



Five ways to optimize the COVID-19 vaccine supply chain

The emergence of COVID-19 vaccines has generated immense excitement, but healthcare systems around the world now face the complex task of securing and distributing supplies to their populations and administering the vaccine. Acquiring sufficient quantities is just the start; the vaccines must then be transported safely to multiple destinations, maintained at the right temperature, and tracked at all times to avoid tampering and assure product integrity and delivery.

Here are five ways that can optimize the vaccine supply chain and help communities everywhere return to some kind of normal as soon as possible.



1. Planning is the key to success

An effective supply chain puts the vaccine receiver at its heart, and aims for speedy execution with minimum wastage, at an agreed and understood cost-to-serve. It should make the most of existing distribution and cold storage capabilities (for flu jabs or other vaccines) and offer the potential to scale up if necessary. Good planning is necessary to understand the capacity of infrastructure and critical assets (e.g. refrigerated trucks, fridges at GPs/family practices) to be able to deliver in an effective way.

Demand planning comes to the fore when millions of doses of vaccine are required. Those responsible for procurement must swiftly evaluate different manufacturers of vaccines, syringes and refrigeration equipment, determined in part by their location, capacity, and compliance with licensing and other regulatory requirements. With a number of vaccines available — and more possibly in the pipeline — there is the option to use multiple manufacturers. While this can increase volume, it also adds to complexity, as different products may require different storage conditions and have varying expiry dates.

Complexity is further increased as over the coming months, governments and health systems will be transporting COVID-19 vaccines to hundreds and possibly thousands of destinations — at a level far beyond current vaccine distribution. They need to assess the available transportation options, check whether airports and ports can handle the increased traffic, and map the many routes. One major decision is whether to coordinate centrally, or adopt a more

devolved or more hybrid model based on the patient and location (metro, regional, remote) differentiation.

Given the high demand for the vaccine, it may not be possible to ramp up the existing estate of suitable vehicles with cold storage and fragile stock facilities. Third-party logistics companies are likely to fill the gap, with the option of one or more providers for national, regional and/or local deliveries. The procurement or logistics team could also consider appointing a lead provider to coordinate other providers. Despite the high priority of vaccines, there should be models for the costs of transport at different frequencies of delivery, to make the most cost-effective choice.

These providers must practice robust inventory management, to optimize product flows from suppliers and wholesalers, supported by strict controls over temperature and handling throughout the product journey. The health system supply chain manager could create and share a rolling 13–26-week demand forecast with manufacturers and logistics providers, to ensure that outreach locations can be reached before vaccines expire. Contracted providers should also be subject to performance and compliance management, with key performance indicators (KPIs), and careful monitoring via logistics tracking dashboards. Control tower/CDC capabilities are also useful in order to conduct event management, i.e. late delivery, out of spec delivery etc. with thresholds set based on the policies agreed.

Ongoing reviews on a daily, weekly and monthly basis can address any problems, re-calibrate supply to meet changing demand, and aim for continuous improvement of providers' performance. The key participants are the healthcare system(s), manufacturers, logistics service providers, health professionals and pharmacists.



2. Keep vaccines at the correct temperature

Cold storage is an integral part of the new COVID-19 vaccine supply chain. The huge volumes of the vaccine being produced and transported could expose limitations in refrigerated capacity in warehouses, vehicles and healthcare facilities. In addition to ramping up their cold storage infrastructure, supply chain managers need end-to-end temperature logging, as well as real-time monitoring and reporting of temperature, shock and moisture — with system alerts via automated scanners, to maintain warehouse integrity. This allows time for remedial action to prevent damage and spoilage, and prevents compromised goods in transit from reaching the customer.

Supply chain managers also need to be alerted in advance if a particular geography looks likely to exceed its cold chain capacity, and either bring in new resources or adjust delivery quantities accordingly.



3. Track and trace

Complete, end-to-end inventory visibility is vital, to understand when vaccines will be available for use, and to avoid damage or theft. Data on tags from COVID-19 vaccine batches enable efficient tracking, giving supply chain managers a complete picture of the volumes stored or in transit, as well as any vaccines delivered but not yet used. Stock can also be identified according to the manufacturer and expiry date — which is important, given the relatively short shelf life. All of which enables better demand planning, to inform decisions on ordering, distribution, order allocation, storage and returns, optimizing product flows and avoiding overload and wastage.

Post-vaccination tracking plays a vital role in evaluating efficacy, but can only be effective if there are mechanisms to adverse events i.e. record successful/unsuccessful treatments and side-effects. It would also enable distribution and application centers to efficiently plan for second dosage and recurring applications for the vaccine to further eliminate the risk of incompatible vaccine brands.

Such a capability removes the need for logistics providers, hospitals, pharmacies and other players to carry out physical stock counts, and ensures that the numbers of actual and recorded products are reconciled.

Track and trace calls for a robust data analytics capability, and an established process for capturing, storing, transferring and processing real-time data. In such a large and complex supply chain, involving multiple players and geographies, one should not underestimate the importance of taxonomies and common language. Asset data standardization, agreed taxonomies, and commercial data sharing can all help to generate common understanding, visibility and compliance.



4. Ensure product integrity

Like many supply chains, pharmaceuticals can be vulnerable to counterfeiting, tampering, contamination and theft — especially as products and components often pass through multiple locations and countries. Provenance and authenticity is critical, to assure end users of the vaccines' safety and efficacy. Batches should be serialized for easy identification, with proof of pick-up and delivery confirmed via an authenticated chain of custody, reported through smart, IoT devices and applications. These should detect any anomalies and send alerts — visible to all key supply chain managers — and be able to trace the source of any unauthorized intervention. Anyone coming into contact with the vaccines must be trained in identifying counterfeits.

Comprehensive assessment and monitoring also places the purchaser of the vaccine in a stronger position, should they need to make any insurance claims for unusable stock.



5. Manage last-mile delivery, returns and post-vaccine tracking

Last-mile delivery is one of the most critical parts of the COVID-19 vaccine supply chain. The number and location of vaccination sites will be determined by the percentage of population to be vaccinated, the priority groups, the population density, availability of trained frontline workers, and the distance the target population must travel to access health facilities.

Longer-distance journeys of bulk vaccine freight are typically made by larger trucks, with smaller trucks and carriers taking over for the 'last-mile', performing multiple drops to healthcare centers, pharmacies and hospitals. Accurate volume flow is critical to avoid wastage: even the larger distribution points can only accept 5–7 days of stock due to on-site capacity limitations and cold chain requirements.

The last-mile delivery vehicles must be equipped with cold chain storage and precious cargo facilities, commanded by licensed drivers, and integrated into track and trace systems to assure 24/7 visibility for both delivery and returns (due to expired stock, overstocking, or damaged stock). Ideally, one truck or carrier should manage both outbound fulfilment and returns, offering transport, processing, storage and destruction. They will be responsible for the integrity of returns and show there has been no replacement or theft of vaccines.

Most governments and healthcare systems are accustomed to distributing vaccines to different segments of their populations. But the COVID-19 vaccine is of a different magnitude; not just in terms of scale, but in its huge potential impact on the world's health, social and economic wellbeing. That's why it's so important to achieve a fast, efficient and responsive supply chain, bringing together the best of public and private capabilities, demonstrating best practice at every stage.

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Designed by Evaluateserve. | Publication name: Five ways to optimize the COVID-19 vaccine supply chain

Publication number: 137293-G
Publication date: December 2020