



# MODERNISING THE MEDICAL INVENTORY MANAGEMENT SYSTEM: THE CASE FOR INTELLIGENT AUTOMATION IN HEALTHCARE SUPPLY CHAINS

## Abstract

Hospital supply chains are under constant operational pressure. Rising pharmaceutical costs, persistent staffing shortages, and the growing complexity of clinical workflows have exposed the limits of manual inventory management in wasted capital, in lost clinical time, and in avoidable patient risk. This article examines how intelligent automation is transforming the medical inventory management system, with particular focus on automated point-of-use supply capture, wireless PAR weighing bin analytics, and the data infrastructure required to realise lasting operational and financial value.



Supply chain costs account for more than one-third of hospital operating budgets, making them the second-largest expenditure category in most health systems after labour. Yet the return on that investment is consistently undermined by the inefficiencies baked into manual processes. For a typical mid-sized hospital, it is estimated that more than \$12 million is wasted in annual overspend due to redundant orders, expired inventory, and suboptimal procurement.

Nurses currently spend up to 20% of their working hours on supply-related tasks, like tracking down items, manually counting

stock, and documenting usage. That is one-fifth of a shift absorbed by logistics rather than care. In an environment where staffing shortages are already acute, this is not an abstraction. It is lost clinical time that cannot be recovered.

62% of supply chain executives in a recent industry survey cited measurable cost savings as their primary motivation for investing in inventory management technology. The pressure is from both directions: costs are climbing, and existing processes are not equipped to absorb them.

The burden on clinical staff compounds the

problem significantly. Aggregated across the US nursing workforce, non-clinical time represents approximately \$14 billion in annual productivity loss. In an environment where staffing shortages are already acute, this is not a secondary concern. It is lost patient care time that cannot be recovered.

In response, the global AI in the medical supplies and inventory management sector is growing at a compound annual rate of 22%. That growth trajectory reflects both the scale of the unresolved problem and the availability of technologies capable of addressing it.

## Legacy Systems Fall Short

Most hospitals still manage a significant share of their inventory through a combination of manual counting, paper-based Periodic Automatic Replenishment (PAR) sheets, and periodic visual audits. These methods were designed for a simpler environment. They cannot keep pace with the demands of modern clinical operations.

### Latency

The fundamental failure is one of latency. A manual PAR count captures the state of inventory at a single point in time. By the time the count reaches materials

management and a reorder is processed, actual consumption has moved on. This gap between what the system records and what is physically available generates systemic overstatement errors that distort reorder triggers, inflate safety stock, and prevent accurate demand forecasting. In button-scan systems that depend on deliberate staff action, the problem is compounded by inconsistent compliance during high-pressure periods.

### Expiry management

Expiry management is a direct casualty of this latency. Without automated tracking,

supplies are typically drawn from the front of a bin regardless of expiration sequence, leaving older stock to degrade at the back. The Healthcare Supply Chain Association estimates that between 20% and 30% of hospital inventory expires before use. This is a preventable loss that an automated first-in, first-out system is specifically designed to eliminate.

Over-ordering follows from poor visibility. Without a reliable, real-time view of stock levels, procurement teams default to conservative purchasing, tying up working capital in static inventory.

## Intelligent automation

Intelligent automation entails shifting the burden of tracking, counting, and reordering from people to systems that are structurally better suited to those tasks.

The architectural shift is from interval-based data generation to continuous data generation. Legacy inventory management relied on humans to create data at scheduled points. Intelligent

automation creates data passively and persistently, at the moment and location of consumption. This changes the quality of every downstream decision. Reordering, budgeting, PAR-level optimization, and demand forecasting all become more reliable when the usage data underpinning them is accurate and current.

Two capabilities are the core of this

transformation: automated point-of-use supply capture and wireless PAR weighing bin analytics. Each addresses a distinct point of failure in the traditional inventory model. Together, and integrated with a hospital's existing enterprise and clinical systems, they represent a substantive redesign of how supply chain operations function in a clinical environment.



## Automated point-of-use supply capture

The most fundamental gap in hospital inventory management is what happens at the moment a supply is consumed. Traditional systems depend on staff to document usage after the fact. During this time, priorities compete. Automated point-of-use supply capture eliminates that dependency by documenting consumption at the moment it occurs, without requiring any deliberate action from clinical personnel.

The technology underpinning point-of-use

capture has matured significantly. RFID-enabled smart cabinets identify items as they are removed, updating stock levels in real time and pushing usage data to a centralised inventory platform. Computer vision systems extend this capability further: using cameras and AI-powered image recognition, they identify products being taken from storage without requiring barcodes or tags.

Solutions of this kind have demonstrated significant charge capture accuracy for

implants and consumables at the point of care, integrating directly with EHR platforms.

Supply usage is thus documented accurately and immediately, eliminating the overstatement errors that distort PAR calculations and reorder triggers. Hospital administrations can systematically enforce expiry compliance too. And clinical staff can be released from logistics.



## Wireless PAR Weighing Bin Analytics

PAR systems have been a fixture of hospital inventory management for decades. The underlying logic is: set a minimum stock threshold, and trigger replenishment when inventory falls below it.

Wireless PAR weighing bin analytics uses weight sensors to monitor stock levels continuously and autonomously. A wireless weighing bin weighs its contents in real time, calculates consumption against the predetermined PAR threshold, and generates a replenishment order

automatically.

These platforms capture granular consumption data like which items are used at what rate, in which departments, and under what clinical conditions. AI algorithms process this data to identify patterns like seasonal demand spikes, procedure-specific consumption anomalies, or gradual drift in PAR levels that no longer accurately reflect actual usage.

This is the distinction between automation and intelligence. Automation removes human effort from an existing process. Intelligence adapts the process dynamically, based on what the data reveals over time. For healthcare organisations managing hundreds of SKUs across multiple clinical areas, that adaptive capability is what transforms a replenishment tool into a strategic supply chain asset.

## Keys to successful implementation

For healthcare organisations, deploying automation on top of poorly defined medical inventory management system workflows does not eliminate inefficiency. Organisations should begin by mapping existing supply chain processes and note where data is generated, where it breaks down, and where the gap between recorded and actual inventory is widest. This diagnostic view identifies the points of intervention where automated capture and analytics will deliver the greatest impact. Several principles consistently distinguish successful implementations from those that fail to deliver.

### Data quality and governance

Data quality is a non-negotiable foundation. PAR-level optimisation and predictive analytics are only as reliable

as the consumption data feeding them. Organisations that invest in clean master data realise value from automation significantly faster.

Governance frameworks must be established alongside technology deployment. This means defining service-level agreements, setting measurable KPIs in inventory turnover, stockout frequency, charge capture rates, and manual effort reduction. It also involves creating escalation pathways for issue resolution. Without governance, even well-deployed systems fail to deliver sustained value as workflows evolve and clinical volumes change.

### Change management

Change management deserves equal attention to technical implementation.

Frontline staff, like nurses, logistics personnel, and materials managers, are the people who interact with these systems daily. Their understanding of how the technology works, and their confidence are a prerequisite for adoption. Investments in training and structured transition support have consistently been shown to accelerate time-to-value and reduce the risk of reversion to manual processes.

### Deployment plan

A phased deployment reduces risk and builds organisational evidence. Piloting in one clinical area allows performance to be measured against agreed KPIs before broader rollout. The evidence generated in a pilot is also invaluable for securing the internal support required to scale across departments and facilities.



## End note

The medical inventory management system is directly connected to what happens at the point of care. When supplies are accurate, accessible, and managed intelligently, procedures run on time, clinical staff direct their attention to patients, and avoidable waste stays low. When they are not, the consequences are felt across the entire care environment. Automated point-of-use supply capture

and wireless PAR weighing bin analytics address specific, measurable failures that manual and semi-automated systems have never reliably solved.

The evidence from early adopters is compelling. There have been significant reductions in inventory carrying costs, elimination of stockouts, and a recovery of lost charge capture revenue. The transition demands deliberate planning,

clean integration work, and a willingness to redesign processes rather than simply automate the old ones.

For healthcare organisations seeking to reduce supply chain waste, strengthen compliance, and give clinical teams more time for care, the case for [intelligent automation](#) is well-established. They must implement it in a way that survives the real operational complexity of a hospital.

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