

The New Zealand Blood Service – a ‘vein-to-vein’ supply chain



The Epsom Donor Centre in Auckland – the NZBS has blood collection sites in the main urban centres throughout New Zealand

Established in 1998, the New Zealand Blood Service (NZBS) is the only provider of blood and blood products to the health sector of New Zealand. Trilby van Bree, NZBS national manager of logistics, explains how logistics is pivotal within its supply chain.

As a Crown entity, the primary purpose of the NZBS is to ensure the availability of safe and appropriate blood and tissue products and related services to clinicians for the people of New Zealand. The NZBS operates an integrated national ‘vein-to-vein’ blood service based on the principle of voluntary, non-remunerated blood donation.

The NZBS confronts a series of distinct supply chain challenges: reliance on the altruism of volunteer donors as a raw material which cannot be procured; variable shelf life for each product type; storage and transport specifications; reliance on packaging methods and transportation options to meet compliance with manufacturing standards and regulatory standards; and aligning supply with demand to ensure 100% supply of blood while minimising expiry losses.

Key areas

The NZBS blood supply chain spans four key areas: from collec-

tion of donations, processing and accreditation testing, to blood banking.

Collection

Blood collection sites are located in six main areas – Auckland, Hamilton, Palmerston North, Wellington, Christchurch and Dunedin – and each site is responsible for donor administration and coordination of collections within their defined geographical regions.

Smaller collection centres are also located in Auckland (on the North Shore and in Manukau) and Tauranga. Mobile blood drives are coordinated within each region to service local communities, and these blood drives contribute around 47% towards the total whole-blood collection volume.

Processing

Processing (manufacturing of donations) is centralised in four sites: in Auckland, Hamilton, Wellington and Christchurch. These sites process collection volumes

of around 160,240 total donations per year comprising 122,450 whole-blood donations, 3960 plateletpheresis donations and 33,830 plasmapheresis donations. The processing of donations involves the separation of the donation into the required outputs, mainly red cells, platelets and fresh frozen plasma. Approximately 52,000 kg of plasma (containing many types of protein) per year is sent to CSL Behring in Australia whereby the proteins can be extracted by a highly complex fractionation process. The resulting blood products manufactured from the plasma are returned for use within New Zealand.

This method has enabled New Zealand to be one of only a few countries in the world to maintain a strategy of ‘self-sufficiency’ whereby the collection and manufacturing activities meet the clinical demand.

Testing

Accreditation testing is centralised into two main sites in Auckland and Christchurch. Auckland completes the testing for the mid to upper North Island while Christchurch completes the testing of donation samples for

the lower North Island and the whole of the South Island.

Testing involves two distinct processes: blood grouping, and screening for infectious markers. Each donation is required to be tested prior to release, and no product is released for issue to a patient until all mandatory and supplementary testing is complete.

Blood banking

Blood banks are the pre-transfusion testing laboratories where blood products are matched to suit each individual patient. The NZBS manages six of the blood banks which are located in the main cities alongside the district health board (DHB) managed blood banks.

Blood management

The ability of the NZBS to provide a ‘vein-to-vein’ supply chain depends on a blood management software system, eProgesa®. This system has been designed specifically to meet the functional requirements of both the blood donor centres and blood banks. The system provides information from the blood donor through to the recipient. eProgesa is installed in each DHB blood bank and



Red cells in storage



Transport shippers used for incoming and outgoing consignments

provides visibility of stock levels regionally and nationally. It also controls the testing and the selection of blood products for the patients. Data is extracted from eProgesa into a data warehouse from which analysis of demand can take place.

Scheduling and transportation

The role of logistics is pivotal within the NZBS supply chain. With mobile blood drives being located around New Zealand, the logistics teams take a significant role in scheduling and transportation planning to ensure the raw material is received at the four blood processing sites in time to meet product specifications required from the manufacturing standards.

Transport time and temperature specifications are critical in determining the type of product manufactured to meet the needs of the business. For incoming whole blood, both road and air transport is utilised. A combination of NZBS transport vehicles as well as external service providers is used. External providers have a good understanding of the nature and criticality of the product being shipped, and establishing a collaborative working relationship to develop this understanding is fundamental.

Packaging

The NZBS has invested resources towards the development of a portable packaging system. This type of shipping system has a more demanding role than a fixed

system. In addition to protecting the product from temperature fluctuations from external conditions, it is also required to retain the integrity of the product and temperature conditions during transit.

The challenge in this development and validation was to design a set of standardised transport shippers that would cover both ends of the supply chain: incoming whole blood and apheresis donations as well as outgoing finished product. The versatility of the packaging system has meant the packaging can be used for various products at different temperature ranges: from red cells between 2–10 degrees C to platelets between 20–24 degrees C.

The transport shipper is also suitable for packing whole blood donations, donation accreditation samples, frozen plasma, bone and tissue. Dry ice is used as the coolant material for frozen product. The venting capacity of the boxes has been tested to ensure the sublimation of the dry ice does not result in a pressure build-up within the shipper.

The shippers have a life expectancy of at least two to three years without any impairment of functionality. They are also easily identifiable and far surpass their cardboard predecessor which only lasted two to three weeks. Packaging is returnable and a closed loop system for the reverse logistics is managed by the NZBS.

Transit control

The portable packaging system

is accompanied by a validated blood packaging software system which provides individual packing sequences in the form of a diagram based on the type of product being packed, the quantity, transport time and ambient temperature.

The software is intuitive to follow and instructs the end user which box size to select, what ballast to use, and the placement of the ballast and components within the transport shipper.

The NZBS continually monitors the environment in which blood products are transported as incoming raw material and as finished product with Temprecord International multi-use, calibrated data loggers. This ensures strict quality and safety control when transporting blood products.

Distribution of finished product is the responsibility of the logistics teams located in the four main hub sites, and the primary customers are the 20 DHBs throughout New Zealand. Order and delivery cycles, minimum and maximum stock levels have been negotiated with each individual blood bank. Orders are prioritised, and delivery is dependent on how urgently the customer requires the product.

Demand management

A key output measure for the NZBS is product service and availability; key products and services are available at all times. Emergency orders, which are required in the shortest delivery timeframe possible where patient clinical safety is at risk, may require utilis-

ing chartered aircraft or dedicated road transport to fulfil the order. The NZBS works closely with each DHB to review current approaches with the aim of improving overall efficiency whilst maintaining appropriate levels of supply.

Demand management is an organically grown area in which the NZBS has established the methodology to forecast red cell demand by each individual blood group and align the whole blood collection requirements to develop the collection plan. The decline in the use of red cells within New Zealand reflects an international trend due to improved clinical practice and better use of resources while sustaining good clinical outcomes for patients.

The current demand management process was developed due to a business initiative to reduce wastage to less than 3% by June 2014 which has been achieved.

To manage the supply, the NZBS must accurately forecast the demand for blood products, plan where and when to collect the donations, and monitor demand against inventory and forecast data. This information is used to redistribute products between regions and modify national and regional collection plans.

Future development opportunities in the NZBS supply chain include assessing an MRP (materials resource planning) system specifically designed for use in blood centres, an electronic ordering system for blood banks and a barcode data capture platform for consumable inventory management.