore, there were digitalization, cold chain infrastructures, and public-private partnerships that mattered in helping to boost supply chain resilience. In terms of government reaction, especially emerging markets, there is policy readjustment on import policies as well as encouraging local production to reduce dependency on international vendors and encourage regional cooperation.

Major pharmacies must prepare and arm themselves for the future through flexible, agile supply chains, advanced analytics predicting demand, and much better partnerships with suppliers. Regulatory

harmonization and cooperation are also important in getting essential medicines approved and delivered more rapidly in global crises.

In the long run, the integration of these strategies would build a much more potent, adaptive, and resilient supply chain for the pharmaceutical industry-one that supports global health during crises but also ensures a steady and reliable supply of medicines to all.

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