CLINICAL PRACTICE STANDARD — Aeromedical Operations
AO.CLI.11 – Blood Management

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Contents	**Clinical Practice Standard** AO.CLI.11 – Blood Management
	Appendices **1. RiaStap Reconstitution Card**
Associated Policy Directive/s and/or Operating Procedures/s	AO.CLI.19 – Traumatic Haemorrhage Control
Directorate	Aeromedical Operations
Author Branch	
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Summary	This procedure provides guidance on the management of blood during retrieval missions. It includes the process of packing, delivery, storage, transport, administration and documentation.
Applies to	NSW Ambulance Aeromedical clinical crews
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Related Legislation Nil

Related Documents Nil

Compliance with this operating procedure is mandatory

CLINICAL PRACTICE STANDARD — Aeromedical Operations
AO.CLI.11 – Blood Management

1. Introduction

NSW Ambulance Aeromedical Operations perform pre-hospital and inter-hospital critical care retrievals of many patients with haemorrhagic shock. Packed red blood cells (and other blood products) are provided for the purposes of transfusing patients with obvious severe injuries, persistent life-threatening bleeding or haemodynamic instability after meticulous attention to haemorrhage control.

2. Purpose

This procedure describes the process of storage, transport, administration and documentation of blood transfusion to ensure timely and safe delivery of blood to the patient whilst minimising wastage during retrieval missions.

3. Procedure

3.1 Packing

Blood eskies containing blood products (with corresponding paperwork) are packed by local blood banks. Liverpool Hospital Blood Bank (LHBB) provides blood products for the NSW Ambulance / Toll Aeromedical Base at Bankstown while The Wollongong Hospital Blood Bank (TWHBB) and Orange Health Service Blood Bank (OHSBB) provide blood for the Aeromedical teams at those respective bases.

The blood esky consists of six pre-conditioned cells that are enclosed within an insulated container capable of maintaining safe temperatures for 80 hours in normal operating conditions. Care must be taken not to puncture the insulated container otherwise this will affect the storage of the enclosed blood. Each esky also contains a temperature logging device which must remain within the esky at all times.

Four eskies are provided to the NSW Ambulance / Toll Aeromedical Base at Bankstown Airport. Two of the four eskies will contain three units of O negative packed red blood cells (PRBC) and the other two eskies will contain two units of O negative PRBC and two units of Group A Extended Life Plasma (ELP).

In the event that blood products supplied from a referring hospital are to be transported with the patient, it is the responsibility of the medical team to request that the blood products be packed into dedicated blood shippers. Failure to do so will mean that any unused blood products must be discarded at the receiving hospital. Similarly, any blood products that remain in the shipper once it has been opened will also be discarded at the receiving

hospital. If a blood shipper is returned to the receiving hospital blood bank unopened, the products may be returned to the blood pool circulation.

3.2 Blood Delivery

The blood eskies are changed on Monday, Wednesday and Friday by the blood courier (FRF Couriers 9559 9000) at the NSW Ambulance / Toll Aeromedical base at Bankstown. Four new eskies are delivered to the air lock of the foyer in the operational building between 0730 and 0900 on these days and the four old eskies returned to the Blood Bank to enter the pooled donations.

Should any of the old blood eskies not be available for exchange due to their requirement for a mission, the four replacement eskies will still be left. It is then the responsibility of the duty crews rostered on the day shift to make alternative arrangements for the return of the old esky or eskies to Blood Bank. This may involve utilisation of the road paramedic, operational support paramedic, Duty Retrieval Consultant (DRC) or a taxi with cab voucher.

Eskies must be returned to LHBB within 80 hours of delivery to the base to avoid wastage (due to temperature excursions).

3.3 Storage

It is the responsibility of the medical crews to ensure that the blood eskies are signed into the Blood Esky Register after delivery. This will involve documentation of the serial number on each esky seal as well as the letter corresponding to the esky (ie. A through to J).

Two eskies will be identified as the helicopter eskies (H) and the other two as the road eskies (R). A pouch containing a blood warmer will be kept with each esky. The helicopter eskies are to be stored in the ready room and the road eskies will be stored in the operations room whilst waiting to be utilised for a mission.

One of each of the eskies (PRBC only and both PRBC and ELP) will be initially allocated to each transportation modality (ie helicopter and road vehicles). It is at the discretion of the Aeromedical teams to decide which esky may be required for the mission at the time of tasking. In general, the esky containing PRBC and ELP will be taken on missions where there is a high likelihood that the patient may require blood products.

Unless the blood eskies are taken on a mission, they will remain in their respective locations until 0730 on the days of exchange when the day shift staff will relocate the eskies to the air lock of the foyer of the operational building for collection by the courier.

In the event of blood being required for fixed wing missions, a request may be made through the Aeromedical Control Centre (ACC) for an esky to be delivered to the Air

Ambulance at Mascot by the road or operational support paramedic. In the event that the blood esky is not used, it is the responsibility of the doctor performing the mission to organise return of the blood esky either to the Aeromedical base or Liverpool Hospital Blood Bank.

The retrieval blood eskies should not be dispatched on missions where an Aeromedical doctor has not been tasked - if blood is required for such a mission, supply should be organised through ACC via alternate sources, such as the Australian Red Cross Blood Service (ARCBS).

3.4 Blood Transport

The blood esky should be stored in the Integrated Aeromedical Module (IAM) in the helicopter or strapped to the floor or shelf in the road ambulance during transport.

The blood esky should remain in the vehicle whenever possible to reduce the likelihood of it being left behind at a scene.

The blood esky can be winched to a scene using the red winch utility bag if required.

3.5 Utilisation of Blood

Blood transfusion should never be a substitute for meticulous attention to haemorrhage control. The indications for use of NSW Ambulance blood transfusion include:

- **Pre-hospital:**
  Persistent haemorrhagic shock despite haemorrhage control measures after crystalloid infusion.
- **Inter-hospital:**
  Persistent haemorrhagic shock where there is limited or no access to cross-matched blood and ongoing requirement for transfusion.

The blood esky is opened by breaking the seal attached to the zippers. The blood units and paperwork MUST be checked for matching numbers, expiry date and blood type prior to utilisation.

Blood products are administered through a blood transfusion pump set. A double spike adaptor, if not already present, may be added to the line to maximise the rate of delivery. A fluid warming device (such as the MEQU fluid warmer) may also be utilised to minimise heat loss and mitigate the impact of hypothermia on trauma-induced coagulopathy (TIC)[1].

The esky should only be opened with the intention of administering all units of blood products. The exception to this is children. If all blood units are not given by the retrieval

team, they should endeavour to ensure that the receiving hospital utilises them before starting on the hospital supply. **Once the esky seal has been broken, the blood cannot be repacked and reused and will be discarded by the blood bank**. Used blood bags must not be repacked in the esky as this may cause contamination to blood bank staff as well as contamination through leakage within the esky.

Similarly, when blood products are provided to the Aeromedical team in a blood shipper either as part of a Retrieval Transfusion Procedure (RTP) or from a referring hospital, the shipper should only be opened with the intention of administering all units contained within. Different product types will be packed in separate shippers due to requirements for storage at different temperatures. Once the shipper is opened, blood bank staff are unable to guarantee that the temperature of the blood products have remained within the required temperature range to allow return of the products to stock.

On return to base, if retrieval blood is utilised, the opened esky should be left in the operations room and put aside for collection by the courier at the next exchange. **In the event that two or more eskies of blood are utilised and blood esky changeover is still more than 24 hours away, we will request only ONE replacement esky** (Liverpool Hospital Blood Bank 87385020). The Duty Retrieval Consultant (DRC) may be contacted to facilitate this. Arrangements for collection will be the responsibility of the DRC or duty crew as there is no blood courier other than on the three designated days.

If a replacement esky is requested, ONE esky only must be returned to blood bank to ensure that there are always four blood eskies at Bankstown Aeromedical base.

3.6 Documentation

When administering blood, the **blood unit number MUST be documented on the retrieval patient case sheet** and the enclosed paperwork left with the receiving hospital. This applies to all blood products transfused by Aeromedical teams, irrespective of whether the blood has come from our shipper, from a referring hospital or as part of a RTP. If this is omitted, it will be the responsibility of the retrieval doctor to follow this up. This will ensure that a link is maintained between the ARCBS blood donor and recipient.

Blood unit numbers must also be documented on the Air Maestro database under the “Treatment” tab, irrespective of the source of supply.

3.7 Blood Paperwork Checks

Blood products supplied to Aeromedical teams will have accompanying paperwork which must be cross-checked with the blood component and compatibility label. This must be performed by two people and is applicable to both crossmatched and uncrossmatched blood products.

The following information must be verified for all blood products:

- Blood product type (eg. Red blood cells, platelets, fresh frozen plasma (FFP), extended life plasma (ELP), cryoprecipitate, fibrinogen concentrate)
- Blood product number (or batch number in the case of fibrinogen concentrate)
- Blood product group
- Expiry date and time
- Name (eg. Helicopter retrieval A, pack ID A).

Where crossmatched blood is supplied, the patient's identification details (name, date of birth (DOB), medical record number (MRN), blood group) must be verified against the blood component and compatibility label as well as the accompanying paperwork.

On rare occasions, it may be necessary to administer other uncrossmatched blood products besides packed red blood cells. Whilst the **universal donor for red blood cells and platelets is O negative, the universal donor for plasma (ELP or FFP) is AB** (Rh status not relevant)[2]. Given that Group AB make up only 2-3% of the population, there would be insufficient amount to supply Aeromedical teams so Group A ELP is used instead. This has a low titre of Anti-B and is widely used for unknown patients requiring massive transfusion.

3.8 Activation of the Retrieval Transfusion Procedure (RTP)

In the event that a patient is identified as having life-threatening haemorrhage requiring a massive transfusion, additional blood products can be organised through the Aeromedical Control Centre (ACC). This is applicable to both pre-hospital missions and retrievals from referring hospitals in remote locations where additional blood products are unavailable.

The ACC will be the central hub for activating and co-ordinating the RTP activation process for retrieval services in collaboration with the State Retrieval Consultant (SRC) and other stakeholders.

Early identification and activation as well as good communication are the keys to success. The vital information required by the SRC are in the message format "CLOT".

Clinical Report – Patient's demographics (gender, DOB or estimated age), clinical condition and need for extra blood products.
Logistics / Operational Plan – Time until extrication and perceived "time window" on scene.
Transport Plan – Need for refuel and destination. This is detailed further in "WORK INSTRUCTION – ACC.OPS.305 – Retrieval Transfusion Procedure". Blood components

must be used within four hours of removal from their storage container. Once the RTP is activated, products may not be suitable for return and will be discarded if unused.

3.9 Fibrinogen Concentrate

Fibrinogen concentrate (RiaStap) is derived from human plasma. Fibrinogen (coagulation factor I) is required for clotting and is present in cryoprecipitate which must be thawed prior to being dispensed by blood banks. The delay caused by thawing the product may make it unfeasible for cryoprecipitate to be supplied as part of a RTP. Fibrinogen concentrate does not require thawing and can be rapidly dispensed.

Fibrinogen concentrate is presented as one vial of powder for injection containing 1g of human fibrinogen and one vial of diluent containing 50mL of water for injection. This needs to be reconstituted, ensuring that the solution is not shaken during preparation as this will cause it to foam. The reconstituted solution should be given via a dedicated IV line (ie not mixed with any other drugs or intravenous solutions) and must NOT be given via a fluid warming device. Refer to Appendix 1 - RiaStap Reconstitution Card.

3.10 Local Arrangements

Wollongong Base

One packed esky containing three units of O negative blood will be delivered to and collected from the NSW Ambulance / Toll Aeromedical base at Albion Park as per local arrangements by taxi (Khaled 0435 563 363). This will occur between 0730 and 0830 on Monday, Tuesday, Thursday and Saturday. The blood esky will be signed into the Blood Esky Register after delivery and stored in the ready room to ensure that it remains at a consistent temperature.

Each blood unit will have a yellow tag attached to it which must be checked against the blood product and enclosed paperwork. There will be two copies of the paperwork enclosed in the blood esky. One copy is to remain with the patient and the other copy is to be returned along with the patient's details to TWHBB (via email to Erica.Diiorio@health.nsw.gov.au). The blood unit number(s) must be recorded on the patient's casesheet and on the Air Maestro database.

If blood is utilised, it is the responsibility of the duty crew to contact TWHBB to arrange replenishment of supply (Blood Bank 42225452).

Orange Base

One packed esky containing three units of O negative blood will be delivered by courier to the NSW Ambulance / Toll Aeromedical base at Orange between 0900 and 1000 daily. The esky will be placed in the secure blood delivery cabinet by the courier. The day shift is responsible for placing the previous day's esky in the cabinet at the start of the shift in time for the courier to exchange the eskies.

If the duty crew are not on base and the hangar is locked at delivery time, the courier will leave the fresh esky in the blood delivery cabinet. In this circumstance, the duty crew must return the previous day's esky to the OHSBB at some stage during the shift. This is to ensure the previous day's esky is preconditioned in time for the following day.

The blood esky will be kept in the ready room at all times when the crew are on base to ensure it remains at a consistent temperature.

In the event that blood is utilised, the blood unit number(s) must be documented on the patient casesheet and the Air Maestro database. It is imperative that a record of the patient's details and the fate of each product including the transfusion time of each unit is completed on the Form 41 (Transfusion Record of Blood Products Dispatched outside of Local Hospital) which will be included with the blood paperwork. This MUST returned to OHSBB and can be sent via email (Irene.Chan@health.nsw.gov.au and Evangeline.Immanuel@health.nsw.gov.au) or fax ((02) 6361 5096) or placed in the empty esky before returning it to OHSBB. Similarly, this should occur with any blood products from an RTP provided by any blood bank in Western NSW Local Health District.

In the event that blood is utilised, it is the responsibility of the duty crew to contact OHSBB (6361 5000) to arrange replenishment of supply. The duty paramedic will be responsible for collecting the new blood esky from OHSBB.

4. References

1. Frith D. Brohi K. The Pathophysiology of Trauma-Induced Coagulopathy. Curr Opin Crit Care. 2012 Dec; 18(6):631-6.
2. Blood Bank Australian Blood Administration Handbook, First edition, March 2020.

5. Additional Resources

1. Guidelines for the Administration of Blood Products. Australian and New Zealand Society of Blood Transfusion.
2. Australian Red Cross Blood Service website http://www.transfusion.com.au/

3. BloodSafe eLearning Australia. Transfusion practice and patient blood management education online. Available at https://www.bloodsafelearning.org.au

APPENDICES

1. RiaStap Reconstitution Card

REVISION HISTORY

Version (Document #)	Amendment notes
Version 5.0	3.3.3 Allocation of eskies to vehicles 3.3.5 Utilisation of blood shippers Esky return in exchange for a replacement esky 3.3.6 Documentation 3.3.7 Blood paperwork checks 3.3.8 Activation of the Retrieval Transfusion Procedure 3.3.9 Fibrinogen Concentrate 3.3.10 Update to local arrangements at Wollongong and Orange Base Appendix - RiaStap reconstitution card
Version 4.0 Issued 29 July 2020 WI2020-080	3.1.2 Esky contents at Bankstown base 3.3.3 Allocation of extended life plasma 3.5.6 Instruction on when to request a replacement esky once blood is utilised 3.6.4 Compatibility of blood products 3.8.1 Change to blood supplied to Wollongong Aeromedical Base 3.8.2 Change to blood supplied to Orange Aeromedical Base Transition and naming convention to the new format Approved by A/Executive Director, Aeromedical Operations
Version 3.0 Issued 28 November 2017	Transition to new format and inclusion of following sections: 3.1.3 Packing of blood products from referring hospitals 3.2.1 Increase in number of eskies 3.5.4 Fluid incompatibility with blood transfusion 3.5.6 Instruction on when to request a replacement esky once blood is utilised 3.6 Blood paperwork checks 3.7 New procedure for activation of the Massive Transfusion Protocol 3.8.2 Change to blood supplied to Orange Aeromedical Base. Approved by Executive Director, Health Emergency & Aeromedical Services.
Version 2.0 Issued 2013	Minor amendments Approved by Executive Director, Health Emergency & Aeromedical Services.

Version 1.0	Approved by Executive Director, Health Emergency & Aeromedical Services