Clinical Trials: *A Logistical Nightmare?*

For clinical trial managers, the list of planning variables can seem endless. Cohort selection and patient recruitment, regulatory engagement and compliance, data management and security; each aspect presents unique challenges that could result in trial failure if not well managed. Logistics is another potential headache, with trials requiring global transport of medicines, hazardous materials, patient cells and samples.

Clinical trials are one of the most demanding areas within life science logistics, requiring efficient delivery of novel, sensitive medicines all over the world. These trials often involve numerous cross-border shipments with associated customs requirements. Whatever the shipment type, it is crucial to protect the integrity and quality of the medicine or sample, to ensure that the clinical trial is safe and that data generated from the trial is accurate.

So, is clinical trial logistics as nightmarish as it sounds or could it actually present an opportunity for the industry?

Novel Treatments = Novel Challenges

In the development of novel treatments, the more innovative the treatment, often the higher the potential impact for patients globally. As we've seen with the rise of biologic-based treatments, from monoclonal antibodies to cell and gene therapies, patients can experience life-changing results when successful. However, these treatments present their own unique challenges throughout development, manufacturing and delivery. Often, the most innovative ideas are the most challenging to develop, as completely new techniques are required.

The same is true in logistics. Unlike traditional small molecule drugs that can have long shelf lives and broad viable temperature ranges, medicines based on biologics require precise control of their temperature, storage and delivery to ensure they remain effective and safe. It also places strict limits on delivery times and any delays could result in whole batches being lost, risking the success of the trial and the well-being of the patients.

For autologous cell therapies, these challenges are amplified as the patient's own cells are extracted, shipped to wherever they are processed and then returned to the patient as a treatment. Time is of the essence and there is a lot of pressure to get it right!

Compliance at its Core

Transportation regulations for pharmaceuticals and life science substances are incredibly strict and with good reason. Any deviation in the state or quality of the product can impact patient safety, so ensuring the integrity of the products is maintained throughout the supply chain is critical. Regulations vary globally and any non-compliance can lead to recalls, fines, and in the worst-case scenario, severe risks to patients. Furthermore, regulations are constantly changing, so being aware of the transport regulations that apply to your product is crucial.

In order to comply with international customs requirements and regulations, each shipment must demonstrate that it maintains

temperature stability and passes drop tests. There are strict performance criteria for packaging and it must be qualified in line with industry standard protocols, such as the International Safe Transit Association 7D (ISTA7D) temperature test for transport packaging.

For air-based transportation, International Air Transport Association (IATA) requirements apply. These IATA requirements specify the classification, packaging, labelling, documentation and handling compliance requirements for goods, especially for hazardous materials. There are similar requirements for road, rail and sea transportation, all based on the relevant UN modal regulations.

For cell and gene therapies, chain of custody requirements mandate that each shipment is clearly monitored throughout its journey to prevent any tampering or potential damage. Documentation and traceability requirements add another level of complexity to an already challenging process. Staying up to date with all standards is therefore extremely important and demonstrating compliance is key for regulatory approval.

International Customs Regulations and Avoiding Delays

Customs requirements vary internationally, so clear and accurate labelling is vital. With fragile products, any delays at customs could result in temperature moving outside of the viable range. For example, a delay to a cryogenic shipment may result in warming without refreshment of the dry ice or liquid nitrogen. This risk is further amplified in decentralised trials or studies involving remote participation as materials must travel further and for longer, often also requiring them to be handled more frequently.

As a truly global industry, changes to trade agreements and associated taxes and tariffs can have a major impact on international logistics, both in cost of development and in possible delays. Navigating these complex financial and legal obligations is crucial for maintaining compliance and ensuring smooth operations.

Collaboration is a Game Changer

So far this may all sound like an endless list of potential catastrophes,

Case Study:
Bringing Innovation to Clinical Trial Supply Chains
Increasingly complex demands for international clinical trials are leading drug developers to collaborate with specialist logistics providers to manage their supply chains. The logistics specialist manages all the study samples, including providing validated packaging and transporting the temperature-controlled samples, liaising with the collection/delivery sites, as well as designing and implementing contingency plans throughout.

Challenges
With over 300 participants spread across five collection clinics in the EU and Norway and a varied range of samples, including DNA and plasma, a global pharmaceutical company required secure, seamless and compliant delivery throughout its clinical trial.

This clinical trial included EU and non-EU countries, plus a wide range of samples at each collection site. The multi-site study included remote locations, requiring a worldwide network to ensure the seamless flow of shipments and information, whilst utilising the most efficient transport lanes.

Solution
Contingency plans were created for each phase of transportation, including sourcing replacement packaging and designing secondary flight plans in case of any airline delays.

'As part of our preparation for this clinical trial, we created Standard Operating Procedures tailored to the trial's requirements and advised each office of the paperwork and packaging requirements. By ensuring all the preparation was complete, collection and delivery was made in the shortest possible time as factors such as customs clearance were processed and prepared prior to the arrival of the samples at the airports.' – Dennis Schreiber.

Experienced drivers arrived with validated packaging and placed the samples in the boxes, often directly in front of the customer, thereby ensuring correct handover of valuable materials. Often, the drivers were collecting up to eight sets of samples at the same collection site, many having different temperature requirements, including dry ice and controlled ambient.

Whenever required, local experts were immediately available to help expedite the import process, all while maintaining the highest levels of compliance standards in the industry.

but there is hope! Collaborating with experts who are familiar with the challenges of clinical trial logistics could help to avoid delays and ensure compliance. Should an unavoidable delay occur, proactive management may allow for any risks to be mitigated, whether that is recharging dry ice or finding alternative routes.

Logistics experts, packaging teams and cold chain providers must work together to simplify the process and create solutions that maintain the desired temperature for extended periods and reduce the potential for hazards, mitigating risk against unexpected transit delays.

Impact of New Technologies
New technologies are facilitating clinical trial logistics and their adoption is helping to drive efficiency. Real-time shipment tracking and temperature monitoring are enabled by Internet of Things (IoT) technology, which in turn facilitates regulatory compliance. The data obtained through these technologies can then be used to develop models that will help to plan future trials and ensure enhanced efficiency and performance.

As an industry, we share a purpose to ensure that patients receive critical medications, vaccines and biologics safely, reliably and on time. Every innovation developed in cold chain packaging and logistics is driven by this ambition. When cold chain solutions are more reliable and durable, life-saving treatments arrive in optimal condition. Smarter tracking, advanced insulation and reusable packaging don't just enhance supply chains; they facilitate essential research and development, enable the delivery of safe and effective clinical trials and ultimately impact patient care, making treatments more available and dependable worldwide.

Bailey Coppage

Bailey Coppage, US Customer Solutions Manager, Biocair, has worked in the logistics industry for five years and has been with Biocair for over three years. Since joining Biocair, Bailey has worked extensively within the cell and gene therapy department, onboarding CGT clients, creating standard operating procedures, developing work instructions and building other resources to ensure CGT shipments are properly handled and efficient logistics solutions are delivered across the life science industry.