

# The Role of Artificial Intelligence and Machine Learning in Drug Distribution

## Overview

Healthcare distributors are integrating artificial intelligence (AI) and machine learning (ML) solutions across various functions, including enhancing inventory management, forecasting inventory quantities, enhancing workforce productivity and improving order fulfillment. These technologies, used together or independently, may transform the healthcare supply chain by optimizing drug availability, potentially reducing costs and ensuring timely patient access to medications.<sup>1</sup>

## How Distributors Use AI/ML

### Predictive Shortage Management

Predicting drug shortages and ensuring consistent supply has been a long-standing priority for distributors. AI and ML tools can be used to address shortages, as they are used to assist with product allocation in based on supply and demand. AI's predictive capabilities, in conjunction with greater access to data upstream and downstream, could help proactively identify and mitigate drug shortages.

### Demand Forecasting and Inventory Optimization

Distributors use AI/ML to forecast demand more precisely and align inventory levels, reducing waste, returns, and unnecessary storage costs — critical in a sector with historically tight margins (0.2 percent after taxes in 2024 per the [HDA Factbook](#)).

### Operational Efficiency

AI helps distributors streamline warehousing, packaging and transportation logistics. These tools promote best practices in handling and reducing waste across shipments. Distributors have reported improved productivity, with net sales per employee growing 8 percent to \$29.7 million in 2024.

## Data Integration and Scalability

AI helps distributors address data limitations by dismantling data silos, upgrading aging technologies and enabling scalable operations.

## Current Use Cases Among Distributors

Distributors are currently applying AI and ML in several areas:

- Enhancing workforce productivity
- Optimizing inventory management
- Forecasting demand
- Bolstering supply chain security and integrity

AI is more commonly used for predictive analytics and automation, while ML is often applied to train models on historical data for forecasting and classification tasks.

## Implementation Barriers

Distributors see strong potential in AI to improve efficiency, but they face key challenges that slow adoption. There are three main barriers identified:

- Limited technical expertise
- Data quality and standardization issues
- Difficulty integrating with legacy systems

Distributors continue to view AI as a powerful tool for transforming operations, especially when paired with human expertise.

1. This fact sheet summarizes HDA's 2024 report, "[The Role of Artificial Intelligence in Drug Distribution](#)."



## AI Governance and Safety Standards

To ensure safe, transparent and effective use of AI, many HDA distributor members align with frameworks from:

- [Government Accountability Office \(GAO\)](#): Ethics and accountability
- [Google](#): Fairness and security
- [Microsoft](#): Reliability and safety
- [National Institute of Standards and Technology \(NIST\)](#): Risk-based governance

## Policy Considerations

Federal and state policymakers could support responsible AI adoption by:

- 1 Promoting AI/ML education and workforce training
- 2 Establishing interdisciplinary task forces (clinicians, ethicists, legal, data science, supply chain experts) to monitor implementation
- 3 Enforcing privacy-by-design principles, secure data handling and role-based access controls



For more information on how distributors use technology to ensure a safe and reliable supply chain, visit [HDA.org](https://HDA.org).

## About the Healthcare Distribution Alliance

The Healthcare Distribution Alliance (HDA) represents primary pharmaceutical distributors — the vital link between the nation's pharmaceutical manufacturers and pharmacies, hospitals, long-term care facilities, clinics and others nationwide. Since 1876, HDA has helped members navigate regulations and innovations to get the right medicines to the right patients at the right time, safely and efficiently. The HDA Research Foundation, HDA's nonprofit charitable foundation, serves the healthcare industry by providing research and education focused on priority healthcare supply chain issues.