Howard County Department of Fire and Rescue Services

SPECIAL ORDER

SPECIAL ORDER 2023.59

Prehospital Low Titer O+ Whole Blood (LTO+WB) Whole Blood Program

EMERGENCY SERVICES BUREAU

Issue Date: **August 29, 2023**
Expiration Date: **August 31, 2024**
Applicability: **All Personnel**

OVERVIEW

The Howard County Department of Fire and Rescue Services (Department) is committed to providing our patients with the highest quality and most evidence-driven emergency medical care. The prehospital administration of whole blood has been shown to improve critically ill patients survival and decrease in hospital blood product administration, thus helping conserve precious blood resources. An increasing number of EMS systems worldwide have implemented whole blood programs.

This order outlines the Department's inaugural prehospital whole blood program, including storage, administration, and documentation. **It is imperative for our patient's safety and this program's sustainability that all personnel strictly adhere to the practices for storage and administration as described in this document.** The Department is thankful for our collaboration with partners in Northern Virginia who have helped to pioneer prehospital blood administration in the Mid-Atlantic. The Department also appreciate the input of multiple subject matter experts who have helped inform the development of this program.

DEFINITIONS

- **Hemorrhagic Shock** – The type of shock that occurs following blood loss.
- **Shock Index** – A calculation to quantify the various stages of shock. Shock Index = Heart Rate / Systolic Blood Pressure. A normal class I shock: SI < 0.6; class II shock; SI ≥0.6 to <1.0; class III shock SI ≥1.0 to <1.4, class IV shock: SI ≥1.4
- **Credo ProMed™** – Cold chain carry bag that insulates a Thermal Insulation Chamber (aka TIC)
- **Thermal Insulation Chamber™ (TIC)** – The primary container that houses whole blood providing the required temperature range.

- **Hemo-Trac™** – Blood temperature indicator attached by the blood bank.

Low Titer O+ Whole Blood (LTO+WB), aka "Whole Blood"

TOPIC DETAILS

Authorization to Administer Whole Blood

Medical Duty Officers (MDO) and those eligible to be acting MDOs who have completed the Office of the Chief Medical Officer (OCMO) approved training program may administer whole blood to a patient. The Department whole blood training and credentialing process consist of successfully completing the following components:

Initial Training and Credentialing

- Online fundamentals of blood administration training course completed through the Virtual Academy.
- In-person blood product storage and administration procedures skills demonstration.
- Resuscitaiton simulation scenarios.

Ongoing Annual Maintenance of Credentialing

- In-person procedures skills demonstration.
- Resuscitaiton simulation scenarios.

Blood Storage and Administration Equipment

The following equipment is utilized to maintain the blood supply in Department blood-equipped Medical Duty Officer (MDO) vehicles (EMS1, EMS2, EMS/BC3). The vehicle shall be parked in a temperature-controlled building between calls and locked to maintain security when left unattended.

Specialized Filtered "Y" Blood Tubing

- This tubing set is specifically designed for the administration of blood products.
- It contains a specialized filter and is wider than conventional tubing.

Pressure Infuser Bag

- The blood shall be administered using a pressure infuser bag for adult patients.
- As blood is administered, pressure may be added to the bag to ensure the gauge is in the green range.

LifeFlow Plus Volume Infuser

- This is a hand-operated rapid infuser for precise volume delivery of blood, 10ml at a time.
- Shall be used for blood administration for the pediatric patient and, in other cases, at the discretion of the MDO.
- The LifeFlow infusor requires a dedicated infusion set with an integrated administration tubing set.

Dedicated Freezers

- Each MDO station will be issued a storage freezer.
- Each freezer shall be plugged into an outlet that is generator supported.
- Each freezer shall be set to a temperature of at least -18℃.
- Each freezer shall have a thermometer to provide continuous temperature validation.
- If a freezer fails to maintain the appropriate temperature, the MDO will notify the EMS Operations Captain for a solution.
- Each freezer will have two Thermal Isolation Chambers (TIC) conditioned for 24 hours. The TIC insert box will be placed in the freezer apart from the lid.

Portable Cold Storage

- Each MDO unit will be issued one tan Credo ProMed bag that contains a TIC box.
- Two additional TICs will be issued and placed in the dedicated freezer for conditioning.
- The TIC box is certified to maintain temperatures between 2-8℃ for 24-48 hours.
- The TIC boxes will be rotated every 24 hours at the beginning of the shift.
- When the TIC box is removed from the freezer, it should be frozen and not "slosh" or sound like it contains liquid.

Wireless Temperature Monitoring

- TracableLIVE thermometers and app shall ensure continuous blood product temperature monitoring.
- The temperature logger communicates wirelessly via WiFi.
- Alarms are set for high (6℃) and low (2℃) ranges.
- When alarm thresholds are encountered, an audible alarm sounds on the device and notifications are sent to the MDO-assigned cell phones, EMS Operations, and OCMO.
- All temperature data is available through generated reports and cannot be altered or deleted.

QinFlow Warrior Lite Fluid Warmer

- Each MDO vehicle will carry a QinFlow Warrior Lite Fluid Warmer with the required accessories and the Extra Power Battery.
- The unit will warm near freezing blood/IV fluids at up to 180 ml/min, or up to 3 liters of blood/IV fluids on a single charge, to 38℃.
- The Warrior Lite comprises four parts: the Base Unit, the extension cable, the battery, and a Compact Disposable Unit (CDU).

Daily Shift Change Procedure

All blood shall be continuously housed in the Credo bag cooler to maintain a storage temperature between 2°-6° Celsius per applicable FDA regulations. The blood shall be removed only for transfusion to a patient or to transfer when changing over TICs. Only blood products and the temperature monitoring probe shall be stored in the Credo bag. At no time shall food or drink be stored in the TIC freezer or Credo bag.

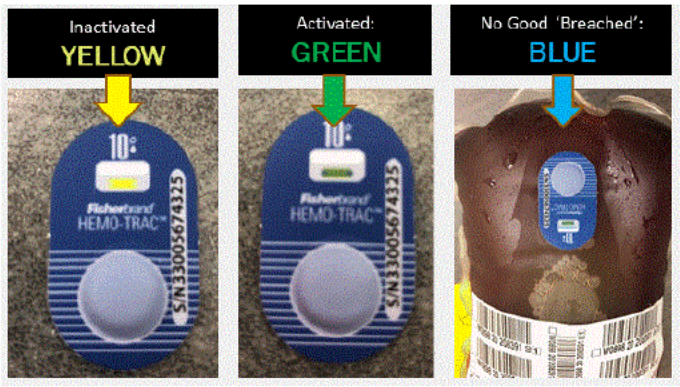
- Each MDO station will be issued one Credo bag with a Thermal Isolation Chamber (TIC) to maintain the storage of blood products within 2-6℃.
- Each MDO station will be issued a separate cooler and reusable ice packs.
- Each Credo bag will have a wireless thermometer with a high and low alarm parameter set.
- The Credo bag shall be kept in an environment where the surrounding ambient temperature is maintained between 5-27℃ (41-80F)
- While the passenger compartment area of the MDO vehicle is the preferred location to maintain a connection with the Rocket modem and prevent the CREDO from being left behind, a best practice is if visiting Department locations, bring the CREDO with you and keep it within a distance where audible alarms can be heard.
- When weather extremes prevent the CREDO from being in the appropriate ambient temperature range, accomplish the following:
    a. If visiting Department locations, bring the CREDO with you and keep it within a distance where audible alarms can be heard
    b. Utilize the provided soft-sided cooler with conditioned ice packs
    c. The CREDO may only be left in the secured, idling vehicle as a last resort.
- When the MDO is in quarters, the cooler will be stored where audible alarms can be monitored or within range of the rocket modem, and the integrity of cold storage can be maintained. This will allow continuous thermometer data to be transmitted.
- The Credo bag containing the TIC cooler will be closed and tightly secured with the exterior straps to maintain proper temperatures.
- If a high-temperature alarm occurs, the crew will identify and document the temperature and begin the process of conditioning and exchanging the TIC insert. (see below)
- Notify the EMS Operations Captain (or designee) of the alarm for further instruction and a resolution.

STORAGE AND CHANGEOVER PROCEDURES

- The Credo Bag and Blood Administration Bag shall be confirmed, and the daily electronic checklist completed each day at 0700 or sooner upon the change in personnel.
- The Minimal Blood Administration equipment shall include the following:
    - [1] Pelican Thermal Isolation Chamber (TIC) Cooler inside a Credo^{R} bag.
    - [2] Spare TIC box
    - [2] Insulated pads
    - [1] Dedicated Freezer set to at least -18℃
    - [1] TraceableLIVE^{TM} wireless thermometer
    - [1] QinFlow Warrior Lite Blood Warmer Base
    - [1] QinFlow Warrior Lite Blood Warmer Extension Cable
    - [2] QinFlow Warrior Lite Blood Warmer Compact Disposable Units (CDUs)
    - [2] QinFlow Warrior Lite Blood Warmer Extra Batteries

- [2] Specialized Filtered "Y" Blood Tubing
- [1] 500ml Pressure Bag
- [1] 250ml normal saline bag
- [1] LifeFlow Infuser for Pediatrics
- [1] Labeled 2.5-gallon bag
- Low Titer O+ Whole Blood
  - EMS 1: [2 units]
  - EMS 2: [1 unit]
  - EMS BC/3: [1 unit]

- Cooler cores (spare TIC boxes) shall be switched out with a fresh core at the start of **every shift**.
- The TIC shall be removed from the freezer and allowed to thaw for **25 minutes** to achieve the correct temperature (>1°c) before inserting into the Credo Bag.
  - If the 25 minutes is interrupted by a call, place the TIC box back in the freezer and restart the process when back in service. Allow the TIC to re-condition for 8 hours.
  - When the TIC box is removed from the freezer and is not entirely frozen, do not exchange it with the one in the Credo bag. Check the freezer operation and contact the EMS Operations Captain for further direction.
- Once the 25 minutes have passed, wipe free of moisture/condensation. The blood products bag(s) and the thermometer probe should be removed from the outgoing TIC and placed inside the newly conditioned TIC with an insulated pad in the bottom; then, the TIC should be immediately placed inside the cooler with the lid placed securely, assuring that temperature controls are in place.
  - Inspect the HemoTRAC temperature dot on each unit of blood to ensure the temperature dot is intact and indicate the appropriate temperature at the beginning of each shift.



- Place the conditioned TIC box with the Whole Blood and thermometer in the Credo. Close the lid tight and secure the exterior straps.
- The outgoing TIC™ panels that have just been removed Credo bag shall be rotated back to the dedicated freezer and allowed to condition for at least 24 hours at -18 degrees Celsius or colder.

The box and lid will be stored (conditioned) in the freezer separately, not as one unit. **Do NOT condition the TIC box with the lid on.**

- Complete the electronic Daily Whole Blood Rotation Form.
- If an MDO vehicle will be out of service for a prolonged period, contact to EMS Operations Captain.

BLOOD ACCOUNTABILITY PROCEDURE

The MDO is responsible for the daily accountability, exchange of cooler units, and temperature monitoring of the whole blood products.

- The Department Blood Program Manager will install and maintain a temperature data logger.
- The blood **must be** continuously temperature monitored. Consistent temperature monitoring will be achieved with technology capable of recording temperatures at programmed intervals (5 minutes) and sending out alerts when the temperature reaches specific set points (2° and 6° Celsius), or the data logger loses connection.
- The MDO shall always keep the assigned cell phone on them to receive push notifications from the data logger. Electronic logging database records shall be maintained for three years for inspection by Inova Blood Donor Services, MIEMSS, or regulatory agencies.

BLOOD DISCREPANCY PROCEDURE

If the temperature monitoring dot indicates excess warmth OR if the recorded temperature falls outside the accepted range (1-10° Celsius for more than 30 minutes), the Blood Program Manager shall arrange to return the blood to Inova Blood Donor Services immediately.

The MDO shall complete the following:

- The Blood Program Manager and Chief Medical Officer shall be immediately notified. If unable to reach the EMS Blood Program Manager by phone, a text or e-mail shall be sent as soon as possible as notification.
- All physical evidence shall be photographed and preserved.
- The Blood Program Manager shall immediately notify Inova Blood Donor Services to inform them of the temperature discrepancy.
- The decision to exchange or discard blood shall be at the discretion of Inova Blood Donor Services.
- If other physical evidence must be discarded/exchanged, it shall only be discarded after an opportunity to directly document the physical evidence, including taking detailed and precise photos.
- The MDO shall perform immediate preliminary fact-finding efforts to determine if, how, when, and why the discrepancy may have occurred. Suppose the initial fact-finding effort cannot rule out tampering or inappropriate use of the blood products. In that case, the discrepancy shall be considered unresolved, and further investigation and action will be required.
- Upon completion, the Department Blood Program Manager shall provide a summary report of the preliminary fact-finding effort to the EMS executive Battalion Chief and Chief Medical Officer.

- Investigations that reveal inappropriate handling or access to blood products shall result in internal escalation.

If the recorded temperature falls between 1-2° Celsius or 6-10° Celsius, the following shall occur:

- Immediately correct action by moving the Credo bag to an acceptable temperature environment.
- Follow the procedure used for daily TIC exchange.
- In addition, for temperatures between 7-10° Celsius, complete the following.
  - If not in quarters, the unit will go out of service and locate the closest TIC freezer.
  - Attempt to have personnel remove a conditioned TIC and begin the timer.
  - During the movement of blood products to the new TIC, examine the Hemo-Trac for activation.
- Notify the Blood Program Manager and provide the following information
  - The maximum or minimum temperature recorded.
  - The event(s) causing the blood products to fall out of range.
  - What actions have been done to return the blood to the acceptable temperature range.

EXCHANGE OF WHOLE BLOOD

- Blood will be exchanged with Inova Blood Donor Services every 14 days by delivery when possible. Exchanges will occur on Thursdays between 1000-1400
- All blood will be exchanged regardless if a particular unit has been in the Department's procession for less than 14 days.
- Blood will arrive in an insulated box, keeping blood at an acceptable range for 48 hours.
- Paperwork from the blood bank will contain information for each unit of blood. This will be scanned and placed in a specified DropBox folder. It will also accompany the unit of blood while under the Department's possession.
- Only MDOs or personnel specifically authorized by ESB/EMS Operations are permitted to exchange or replace blood products.
- Exchanged blood being returned to the blood bank will have a photo will be taken of each unit showing the label and an intact Hemo-Trac.
- The exchanged blood will be shipped back to the blood bank utilizing the same process as it was shipped to the Department.
- When whole blood is administered in the field, the MDO shall notify the Blood Program Manager and complete a STAT notification. The Blood Program Manager will facilitate resupply by contacting Inova Blood Donor Services.
  - If the blood administered was from EMS 2 or EMS BC 3, the second unit of blood from EMS1 may be reassigned until a new unit of blood is obtained.
- If a courier or shipping company is unavailable, personnel will drive to the Innova Blood Donor Services to exchange or replenish units of blood.
- The address for Inova Blood Donor Services is:

[redacted]

- Personnel will utilize the callbox on the outside of the building to alert the staff in the facility to their arrival.
- Personnel will utilize a designated insulated shipping container to return blood to the Inova Blood Donor Services facility. New blood will be supplied on arrival with new paperwork.

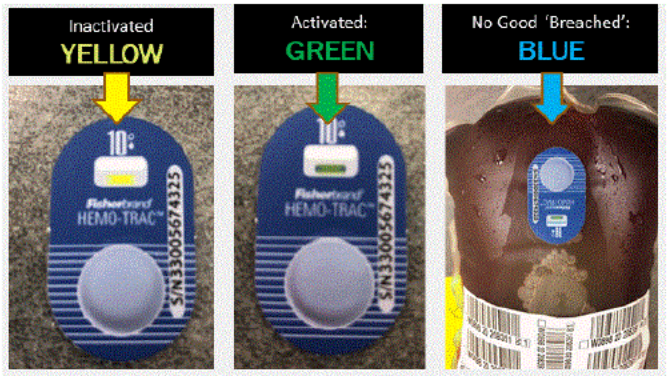
LOW TITER O+ WHOLE BLOOD PRODUCT (LTO+ WB) ADMINISTRATION

- **Indications**
  - Per the Maryland Medical Protocols for EMS Clinicians (Appendix A), blood products may be administered to patients with clinical suspicion of significant blood loss with evidence of physiologic compromise (MMP 14.6).
  - Cardiac arrest patients from presumed hemorrhagic shock, who are non-asystolic, are eligible to receive blood.

- **Contraindications**
  - The patient indicates a refusal to receive blood.
  - A Jehavoh's Witness patient with a wallet card.
  - A medic-alert tag or similar that indicates the patient's objection to receiving blood.

- **Consent**
  - Obtain informed verbal consent for blood transfusion if the patient can give consent (or someone legally authorized to consent for the patient is present to give consent in a reasonable time under the circumstances).
  - If unable to obtain informed consent, blood may be administered under the principle of implied consent.

- **Procedure (See Attachment "A" for detailed instructions)**
  1. Gather all necessary equipment to conduct a pre-hospital blood transfusion.
  2. Inspect the temperature dot to ensure the blood is at the appropriate temperature.



  3. Obtain a baseline or pre-transfusion set of vitals (<u>including temperature</u> if at all possible).
  4. Ensure IV (preferred)/IO patency or establish access (if given via IO, blood will flow slower).
  5. Proceed with transfusion of LTO+WB per MMP.

6. Monitor vitals for signs of a transfusion reaction (see below).
7. Administer Calcium Chloride to treat hypocalcemia (per MMP) which is known to occur with transfusion and hemorrhagic shock.
8. Administer TXA to treat traumatic hemorrhagic shock or postpartum hemorrhage (per MMP).
9. Upon arrival at the receiving facility, a face-to-face closed-loop discussion shall occur with the attending physician to ensure they know that prehospital Whole blood was transfused. Using the MDO iPhone, take a clear photo of the label on used bag of blood products. Provide the empty WB bag to hospital staff in accorandance with MMP.
10. Complete a STAT notification to include the Blood Program Manager.

MONITORING FOR TRANSFUSION REACTIONS

- Personnel shall monitor the patient for signs and symptoms of a potential blood transfusion reaction.
    - The MMP identifies possible transfusion reaction signs and symptoms as:
        - Hives
        - Wheezing
        - Rigors (uncontrollable chills)
        - Fevers
        - Abdominal pain
        - Vomiting
        - Sudden hypotension worsening or tachycardia inconsistent with the patient's underlying condition.
    - Additional signs of transfusion reaction may include:
        - Shortness of breath
        - Facial flushing
        - Bronchospasm
        - Pruritis (itching)

SUSPECTED TRANSFUSION REACTION PROCEDURES

- **Stop the transfusion.**
- **Administer dexamethasone and diphenhydramine and, possibly epinepherine, as outlined in the MMP.**
- Notify receiving hospital through EMRC of transfusion reaction.
- Photograph unit of blood
- Collect all administration equipment (Unit(s) of blood, administration set, and CDU) and place it in a labeled 2.5-gallon bag.
- Confirm with hospital staff that they will begin the investigation and testing of blood.
- STAT notification to include Blood Program Manager, who will immediately notify Inova Blood Services.

Documentation and Post-Administration Events

- Upon infusing whole blood, clinicians shall use the department-issued iPhone to photograph the unit(s) of blood administered, with the label visible in the photo and a photo of the paperwork.
- Document blood administration in ImageTrend Elite patient care report (ePCR). Attached are photographs or unit(s) of blood administered to ePCR.

FORMS/ATTACHMENTS/REFERENCES

- Attachment A – Whole Blood Administration Procedures

Approved:

Louis G. Winston, Fire Chief
Office of the Fire Chief

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Office of the Fire Chief

Attachment A: Whole Blood Administration Procedures

1. Connect battery to base unit and check battery level. a. Connect extension cord to base unit if using.
2. Remove blood IV administration set from packaging a. close all clamps b. Spike Normal Saline (NS) bag.
3. Open clamp below NS and squeeze drip chamber so that fluid is above filter and ball is floating.
4. Connect administration set to CDU.
5. Open the main clamp and flow fluid through CDU to remove all air.
6. Close main clamp once primed.
7. Connect the distal end of the CDU directly to the IV catheter hub.
8. Attach CDU to base unit or extension cord. a. Make sure either is secured to the base unit.
9. Allow base unit to go through checks. (All indicators will illuminate, then battery indicator and green check light will remain on; it may be solid or blinking).
10. Open main clamp back up to run NS and ensure flow to patient.
11. Close main clamp and NS clamp.
12. Remove unit of blood products from CREDO and slightly agitate.
13. Spike blood bag for administration and place in pressure
14. Open blood clamp and main clamp to administer blood.