

Calculating your Blood Component Inventory

How do you decide your ideal stock levels?

Rationale

Ideal or optimal inventory levels for blood components need to be defined to maximize management of your inventory. Ideally, a balanced approach to Inventory Management should be utilized as it supports both patient blood requirements and patient safety foremost, while ensuring there is an adequate blood supply for all hospitals. Hospitals should avoid overstocking or 'stockpiling' practices.

Inventory levels should be sufficient to ensure blood components are available, when required, to maintain expected patient daily needs while not being excessive resulting in high rates of discard due to outdating.¹ Blood components should be considered a valuable and limited resource and efforts should be made to avoid discarding them unnecessarily.

Inventory levels should be evaluated periodically and adjusted if needed. Once inventory levels are determined, it is important to monitor at regular intervals (through the use of quality indicators) and to do a thorough review at least annually to ensure they are still adequate. Any change within the hospital that may affect the demand for blood products such as increases or decreases in services or significant changes to surgical or clinical staff warrant a review of inventory levels.²

Important quality indicators for monitoring whether or not inventory levels are sufficient are:

- **Rate of outdating product.** If the outdating rate is high or increasing, it may be possible that inventory levels are set too high. If the outdating rate is too low, there is a risk that insufficient inventory is on hand and this may compromise patient care.
- **Number of 'STAT' requests for blood components from the blood supplier.** If there are frequent needs for urgent requests (outside of routine delivery) from the blood supplier, this may indicate that insufficient inventory is being held by the Transfusion Medicine Service.

¹ Chapman JF. Unlocking the essentials of effective blood inventory management. *Transfusion* 2007;47:190S-196S.

² Managing blood and blood product inventory – guidelines for Australian Health Provinces. April 2013. National Blood Authority Australia. www.blood.gov.au

- **Number of units being redistributed.** If a large number of units are needing to be redistributed in order to maintain a low outdate rate, it may indicate that stock inventory levels are higher than needed.

Suggested Methods for Determining Optimum Inventory Levels

Determining inventory levels for Red Blood Cells (RBC):

There are several methods to use to determine the desired RBC inventory levels to be stocked at your hospital. These include:

1. Weekly usage – record RBC use weekly by ABO group and Rh type for 6 months. Discard the highest week and then calculate the average weekly usage. This will give you the levels of red cell units to stock, by ABO and Rh for an ideal inventory level.
2. Daily usage – record RBC use each day by ABO group and Rh type over several months. Calculate the average (average daily red cell demand or ADRD). This will provide an estimated average of your needs per day by ABO group and Rh. Ideal inventory to have on hand is generally 6-9 x ADRD based on the inventory index calculation provided on the Canadian Blood Services (CBS) inventory reporting system.³ This can be adjusted if your hospital is at a greater distance from the blood supplier or if transportation for delivery of products is not dependable or is infrequent. If you are far away from the blood supplier (>3 hours) and are in a remote location, 10-12 x ADRD would be reasonable. If you are close to the blood supplier (<1 hours) it would be reasonable to hold a stock closer to 6 x ADRD.

NOTE: Historically, calculations used to determine optimal inventory levels used a denominator of 250 vs. 365 which CBS currently is using therefore optimal inventory was estimated to be equivalent to 4-6 days. Using the denominator of 365 results in a similar total number of units in optimal inventory but is equivalent to 6-9 days ADRD. This would be considered your ‘Green Phase’ or optimal inventory level.

3. Inventory Calculator tool for red cells: ORBCoN has developed a tool for hospitals to use to perform a very quick and ‘rough’ estimate of what their ideal RBC inventory may be. By entering your annual number of red cell units transfused (for the most current year), an estimate of average daily use will be calculated by the formula locked in to the table.

Once the daily estimate is calculated, the table will populate with respect to ABO group and Rh type. These numbers are based on current Caucasian population

³ CBS Inventory reporting website <https://dispositioninventory.blood.ca>

probabilities for ABO and Rh.⁴ Sites may wish to determine their own ABO proportions based upon their own patient populations.

The table will provide a display of calculated 1-day, 2-day, 5-day and 8-day inventory levels by blood group. It is necessary to review these numbers carefully and then determine what you should stock as a minimum and maximum inventory for each group. For example, if a 10-day inventory of Group O Rh Positive red cells is calculated as 24.6, the suggested inventory level to enter in your maximum for that blood group / Rh would be 25 units.

If the table calculated a 10-day inventory of less than 2 units, it is likely that this group and Rh is not required to be held at the hospital on a routine basis. It is good practice, however, to order group and Rh specific red cells for a patient if time allows rather than issuing non group and Rh specific. **Note: if the estimated inventory level for your site is small, you should ensure your inventory is sufficient to provide basic care for patients. In other words, generally, minimum on hand red cell stock should not be lower than 4 group O Rh Positive and 2 group O Rh Negative. Minimum stock levels may also depend on patient mix and proximity to other nearby hospitals, the number and frequency of transfusions that occur at the site and the delivery time from the blood supplier.**

Determining inventory levels for platelets:

Not all hospitals need to stock platelets. If the need for platelet transfusion is only elective, platelets can be ordered through the local CBS distribution site as needed. Hospitals that transfuse a large number of platelet doses and/or have a large trauma unit will likely choose to maintain an inventory of platelets on site to minimize delays in providing platelets for their patients and to minimize the frequency of blood deliveries required.

ORBCoN has also developed a tool to calculate the estimated ideal number of platelet doses to maintain on site based on the average number of doses used each day. Platelet usage can vary widely from day to day; however, the calculator tool can be used to estimate an average based on the annual use. This can provide a 'starting point' or help to validate existing stock inventory levels.

Once again, monitoring quality indicators such as outdate rate and frequency of stat deliveries will aid hospitals in determining what their ideal stock level should be. In general, equivalent of a 1-2 day average daily use will often be the best number of doses to keep on hand. Some CBS distribution sites will provide standing orders to help hospitals maintain their ideal inventory levels and maximize efficiencies of ordering/delivery.

⁴ AABB Technical Manual 17th edition. Roback J Ed. AABB Press. 2011:990.

Inventory levels for blood shortage management

Inventory levels for RBC and platelets should be determined for various phases of a blood shortage. One of the first actions hospitals will be asked to take when informed of a blood shortage will be to reduce target inventories, thus increasing the total pool of available blood inventory to provide coverage for life threatening needs.

In the Ontario Hospital Toolkit for Emergency Blood Management,⁵ instructions are provided to help hospitals determine appropriate target levels of inventory to stock during Green, Amber or Red phases of a blood shortage. Notification of a blood shortage will be received through each hospital's local CBS distribution site. This toolkit may be found on the website www.transfusionontario.org under the 'toolkits' tab.

⁵ Ontario Hospital Toolkit for Emergency Blood Management version 3 October 2016 .