



# Leveraging predictive analytics prevents \$1.3 million worth of medical supply waste

## Closing the never-ending waste cycle

In the US alone, \$5 billion worth of medical supplies are thrown away each year. This epidemic of waste in health care facilities raises the cost of care and takes up space in landfills – both of which have significant social and environmental consequences. This waste can be attributed to poor inventory management. Without accurate inventory tracking and analysis, stock piles up and sits, unused, until it expires.

This project, run by Z5 Inventory, consisted of two phases. Phase one: clean out all the excess products (those not purchased recently or above the Periodic Automatic Replenishment levels) from 30 health care facilities and send them to a Z5-run warehouse. Phase two: use predictive analytics to reallocate these products to health care facilities in need.

The goal was to help clients reduce product overstock, gain shelf space for newer products, improve staff efficiency, reduce inventory supply costs, and reduce waste in the health care supply chain to as close to zero as possible. If this process were to be implemented in all US health care facilities, billions could be saved annually. This would ultimately save valuable taxpayer money, reduce landfill levels, and give at-risk communities supplies they might not have otherwise had access to.

## Forecasting demand using KNIME and R

After determining the project objectives with key stakeholders (Z5 and client C-Suite), data scientists drafted out the components of the project (i.e. demand forecast, reallocation, best cycle selector, etc.), and how they should interact.

The first step was processing the data for analysis, checking for and handling errors such as missing values, invalid entries, and date range errors. Then, using the KNIME Integration with R, data scientists could begin the demand forecasting (based on the purchase history of the health care facility), and create a list of products for each facility. R was used to split excess products into different destination facilities based on a ranking. This ranking was calculated using purchase frequency, average purchase quantity, standard deviation of purchase quantity, as well as the predicted quantity on the wish list. Additionally, since the goal was to reallocate products to health care facilities as much as possible, a “best cycle selector” was created to ensure that for a given product, its use was maximized in the destination facility.

Throughout the process, data scientists checked back in with key stakeholders, presenting interim results, and making necessary changes to the KNIME workflow. Robustness of models are continually evaluated based on customer feedback. Until now, there have been no complaints of over-shipment, which indicates that the model is successful in helping to solve the challenge of over-stocked health care facilities.

### Company

Z5 Inventory is a full-service supply chain lifecycle solution for health care providers. Providers can count and value their inventory rapidly on Z5's mobile app; identify and reallocate excess product to prevent expiration; predict and buy unopened, unexpired product according to their needs. The company was founded in 2015 in Austin, TX, and currently operates in hospitals across the continental United States.

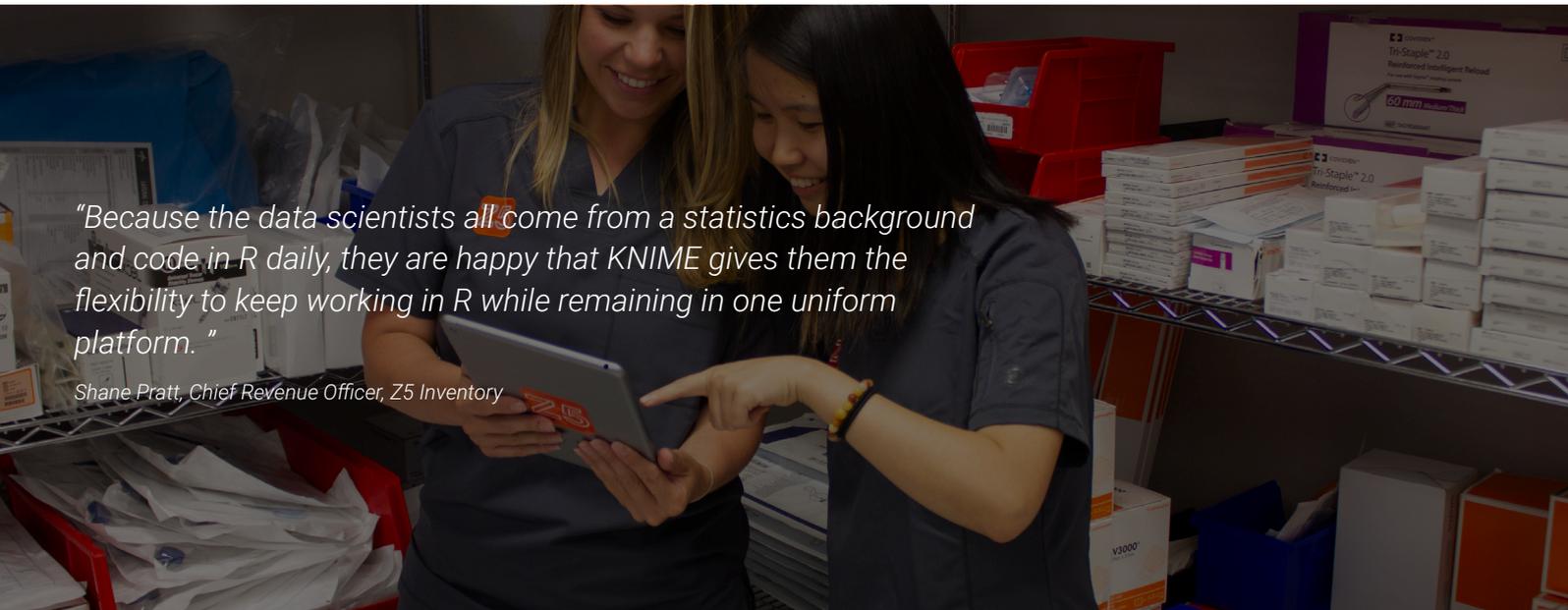
### Solution highlights

Savings of

**\$1.3**

million worth of medical supply waste

- Healthcare
- Inventory Management
- Predictive Analytics



*"Because the data scientists all come from a statistics background and code in R daily, they are happy that KNIME gives them the flexibility to keep working in R while remaining in one uniform platform."*

*Shane Pratt, Chief Revenue Officer, Z5 Inventory*

## \$1.3 million in savings

This project was carried out in the Mid-Atlantic region of one of the largest health care networks in the US, where 32 health care facilities participated. Approximately USD\$1.3 million worth of medical and surgical product was moved to prevent expiration and disposal within the project execution. This is a phenomenal achievement. It indicates that, if all US health care providers employed a similar strategy, nearly all the USD\$5 billion that goes to waste would actually be used.

Ideally, by utilizing this process, the central warehouse that handles distribution to health care facilities will become perfectly efficient. To be precise, it would be empty. The current projection is being able to distribute all product within the following month. In a perfect world, waste in the health care supply chain would be reduced to zero. Realistically, given the number of uncontrollable variables in the industry such as clinician preference, supplier and manufacturer changes, and the increasing rate of industry consolidation, this isn't possible. However, what can be controlled is reducing products going to waste on shelves and being thrown away.

## Why KNIME?

*KNIME nodes are visual and self-documenting, which saves a significant amount of time and makes results easier to understand for the non-coder.*

Sometimes, they can even reproduce the results without knowing how to code. Previously, when coding directly in R or Python, a lot of time was spent on documentation to ensure the scripts were easy to read and results were reproducible. This is now time which can be spent modifying and improving the project processes.

Because the data scientists all come from a statistics background and code in R daily, they remain happy because KNIME gives them the flexibility to still work in R whilst remaining in one uniform platform. They can therefore take advantage of the best of both worlds. KNIME Analytics Platform is a great tool with many powerful capabilities such as comprehensive ETL nodes, an easy-to-use drag-and-drop interface, and integrations with many other popular data science and data mining tools. It simply makes doing analytics and pre-processing tasks simpler and faster.