National Guidance for the Management of Red Blood Cell Inventory

National Blood Authority

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Contents

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Background

The guidance in this document will assist Australian Health Providers (AHPs) to implement the *National Statement for the Emergency Use of Group O Red Blood Cells*[1] and take appropriate actions to improve inventory of all red blood cell (RBC) groups and reduce reliance on group O RhD negative. RBC group distributions have changed in Australia[2] and inventory holdings need to be reassessed to reflect this change and to meet patient demand.

Whilst only 6.5%[2] of the Australian population are group O RhD negative, group O RhD negative RBC have represented as high as 17% of total RBC issued to AHPs. Managing the appropriate use of group O RhD negative RBC (see *National Statement for the Emergency Use of Group O Red Blood Cells*[1]) will assist in reducing the level of group O RhD negative inventory needed. This will deliver significant benefit across the sector, as group O RhD negative RBC donors and supplies are always under pressure.

In most situations, RBC inventory practices should aim to maintain stock numbers that meet clinical need while at a low enough level to minimise time expiry. For example, this could be holding three to five-days stock cover in AHPs in metropolitan areas. AHPs in regional and remote areas should consider their distance from a distribution centre when reviewing their ordering practices.

An accurate inventory count must always be provided when placing an order, including any Group O RBC which have been allocated for emergency use. *This is especially important when restrictions are in place at the Australian Red Cross Lifeblood (Lifeblood), to ensure blood is available for all patients requiring transfusion.*

Two key references that outline responsibilities for inventory management in health settings are the:

- *Australian Health Ministers' Statement on National Stewardship Expectations on the Supply of Blood and Blood Products*[3] (Stewardship Statement), and
- *National Safety and Quality Health Service Blood Management Standard*[4]; specifically, actions:
  - 7.09 Storing, distributing, and tracing blood and blood products.
  - 7.10 Availability of blood.

This document should be read with:

- 10 Tips to Help your Blood Product Inventory[5]
- Managing Blood and Blood Product Inventory: Guidelines for Australian Health Providers[6]

Note: AHP refers to laboratories and hospitals throughout this guidance unless otherwise stated.

Inventory management principles

Inventory governance

Policies and procedures followed at a local level can have a significant impact on inventory management performance. It is important to establish local policies, which adhere to the state and territory or national guidelines where applicable, to standardise practices between staff, and to review local policies regularly to assess whether they are reflecting best practice.

Where a policy or procedure may need to be negotiated with clinicians who use the laboratory service. The Blood Management, or Hospital Transfusion Committee or equivalent Governance Committee must be involved to assist in achieving positive outcomes. Where an AHP has a Transfusion Clinical Nurse Consultant (CNC) or Patient Blood Management Officer or equivalent, they may also be helpful in negotiating a solution that is satisfactory for the laboratory and the clinicians. For example, when determining the length of time crossmatched units are held in hospitals without an on-site laboratory.

Note: Governance Committee refers to the following equivalent committees (or similar) throughout this guidance unless otherwise stated: Blood Management Committee, Hospital Transfusion Committee, Patient Blood Management Committee.

Practice stock rotation

Units of group RBC (O RhD negative or positive) that are designated for emergency use e.g., medical retrieval services, need to be rotated back to the general blood inventory to minimise waste due to time expiry. It is recommended that AHPs establish a local guideline for the age at which RBC units should be rotated/transferred back into general stock from the designated emergency holdings. This should include the frequency of review of expiry dates, for example daily or weekly.

Note: The age of transfused RBCs does not contribute to increased mortality as evidenced by randomised controlled trials.[7,8]

Transfer Arrangements

Laboratories should consider developing transfer arrangements with other AHPs (laboratories or hospitals). Smaller laboratories may need to send older blood products to a larger laboratory where it is more likely to be used prior to expiry to minimise wastage. The age at which blood products are transferred should be agreed and documented between the AHPs involved to ensure that sufficient shelf life/age remains when the units arrive in the receiving laboratory (between 7- to 14-days to expiry).

Documentation should outline an effective communication system for notification of pending transfers, allowing the receiving laboratory to include the units in their own inventory count so that over-stocking is avoided. The Managing Blood and Blood Product Transfers[6] guideline provides more information for laboratories and hospitals on better practice in transfers of blood products around Australia.

Logistics

Utilising current sector transport arrangements can assist AHPs to save time and resources managing transfer arrangements, especially in regional and remote areas. These could be used to transport inventory within the local area, so that additional costs of transport are not incurred. Consider the following options:

- existing routine pathology collection times and routes
- contacting your local Lifeblood customer service representative for delivery times and routes that could be used to transfer stock between laboratory or hospital sites
- setting up an arrangement with other AHPs in your geographical area to use the same pathology and laboratory transport routes.

Consideration should be given to routine order delivery times from Lifeblood, logistics of additional transport arrangements, inventory days cover requirements, and the effect each of these will have on inventory.

Optimise crossmatching procedures

Group and screen should be standard policy for patients where there is a low possibility that RBCs may be required for transfusion for patients without clinically significant antibodies.[4] There should be a policy in place for patients with clinically significant RBC antibodies.[5,9]

Minimise the number of units allocated. Consider only issuing one unit at a time using a validated electronic crossmatch, as clinically appropriate. This will minimise RBC inventory that is cross-matched and allocated to specific patients, and therefore unavailable for use by other patients and/or excluded from stock counts.

Minimise the time crossmatched units are held. RBC units are removed from inventory when crossmatched for a patient and can cause unnecessary replacement orders.[6] AHPs should consider a 24-hour crossmatch reservation policy,[5] agreed to by the local Governance Committee. All on site laboratories supplying a 24-hour service, ideally, must return non-transfused 'electronically allocated' RBC units to stock within 24-hours. Laboratories located off-site from a hospital could consider setting the maximum crossmatch time to 48 hours.

Use a Maximum Surgical Blood Order Schedule (MSBOS) to guide your 'group and screen' or cross-matching procedures. Most requests should remain 'group and screen' except for critical bleeding and complex surgeries such as cardiothoracic, solid organ transplant and trauma. A MSBOS is a table listing surgical procedures and the recommended approach to transfusion support, such as 'group and screen', or the number of units that should be cross-matched and allocated prior to surgery. An example can be found in the ANZSBT Guidelines.[10] Local historical transfusion data can be used to customise the MSBOS and should be reviewed at least annually to ensure that recommendations remain relevant.

Monitor your crossmatch to transfusion ratio (C:T ratio) to provide an indication of the level of appropriateness in the requesting of 'group and hold' versus crossmatch for surgical patients. The C:T ratio is calculated from the number of units that are cross matched over a particular period, divided by the number of units that were transfused for specific types of surgery.[6] The C:T ratio provides Governance Committees with a monitoring tool for RBC ordering practice. The closer the C:T ratio is to one, the more efficient the use of RBCs, leading to a reduction in unnecessary crossmatches, decreased wastage and a reduction in RBC inventory requirements.

Review red blood cell inventory levels

A review of current inventory practices and all RBC group holdings (in reference to local and national ABO/RhD group distribution) should be undertaken at least annually to determine the appropriate holdings.

An additional inventory review is warranted whenever there is a change in hospital or clinic activity, for example, during holiday closures or downtimes, and when RBC wastage due to expiry may increase.

A review of inventory can be made using the areas described in this guidance and the reports available in BloodNet. AHPs that use BloodNet can access reports on issues, transfers and discard data from within BloodNet.

An **Inventory Review Report** will soon be available in BloodNet. The Inventory Review Report will help to estimate required inventory levels using days cover for each ABO and RhD group.

It is important to consider all contributions to your inventory management including transfusions, patient and issued ABO/RhD groups, group substitution, transfers in and out, delivery frequency, crossmatched units, inventory held elsewhere and discards due to expiry.

Reporting Inventory in BloodNet

All RBC units not crossmatched for specific patients should be counted as inventory, including those reserved for emergency use. The inventory holdings by AHPs reported in BloodNet are shared with Lifeblood daily to determine jurisdictional and national RBC levels. These levels assist Lifeblood with understanding the RBC demand for planning. There are three ways for an AHP to report their inventory in BloodNet:

1. by entering inventory ‘on hand’ into BloodNet when an order is placed
2. automatically every 15 minutes for AHPs who have a laboratory information system (LIS) interfaced with BloodNet
3. through the ‘Report Inventory’ module in BloodNet, the ‘Report Inventory’ module is used to manually record the amount of inventory on hand in a facility at any given time so it can be used for reporting, pre-activation and or during an activation of the National Blood Supply Contingency Plan.[11]

Identify product not counted as inventory

Many AHPs hold some product that is not counted in daily stock counts but must be considered when creating an order. This may include:

- units that have been delivered to the AHP but not electronically receipted or group checked
- deliveries from remote sites not yet receipted
- phenotyped units reserved for oncology or chronically transfused patients
- emergency group O RBC held in remote fridges or medical retrieval packs.

When there are supply restrictions from Lifeblood, it may be appropriate to return allocated units that have not been transfused to stock before the allocation time has expired.

NOTE: Consideration should be given to group O RBC held for emergencies in the laboratory, elsewhere in the hospital, with retrieval services, or in refrigerators at remote sites as these units may be due to be returned to stock and replaced.

Consider satellite / off-site blood fridges and remote sites

NOTE: For the purposes of this document, satellite/off-site blood fridges and remote sites are those not within or adjacent to a laboratory.

It is ideal to include all emergency group O RBC held at satellite/off-site blood fridges and remote sites as part of the laboratory's inventory when reviewing stock levels.

Group O RhD negative RBC inventory held for emergency use in satellite/off-site blood fridges and remote sites without a laboratory on-site should be reviewed to determine if O RhD positive units can be used in accordance with the *National Statement for the Emergency Use of Group O Red Blood Cells*.[1] Effective communication is required between sites with satellite/off-site blood fridges and remote sites that transfer RBC that are near expiry back to a laboratory prior to the transfer to minimise over-ordering by the receiving laboratory.

Cold chain management of inventory held in satellite/off-site blood fridges and remote sites is critical to ensuring inventory can be transferred to other sites if required. This includes appropriate maintenance, monitoring and documentation of blood fridges/freezers and blood transport containers.

It is recommended that AHPs undertake a risk assessment, including consultation with pathology staff to ensure accurate transfusion information is used, when reviewing group O RBC emergency inventory requirements. The risk assessment should consider:

- the local population needs including location, demographics (age, sex, ethnicity), population specific services
- the clinical requirements and service mix; for example, does the hospital provide obstetric, surgical or 24-hour emergency services
- the time to replenish if inventory is depleted (from Lifeblood or another laboratory or hospital travel time of one hour)
- transfer arrangements (routine and ad hoc)
- number of deliveries per day/week
- number of historical emergency transfusions, for example within a 1-year period.

Emergency group O RBC inventory for hospitals without an on-site laboratory should follow jurisdictional, local health network or organisation policy and procedures, where provided.

Hold the appropriate ABO RhD group for your population

Inventory management is a balance between ensuring product is available to meet patient needs, appropriate use, and minimising wastage. Best practice for AHPs with a high RBC stock turn-over is to hold group B and AB RBCs. **Not ordering group B or AB RBCs and substituting with group O RBCs creates unnaturally high demand and impacts availability across the sector.**

Group O RBC **should not** be routinely used for patients that are not group O. Further clinical information is available from:

- Lifeblood - Use of group O RhD negative red cells | Lifeblood[12]
- ANZSBT - Guidelines for Transfusion and Immunohaematology Laboratory Practice (anzsbt.org.au)[10]

Medium, large and super-size laboratories (see Appendix 1) should review their transfusion data to determine the ABO/RhD groups of their patient population. This will provide a guide for the number of less frequent groups the inventory should hold. Medium, large and super-size AHPs should consider holding all ABO/RhD groups. Referring to current consensus statements, clinical guidelines and local requirements could help align ordering with a balanced inventory.[10]

Determining the population ABO/RhD group frequencies

Population ABO/RhD groups can provide guidance on the percentage of each blood group an AHP should stock in their inventory. The following should be considered when reviewing ABO/RhD inventory:

- Australian population distribution[1].
- local population/hospital distribution
- blood group transfused to patients, this may not be the patient's blood group
- local patients' actual blood groups

Group substitution needs to be taken into consideration if the laboratory routinely uses compatible cross-group units for transfusion. The results could indicate a higher or lesser demand for some groups, e.g. group O RhD negative.

Consider the number of units transfused with group substitution to prevent time expiry. If this is high, then consider reducing inventory stock of those groups used to substitute. Discards of an ABO/RhD group due to time expiry may be low due to group substitution rather than appropriate inventory stock levels e.g. group O RhD negative.

While product substitution cannot always be avoided, RBC products being transfused in elective clinical situations should be the same group as the patient where laboratory staff have the time to plan for patient transfusion requirements. Examples include elective surgery, planned oncology and haematology admissions and routine transfusions.

There are various ways AHPs can determine how often they are using group substitution. A simple way to start is to review one or two blood groups over a short time period (e.g. a 3-month period) and compare the patient's blood group to that transfused. This information is available in the laboratory information system.

Consider transfers

It is important to review the effect that transfers in and out of the AHP have on inventory. AHPs that have a hub and spoke arrangement can manage expected transfers more easily than those who receive stock on an ad hoc basis, especially where sufficient notice is not provided to the receiving AHP.

AHPs that manage their inventory by sending a large percentage of their stock to another site to prevent time expiry should review their inventory numbers and blood groups held to minimise over-ordering and excessive transfer of close to expiry blood products. AHPs should have an effective communication system for notification of pending transfers.

Monitor and optimise your group O RhD negative RBC use

AHPs should monitor the proportion of total inventory that is group O RhD negative, including units that are held in remote, or emergency stock locations and with medical retrieval services. A review of group O RhD negative stock levels should include the following considerations. Table 1 below is also available at the end of this document for printing.

Table 1: Optimising group O RhD negative RBC inventory checklist

Consideration	✓
Use group O RhD positive emergency RBC units where appropriate.	☐
Minimise/reduce the number of group O RhD negative units kept in emergency packs in different locations at the same AHP.	☐
Reduce group O RhD negative units kept in inventory when group O RhD positive emergency packs are introduced.	☐
Review the amount of group O RhD negative inventory being transferred in from AHPs off site.	☐
Develop agreements with AHPs transferring product regarding the days remaining to expiry at the time of transfer.	☐
Review your inventory management practices and determine how the volume or age of group O RhD negative units transferred from your AHP are impacting inventory management and performance at the receiving AHP.	☐
Consider having arrangements with several AHPs to ensure you transfer to those that are most able to utilise the product, especially if you transfer stock close to expiry on an ad hoc basis.	☐
Compare group O RhD negative RBC transfusion patterns with true clinical demand to assess the proportion of group O RhD negative units that are being used in patients of other blood groups.	☐
Consider all group O emergency units, with an emphasis on units that may be returned to the laboratory; this includes units that have been allocated, and those held in remote fridges, hospitals without a laboratory onsite and medical retrieval packs.	☐
Review the percentage of group O RhD negative inventory compared to other ABO RhD group inventory. **Consideration should be given to reducing group O RhD negative inventory in medium, large and super-sized AHPs if group O RhD negative issues are close to or greater than 12% of all issues.**	☐

Types of orders

Stock orders are those placed in BloodNet as required, to maintain/top-up inventory. These could be routine, urgent or life-threatening.

Special orders are used for patient specific orders and blood components of extended phenotype and/or which require special processing e.g. modifiers and antigens.

Consider the proportion of orders that are stock versus special for each ABO/RhD group including:

- Could special orders be reduced by modifying the routine or stock order template in BloodNet? Could these be included in the routine stock order template?
- Are routine or stock order quantities reduced when placing additional special orders to avoid ordering too much stock?
- Check the inventory for the required modifiers and antigens before placing an order.

Note: Stock or special orders may be influenced by medical officer (MO) restrictions.

Special considerations

Emergency Transfusion

The *National Statement for the Emergency Use of Group O Red Blood Cells*[1] provides guidance and a flowchart on recommendations for the emergency use of group O uncrossmatched RBC.

It is recommended that AHPs undertake an audit following implementation of the emergency use of group O RBC clinical guidance. See Appendix 2 for suggestions.

Haemovigilance Reporting

Monitor for, and report, all transfusion reactions to the appropriate haemovigilance and/or clinical incident reporting systems.

Monitor for, and report, any acute transfusion reactions following emergency use group O (RhD positive or negative) RBC transfusion.

Single Unit Transfusion Policy

Implement a Single Unit Transfusion Policy for haemodynamically stable, non-transfusion dependent adult patients. The following two documents can assist with transfusion decisions:

- *Single Unit Transfusion Decision Support Tool*[13]
- Implementing a Single Unit Blood Transfusion Policy: Key Actions for health services organisations and accrediting agencies[14]

Implementing changes

A change in inventory levels may be small or large, in either case, staff may be concerned about having sufficient inventory to meet clinical demand. Two approaches to changing inventory levels are:

- **Full change to inventory levels** – making one change to inventory levels may be easier for staff to become accustomed to and create less opportunity for misunderstanding than incrementally altering inventory levels over a period to reach the proposed level.
- **Incremental change** – AHPs concerned about product sufficiency when reducing inventory levels may decide to gradually alter inventory levels, or commence by reducing levels of one group e.g., group A. This will allow for monitoring during the implementation of the change and may assist in assuring staff that there will be no detriment to meeting clinical demand. AHPs could consider a trial period of inventory change followed by a review and evaluation.

Each approach has advantages and disadvantages. Proximity to a Lifeblood distribution centre or an alternate source of supply may be a factor in deciding to try a full change to inventory levels.

Inventory Review Considerations

The **Inventory Review Report** for BloodNet is in development and will provide a guide for AHPs to consider when reviewing their inventory holdings. The **Inventory Review Report** will not consider distance to other facilities or a distribution centre (e.g. if product was needed quickly), existing transfer arrangements, or any other industry complexities.

When available, the **Inventory Review Report** is intended as a guide and decision-making tool for AHPs to consider adjustments to their inventory.

It is important to consider all contributions to your inventory management including:

- transfusions, including historical emergency transfusions
- mix of ABO and RhD groups held in inventory
- group substitution
- transfers in and out, routine and ad hoc arrangements
- delivery frequency, number of deliveries per day / week
- crossmatched units
- inventory held elsewhere
- discards due to expiry
- range of clinical requirements and mix; for example, does the hospital provide an obstetric service or trauma service
- population demographics and projected changes
- seasonal population changes; for example, tourist season
- proximity to major roads and industrial sites
- alignment with trauma and retrieval plans
- geographical location and the time to replenish if inventory is depleted (from Lifeblood, another laboratory within a one-hour distance, transport links).

Appendix 1 - AHP size

AHP size referenced in the document refers to the definition provided in BloodNet based on the annual number of RBC issues received by an AHP.

AHP size		Annual Issues
Super	>=	10,000
Large	>=	5,000
Medium	>=	2,500
Small	>=	500
Very Small	>=	150
Exempt	<	150

Appendix 2 – Considerations for audits

The *National Statement for the Emergency Use of Group O Red Blood Cells*[1] provides guidance and a flowchart on recommendations for the emergency use of group O uncrossmatched RBC.

It is recommended that AHPs undertake an audit following implementation of the emergency use of group O RBC clinical guidance including:

- monitoring the implementation rate
- reviewing the number of group O RhD negative RBC units routinely held in inventory and adjust as appropriate
- reviewing the numbers of emergency transfusion of group O RBC to non-group O patients
- monitoring the transition to group specific units during emergency transfusion
- monitoring the time taken to obtain a Group and Screen specimen to compare with the number of uncrossmatched units issued.

Appendix 3 – Glossary and definitions

AHP	Australian Health Provider. Refers to laboratories and/or hospitals who are approved to receive blood and blood products.
ANZSBT	Australian and New Zealand Society for Blood Transfusion.
Governance Committee	Refers to Blood Management Committee, Hospital Transfusion Committee, Patient Blood Management Committee or other local terminology.
LIS	Laboratory information system.
MSBOS	Maximum Surgical Blood Order Schedule.
NBA	National Blood Authority.
Remote sites	Satellite / off-site blood fridges and remote sites not within or adjacent to a laboratory.
Stock order	Orders to maintain/top-up inventory. These could be routine, urgent or life-threatening.
Special order	Patient specific orders, blood components of extended phenotype and/or which require special processing.

Optimising group O RhD negative RBC inventory checklist

Consideration	✓
Use group O RhD positive emergency RBC units where appropriate.	☐
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Reduce group O RhD negative units kept in inventory when group O RhD positive emergency packs are introduced.	☐
Review the amount of group O RhD negative inventory being transferred in from AHPs off site.	☐
Develop agreements with AHPs transferring product regarding the days remaining to expiry at the time of transfer.	☐
Review your inventory management practices and determine how the volume or age of group O RhD negative units transferred from your AHP are impacting inventory management and performance at the receiving AHP.	☐
Consider having arrangements with several AHPs to ensure you transfer to those that are most able to utilise the product, especially if you transfer stock close to expiry on an ad hoc basis.	☐
Compare group O RhD negative RBC transfusion patterns with true clinical demand to assess the proportion of group O RhD negative units that are being used in patients of other blood groups.	☐
Consider all group O emergency units, with an emphasis on units that may be returned to the laboratory; this includes units that have been allocated, and those held in remote fridges, hospitals without a laboratory onsite and medical retrieval packs.	☐
Review the percentage of group O RhD negative inventory compared to other ABO RhD group inventory. **Consideration should be given to reducing group O RhD negative inventory in medium, large and super-sized AHPs if group O RhD negative issues are close to or greater than 12% of all issues.**	☐

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