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Vein-to-Vein:

managing the blood supply chain

The National Health Service (NHS), the world's largest health care organisation, has implemented a new supply chain planning system for managing the supply of blood products to hospitals in England.

NHS Blood and Transplant (NHSBT) supplies red blood cells, platelets, plasma and related specialist products to all hospitals in England. Around 35,000 units of whole blood are collected every week through a network of fixed sites and mobile blood collection teams. The blood is handled by five processing centres and distributed through a network of 15 issue centres to over 200 NHS Trusts.

Planning the end-to-end supply chain for these blood donations and deliveries is extremely complicated, due to factors including:

- **Blood supply and demand variability:** supply and demand varies significantly and can result appeals for donors of specific blood types from time-to-time
- **Perishability of blood components:** whole blood collected from donors is split into its main components of red cells, white cells, platelets and plasma; perishability of these components varies significantly – red cells have a shelf life of 35 days, platelets only seven days
- **Storage and transport regulations:** blood products must be stored and transported in temperature-controlled, sterile environments in compliance with strict regulations
- **Demand spikes:** a single incident – for example, a major accident, fire or terrorist attack – could create a demand spike, straining the whole system; even a single patient requiring a very specific blood product could cause a significant spike in demand over a short period of time

Because of this complexity, NHSBT's old system – a collection of manually intensive databases and spreadsheets – grew increasingly unfit to support routine decisions:

- Forecasting was carried out using a model based on deliveries rather than customer demand
- There was little granularity of the demand data, which meant that changes to requirements for more specialised products were often missed
- Stock distribution was carried out using basic push algorithms that could result in redistribution or ad hoc orders
- Additional transportation costs were incurred by NHSBT and its customers

The end result was a sub-optimal process that could not respond to the future needs of its customers.

Requirement

NHSBT outlined its approach to addressing these issues in its strategy document: *Blood 2020*, 2013/14. In addition to key strategic moves to improve donor recruitment and retention and ongoing investments in the manufacturing facilities, a number of key supply chain initiatives were identified that could improve its service levels and increase the efficiency of NHSBT operations and those of its customers, mainly NHS hospitals.

Part of the approach was to bring together several disparate committees and individuals who were involved in various stages of planning under a single integrated supply planning (ISP) or sales and operations planning (S&OP) process. However, although this brought some initial benefits, it was clear that the underlying information was not sufficiently detailed and tools were inadequate to respond rapidly to variations in demand or make supply decisions on a weekly and daily basis.

A public tender for a new planning and control system (PCS) was issued and responses were received from a number of supply chain planning solution providers.

Solution

NHSBT selected a solution proposed by ToolsGroup, choosing a number of modules of its Service Optimizer product SO99+ to support three key processes in one integrated system:

- **Demand planning:** statistical forecasting for each product based on blood group and type at individual hospital level, identification of anomalies and exceptional demand, and collaborative intelligence and support for NHSBT's demand review process
- **Inventory optimisation and deployment:** optimising safety stock levels at each of the five manufacturing sites and 15 stock holding units (SHUs), adhering to capacity constraints and providing visibility of production and donor collection requirements
- **Vendor managed replenishment:** automating the replenishment of blood supply levels in hospitals based on an optimal mix of products, reducing waste, minimising transport costs and eliminating the need for hospital staff to order products on a daily basis

NHSBT supplies red blood cells, platelets and plasma to all hospitals in England

The implementation involved integration with NHSBT's legacy supply management and online ordering systems, as well as with blood fridges and laboratory systems in hospitals. Near real-time stock levels are provided every 30 minutes from participating hospitals, which enables NHSBT to identify the optimal stocking levels and automatically generate replenishment orders. This required significant levels of testing to ensure that all potential scenarios were handled rapidly and effectively.

In addition, the PCS had to comply with ISBT 128 specifications, a new global standard for the identification, labelling, and information transfer of medical products of human origin, including blood, cells, tissues, milk and organ products. This has provided further benefits to NHSBT, which can now manage demand for specific blood products at a very granular level not previously possible.

Benefits

This solution has enabled NHSBT to implement its ISP processes. Changes in demand and supply can be flagged and acted on before supply issues arise, and the supply planning team is now able to respond to issues and questions much more quickly. The optimisation of inventory and replenishment of stocks held at the production sites and SHUs will improve the utilisation of fridges and freezers, whilst reducing the level of shipments required to rebalance stock across the network by moving to a true pull model that responds quickly to changes in demand.

As the vendor managed replenishment solution is highly automated, it has relieved hospitals of the time-consuming effort to order, manage and replenish blood supplies. The end result is an exceptionally patient-focused service that reduces costs and ensures a safe and stable blood supply for England. This has enabled participating hospitals to redeploy medical staff back to front line care in addition to savings in delivery costs of over 20% and reduction in wastage of previously overstocked items by as much as 30% during the first few months of operation.

The PCS platform provides a robust foundation for rolling this programme out to between 70 and 100 hospitals over the next two to three years, which it is anticipated will drive further benefits to individual hospitals, NHSBT and NHS blood supplies generally. Having a single source of demand data at such a granular level has also provided benefits to NHSBT's long-term strategic planning and supports what-if calculations to prepare for different scenarios or to plan for potential changes in donor and patient demographics on national, regional and local levels.

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A video case study is available to view:
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