

# Resilient by design

Logistics for medical  
capital equipment





## Executive summary

Medical capital equipment underpins modern healthcare infrastructure. High-value systems—including life support devices, dialysis units, and advanced diagnostic platforms—must arrive intact, compliant, and ready for immediate use.

These assets are often complex, highly sensitive, and frequently represent multimillion-dollar investments. Moving them requires controlled handling, strict regulatory adherence, and precise coordination across manufacturers, logistics providers, and healthcare facilities.

When logistics execution fails, the impact extends beyond supply chain disruption. Delays can postpone diagnostics, shift surgical schedules, and leave critical care capacity underutilised.

As healthcare systems expand and technologies become more advanced, logistics resilience has become a strategic imperative that directly influences speed to care.

This paper explores how pre-delivery coordination, installation and commissioning support, smart warehousing, and digital infrastructure strengthen resilience across the medical capital equipment lifecycle.

## 1

# From movement to orchestration: A shift in logistics expectations

Historically, logistics for medical equipment focused on safe transport from origin to destination. Today, that definition is no longer sufficient.

Healthcare providers and manufacturers increasingly expect logistics partners to:



Align with clinical and construction timelines



Integrate with regulatory and documentation workflows



Support installation readiness and system activation



Provide end-to-end visibility beyond shipment tracking

This shift reflects a broader reality: medical capital equipment logistics is not a linear process. It is a coordinated, multi-stage system where delays or failures in one stage cascade into others.

## 2

## Industry challenges

Medical capital equipment logistics often involves long lead times, global supplier networks and stringent regulatory oversight. Equipment must arrive intact, compliant and ready for installation, often within tightly scheduled clinical programmes.

**Key industry challenges include:**

- extended procurement cycles, often spanning months, with multiple dependencies across suppliers and regions
- cross-border regulatory requirements, including frameworks such as EU MDR and FDA compliance, where documentation accuracy is critical to avoiding delays
- synchronisation with hospital construction, clinical engineering, and IT infrastructure readiness
- high sensitivity to shock, vibration, temperature, and humidity—particularly for imaging and diagnostic systems.
- lifecycle requirements such as refurbishment, redeployment, and compliant returns
- the need for smarter warehousing to meet regulatory and quality control requirements

Addressing these complexities requires a logistics service provider with specialist healthcare expertise, robust infrastructure and the ability to manage time-critical operations end to end.

## 3

## Evolving pressures

Healthcare supply chains are increasingly being shaped by external disruption and rising expectations. Geopolitical instability is affecting sourcing and transit reliability. Sustainability requirements are reshaping packaging, transport modes and network design. Demand for modular and mobile equipment adds further complexity.

In parallel, the definition of compliance is expanding. It now includes not only regulatory documentation, but also:



End-to-end traceability



Data integrity across systems



Audit readiness at any point in the lifecycle

Resilience in this environment requires systems that are flexible in execution, standardised for consistency, interoperable across stakeholders, and closely aligned with clinical readiness.



## 4

## Pre-delivery logistics

A significant portion of logistics risk can be mitigated before physical movement begins.

Early-stage coordination helps address common failure points such as incomplete documentation, packaging inconsistencies, or site readiness gaps.

### Key considerations during this stage include:

- verifying packaging integrity and compliance with handling requirements
- preparing accurate and complete customs and regulatory documentation to minimise border delays
- conducting site assessments to evaluate access constraints, including spatial limitations and infrastructure readiness
- planning specialised transport solutions for oversized or highly sensitive equipment
- sequencing deliveries to align with installation schedules and resource availability

In many cases, catching issues at this stage can mitigate risk for issues during transit, ultimately determining whether a deployment proceeds smoothly or requires rework.

## 5

# Installation and commissioning support

True logistics support doesn't end at the loading bay. It extends all the way through installation and commissioning to ensure the equipment is ready for immediate use.

In healthcare logistics, well-executed installation support reduces the time between delivery and clinical use. It has become an increasingly important metric for healthcare providers.

Installation and commissioning require precise coordination across logistics teams, clinical engineers, and IT specialists. This coordination helps prevent delays that can affect scheduled procedures or planned service activation.

## Key elements to consider include:



Specialised handling and positioning within controlled clinical environments



Integration with hospital IT systems, including connectivity and configuration



Delivery of all required components, accessories, and documentation together



Execution of compliance checks and operational validation prior to handover

Additionally, spare parts management and rapid delivery are critical to ensure continuous equipment availability. Time-critical fulfilment, supported by strategically located forward stock locations, minimises downtime and ensures parts reach the hospital when needed.

## 6

## Smart warehousing

In the lifecycle of medical capital equipment, warehousing plays a pivotal role long before and after installation. Smart warehousing bridges production, delivery, and long-term performance. Rather than acting solely as storage, these types of facilities enable quality control, flexibility, and lifecycle management.

A smart warehousing approach ensures every device is stored, prepared, and maintained with the precision healthcare demands.

### Core capabilities include:

- pre-staging equipment to support coordinated, multi-site deployments
- buffer storage to absorb variability in production or project timelines
- refurbishment and reverse logistics processes aligned with regulatory requirements
- strategic positioning to reduce transit times and complexity
- serialisation and tracking to support full traceability and audit readiness
- pre-installation configuration and functional testing prior to dispatch

When unified, these capabilities allow logistics networks to adapt to change without compromising equipment integrity or compliance.



## 7

# Digital transformation

Digital technology has become an essential layer of modern logistics, transforming how organisations monitor, manage, and protect high-value medical equipment across the supply chain. Real-time tracking provides visibility into shipment status, but current leading approaches extend it further. They integrate condition monitoring, documentation, and workflow coordination into a single ecosystem.

These digital tools offer the ability to act proactively to reduce risk, improve coordination, and strengthen compliance end to end.

## Key functionalities to consider:



Continuous updates on location and ETA, keeping stakeholders informed and enable rapid response to delays or disruptions.



Integrated control towers that provide a consolidated, cross-site view, allowing teams to confidently orchestrate complex flows.



Digital documentation to streamline audit readiness, ensuring every step is compliant and accessible.



Predictive analytics that help identify patterns and forecast maintenance or replacement needs, so organisations can intervene before patient care is affected.

In this context, visibility is not just about knowing where equipment is. It is about understanding whether it is ready for installation, for inspection, and ultimately for clinical use.

## 8

## Success in action: enabling a hospital network's imaging expansion

A large hospital network sought to expand its imaging capacity across multiple sites using CT, MRI, and mammography systems sourced from several global manufacturing locations. The challenge was not only the scale of the deployment, but the precision required to maintain equipment integrity, manage customs complexity, and align deliveries with tightly scheduled construction and clinical activation windows.

To meet these requirements, Kuehne+Nagel leveraged its specialised healthcare distribution centre—an environment engineered specifically for high-sensitivity medical technology. Within this controlled setting, every step of outbound logistics is managed with the same rigor as the technologies being moved.

The centre maintains strict temperature and humidity controls to protect equipment integrity throughout staging. Certified dangerous-goods handling and structured returns processes ensure compliance with all regulatory expectations. Integrated export administration streamlines cross-border flows, minimising the risk of delays at customs checkpoints.

Beyond controlled storage, the facility provides value-adding technical services essential for capital equipment deployments. Systems can be preconfigured, inspected, and functionally tested onsite, significantly reducing the installation workload and activation time at the hospital location. MRI units, in particular, benefit from remote condition monitoring and continuous cooling, which protect sensitive components during storage and transport.

A fully integrated customs management system, combined with ISO 13485 and GDP-aligned quality controls, ensures that every movement is traceable, compliant, and secured. These processes reduce variability, lower risk, and maintain the integrity of each device until it reaches the clinical environment.

The result is a fully integrated, compliant, and secure logistics platform that accelerates deployment, enhances reliability, and simplifies the experience for healthcare providers managing complex multi-site installations.

## 9

# Designing resilience into the system

Resilience in medical capital equipment logistics is achieved through the integration of coordinated capabilities across the entire lifecycle.

**Kuehne+Nagel applies this approach through integrated solutions that combine:**



Specialised healthcare handling and compliance expertise



Multimodal transport aligned with time, cost, and sustainability requirements



Controlled warehousing and lifecycle services



Digital platforms that enable visibility, coordination, and proactive management

By connecting these elements, the supply chain becomes a structured system that enables faster deployment, reduces risk, and supports the reliable delivery of care.

# About us

Kuehne+Nagel is about making logistics work smarter for our customers. With a global network and deep industry expertise, we help businesses navigate complexity and unlock growth through reliable, digital services, advanced technologies and data-driven insights.

As the logistics partner of choice for companies worldwide, we deliver tailored, end-to-end supply chain solutions across Air, Sea, Road, and Contract Logistics.

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