



*Kaiser Permanente Medical Center, San Francisco
Northern California Region*

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 Work Instruction		
Title: TS-Massive Transfusion	WI Number SFOWI-0110 Revision: 15	
Department: Immunohematology Area: 2425 Geary Blvd SFO Hospital Lab	Approved & Released Work Instruction	Implementation Date: 12/24/2018
Type of Document: Work Instruction		Review Period - 340 Days

PURPOSE

To provide a policy and procedure for managing a Massive Transfusion Protocol (MTP). MTP is implemented to provide appropriate blood component therapy and to help avoid the dilutional coagulopathy and thrombocytopenia associated with massive transfusion of blood.

- A. The three most common definitions of Massive Transfusion are:
 - 1. transfusion of more than 100% of the patient's total blood volume (TBV) within 24 hours, this approximates 10 units of whole blood for an average adult patient (70kg)
 - 2. transfusion of more than 4 units of whole blood in 1 hour for an average adult patient with anticipation of continued need for blood product support
 - 3. replacement of more than 50% of the TBV by blood products within 3 hours.
- B. Once this occurs, the pre-transfusion specimen will not represent the patient’s current serological status, and immediate spin and IAT crossmatches can be omitted.
- C. A patient is a candidate for the massive transfusion protocol when they have lost 50 % of blood volume within 3 hours, rate of loss of 150 ml per minute or in adult, loss of 3-4 units blood in 1-2 hours.
- D. It is the responsibility of the attending physician or designee to initiate and discontinue MTP.
- E. Ongoing communication with the Blood Bank regarding the patient's status and clinical condition is essential to meet the patient's transfusion needs and to avoid blood wastage.

REAGENTS

- A. Type and screen reagents
- B. Phenotyping sera

EQUIPMENT

- A. Automated analyzer
- B. 12 X 75 mm test tubes
- C. Centrifuges
- D. Cell Washer
- E. 37° C heat block
- F. Optical Viewer
- G. Validated blood coolers
- H. Temperature indicators
- I. Ice Packs

SPECIMEN

See Blood Bank Specimen and Requisition SOP.

CONTROL

- A. Daily Analyzer QC
- B. Daily Reagent QC
- C. Daily Equipment QC
- D. Supervisory review of LIS records and MTP Worksheet

PROCEDURE

- A. Massive blood loss is defined as loss of 50 % of blood volume in 3 hours (150 ml per minute) or in adult, lost of 3-4 units in 1-2 hours. It is considered massive transfusion when the patient has received an amount of blood that exceeded their blood volume. The blood volume estimate is based on the age of the patient as follows:

Age of Patient	Red Blood Cells Issued
Less than 1 year	2 units
1-5 years	4 units
6-11 years	6 units
12-15 years	8 units
16 plus years	10 units

Note: Estimated blood volume: 70 ml/Kg or about 5000 ml (10 units of whole blood) in a 70 Kg adult. Adult blood volume is 7 % of body weight whereas 8-9% in a child.

- B. **When informed** by the patient's physician or MTP coordinator (usually a physician or nurse) **to activate the Massive Transfusion Protocol**, perform the following:
 - 1. Obtain patient's name, MRN, location and the Physician initiating the MTP. Check LIS while caller is still on the line.
 - a. If patient has no current history, inform caller to send pre-transfusion sample with completed requisition immediately.
 - i. **DBCK** can be drawn at the **same time** but must be drawn **by a**

- ii. **different blood drawer** and sent with a separate requisition.
 - Continued dispense of O Neg pRBC will deplete the limited inventory and deprive usage for subsequent emergencies.
- 2. Immediately, begin thawing 2 FFP (there should be 2 AB thawed FFP available at all times). Thaw 4 FFP if none available.
- 3. Initiate an MTP worksheet by documenting the following information:
 - a. Patient's name, MRN, age and location.
 - b. Physician' name who activated the MTP.
 - c. MTP contact's name and phone number.
- 4. Designate a CLS to be the BB MTP coordinator, who will perform the following:
 - a. Primary contact with the MTP patient care team.
 - b. Document activity on the MTP worksheet.
- 5. When patient's **blood type is unknown** or **NO DBCK** or **NO current TYSC**, follow the 'Urgent requirements for Blood and Components' SOP to dispense MTP Set 1.
 - a. 4 O Neg RBC, uncrossmatched.
 - b. 4 AB plasma, thawed.
 - c. 1 platelet pheresis, any blood type (dispense as soon as available). NOTE: Give Rh Neg platelets if available to Rh Neg female 50 years old and younger.
 - d. Obtain pre-transfusion sample for testing as soon as possible.
- 6. When MTP is initiated,
 - a. Check platelet inventory and order adequate platelets STAT to stay ahead.
 - b. Begin assembling MTP Set 1. Refer to the table below.

L&D Patients

Set 1, 2 and all Even# Sets	Set 3 and subsequent Odd# Sets
4 RBC	4 RBC
4 thawed plasma	4 thawed plasma
1 platelet pheresis	2 Cryo Pool-5 (10 units)

All Other Patients

Set 1	Set 2	Set 3
4 RBC	4 RBC	4 RBC
4 thawed plasma	4 thawed plasma	4 thawed plasma
1 platelet pheresis	1 platelet pheresis* (substitute with 10 cryo in even# sets if requested by MD)	1 platelet pheresis

* Alternate use of 10 units Cryoprecipitate instead of platelet pheresis in even # sets must be verbally communicated to the Blood Bank by the patient's MTP Coordinator. Otherwise,

dispense 1 platelet pheresis.

- c. **A-la-carte blood product orders are not allowed during MTP except for Cryoprecipitate.**
 - i. **A-la-carte blood product pick-up is also not allowed** e.g. MD picks and chooses what to pick up.
 - ii. CLS need to inform MD to cancel the MTP if MD wants to deviate from the fixed ratio.
- d. Attach a temperature indicator to the back of RBC units if dispensing to Surgery or in a cooler.
- e. Computer Crossmatch Dispense of pRBC can be performed if patient qualifies and if time does not permit crossmatch prior to dispense.
- f. Notify nursing department as blood products become available. Dispense all available blood products.
- g. Continue assembling subsequent sets until the MTP is ended by the physician.
- h. **Keep track of the number of units for each blood component prepared and dispensed on the MTP Worksheet to ensure the ratio is maintained.**
- i. Serological crossmatch can be omitted after 10 units of pRBCs have been dispensed. However, it will expedite the computer dispense if pRBCs are crossmatched.
- j. **Write the Set# on the top right corner of the Product Chart Copy (PCC).**

C. General Blood Product Selection

- 1. If time permits, select blood products based on **patient's antibody history and ABORh performed on the current sample.**
 - a. Attempt to obtain a DBCK specimen if needed. A second ABORh is needed before type specific blood can be dispensed.
 - b. Otherwise, set up group O Rh compatible RBCs. See subsequent section for more information on Rh Neg patients and special requirements.

2. RBC Selection

Follow the table below for patients who have **a current and a second ABORh.** (N/A - not applicable).

Patient ABORh	1st Choice	2nd Choice	3rd Choice	4th Choice
O Pos	O Pos	O Neg	N/A	N/A
O Neg	O Neg	O Pos	N/A	N/A
A Pos	A Pos	A Neg/O Pos	O Neg	N/A
A Neg	A Neg	O Neg	A Pos	O Pos
B Pos	B Pos	B Neg/O Pos	O Neg	N/A
B Neg	B Neg	O Neg	B Pos	O Pos

AB Pos	AB Pos	AB Neg/A Pos	B Pos	O+,A-,B-,or O-
AB Neg	AB Neg	A Neg	B Neg/O Neg	AB+,A+,B+/O+

3. **Patient has negative antibody screen**
 - a. Set up ABORh compatible RBC.

4. **Patient has clinically significant antibody** in the **current** specimen or in the **history**.
 - a. Set up ABORh compatible and antigen negative RBC if possible/available.
 - i. Antigen negative RBC may not be available for those antigens which are of high frequency, i.e. anti-e.
 - ii. Inform the attending physician and the pathologist immediately if antigen negative RBCs are unavailable.

 - b. If the patient is actively bleeding, consider switching to antigen untested units.
 - c. Speak to the physician to confirm that patient's bleeding is still active and cannot be controlled immediately.
 - d. Inform the attending physician and the pathologist about switching to antigen untested units.
 - e. Inform the attending physician to notify the Transfusion Service immediately if the bleeding is under control and to switch back to antigen negative RBC.
 - f. Document the approval in the Communication Log and Blood Bank Comments in LIS.

D. Consideration for Rh type and Special Requirements

1. Select products based on Rh type and special requirements with certain exceptions specified below.

2. Patient is **Rh Negative**
 - a. Patient is a **female 50 years old or younger**, or a **male infant 1 year old or younger**
 - i. Set up ABO compatible Rh negative RBC.
 - ii. It is preferable to switch to group compatible Rh negative RBC before switching to Rh positive RBC.
 - iii. Avoid switching to Rh positive unless absolutely necessary.
 - iv. If the continuation of transfusion is expected to deplete the available supply of Rh negative blood, evaluate switching to Rh positive blood product.
 - v. When switching from Rh Negative blood to Rh Positive blood becomes necessary, notify the attending physician immediately and the pathologist.

- vi. Document the approval in the Communication Log and in the Blood Bank Comments in LIS that 'Rh Positive blood dispensed to Rh Negative patient'.
- b. Patient is a **female over 50 years old** or a **male over one year old**
 - i. Notify the physician and the pathologist to get approval for releasing Rh Positive RBC to Rh Negative patient.
 - ii. Document the approval in the Communication Log and Blood Bank Comments in LIS.
 - iii. Set up ABO compatible Rh positive RBC.
 - iv. Switch to Rh positive blood should be made early to conserve blood for other recipients.
3. Patient requires **Irradiated** blood products.
- a. There is no substitution for irradiated blood products.
 - b. Notify the physician and the pathologist that the available irradiated RBC inventory is inadequate to sustain the ongoing MTP.
 - c. Document the decision of the Medical Director/pathologist in the Communication Log and Blood Bank Comments in LIS.
 - d. Set up prestorage leukocytes reduced RBC or platelet.
 - e. Order irradiated products, as directed by the Medical Director/pathologist.
4. Patient requires **CMV Negative** blood products.
- a. Set up prestorage leukocytes reduced RBC or platelets.
 - b. Notify the physician and the pathologist that prestorage leukocytes removed by filtration RBC can be considered CMV safe.
 - c. Document the approval in the Communication Log and Blood Bank Comments in LIS.
5. Patient requires **HgbS Negative (SIC-)** blood products.
- a. Notify the physician and the pathologist that the available SIC- RBC inventory is inadequate to sustain the ongoing MTP.
 - b. Majority of the donor units are HgS negative eventhough the units were not tested.
 - c. Document the decision of the Medical Director/pathologist in the Communication Log and Blood Bank comments in LIS.
- E. **Order in LIS** (this may be the initial order based on an Emergency Release signed form or placed in HeathConnect directly by the physician).
- 1. If crossmatch has not been ordered, add Crossmatch Flex to current accession and add Order Comment 'Massive Tx'.
- F. **Dispensing blood products**
 Massive Transfusion Protocol is usually initiated in an emergency. **The TAT is 10**

minutes. However, thawed plasma products may not be immediately available. As such, the blood products are dispensed as they become available.

1. **Computer Crossmatch Dispense of PRBC can be performed if patient qualifies.** It may be necessary to override the special requirements (CMV-, IRR, SIC-) warnings.
2. Use **Dispense** to issue units or to emergency release uncrossmatched/unassigned units. It may be necessary to override the antigen negative and/or special requirements warnings. **NOTE: MTP is exempted from Prepare Order.**
3. **Any** of the following with complete patient's identification (emergency identification e.g. Doe, John/Jane is acceptable) can be used as blood products pick-up form:
 - a. Last, First name and MR# of the patient on the Blood Bank Product Pickup form.
 - b. Last, First name and MR# on a piece of paper.
 - c. Last, First name and MR# on the 'Emergency Release of Donor Blood' form.
 - d. Last, First name and MR# on the HealthConnect form.
4. Dispense all blood products that are ready.
5. CLS performs a **visual inspection** of the blood products.
6. **Omit readback with courier. CLS is responsible** to ensure that **all identifying information and paperwork are accurate and complete** before dispense.
7. **Use one TF0032 MTP Issuance Record per dispense occurrence.**
 - a. Write the patient's name and MRN.
 - b. CLS and courier complete the verification section of the MTP Issuance Record.
 - c. Omit completing the Issuance Record section on all Product Chart Copies (PCC).
 - d. Remove yellow copy of the PCC and staple it to the MTP Issuance Record along with the pick-up slip.
8. **Dispense units in blood cooler if needed.**
 - a. Do not place platelets and cryoprecipitate in the cooler.
 - b. Label the cooler with the appropriate expiration time.
9. Enter 'SFO-Surgery' for Cooler when issuing to Surgery. Enter 'SFO Cooler' when issuing in a cooler.
10. Call nursing department 20 minutes prior to the expiration time of the cooler to

inquire if the blood products have been transfused, otherwise the icepacks need to be changed.

G. After the bleeding episode

1. The MTP coordinator or the patient's physician will notify Blood Bank to end the MTP. Record the name of the physician who ended the MTP and the time on the MTP worksheet.
2. **Blood Product Return**
 - a. Locate the matching yellow Product Chart Copy (PCC).
 - b. If needed, go to PPI Product List and find the Dispensed time for the unit(s) returned. For multiple units, a printscreen of the Product List for all dispensed units may be helpful.
 - c. **Write 'R' on the top right corner of the matching yellow Product Chart Copy (PCC). DO NOT remove it from the MTP Issuance Record.**
 - d. Keep the white PCC with the requisition or place in Cancelled box after release to inventory.
 - e. Complete the Return section of the MTP Issuance Record.
 - f. Return unit(s) in the LIS.
3. Release unused plasma products to inventory.
4. Return to routine compatibility testing after the MTP.
5. Leave paperwork for Supervisor or designee to review.
6. Refer to Platelet Transfusion SOP for RhIg recommendation if Rh Pos Platelets were transfused to Rh Neg female of child bearing age (50 years and younger).

H. Problems during MTP

1. Complete the back page of the MTP Worksheet when CLS has time. Add comments if needed.

PROCEDURE NOTES

- A. If Hemorrhagic Shock is life threatening, blood for transfusion must be issued immediately regardless of risk
- B. When time does not permit crossmatch, units will be issued uncrossmatched (refer to Urgent Requirements for Blood and Components SOP).
- C. The pre-event platelet count and fibrinogen will decrease by approximately 63 % with each blood volume replaced without the infusion of platelets or plasma.
- D. The results of platelet counts, PT, aPTT, and INR can guide the need for blood components transfusion.
- E. In general, 1 platelet pheresis may be administered for every 10 units of RBCs transfused.
- F. Refer to Blood Bank Specimen and Requisition SOP for additional specimen and requisition requirements.
- G. Obstetric hemorrhage risk assessment:

Stage 0	Stage 1	Stage 2	Stage 3
Every Woman in labor	EBL >500 vag and >1000 C/S or VS changes	QBL 1000 to 1500 and Symptomatic	1500 and above Severe Shock
Focus on Risk Assessment-Order blood	Get help-Charge RN, Anesthesia	Evaluate Causes-Tone, Tissue, Trauma, Thrombin	Massive Transfusion Protocol
Active management of 3rd stage labor	Pharmacologic intervention	Get to OR & intervene -uterine tamponde, inspect, curette, IR	Laparotomy-B-lynch, O'Leary, Hysterectomy, IR
Fundal massage and Oxytocin or Cytotec	Uterine Massage and clear the clots	Resuscitate and type and cross 2 units	Rapid infuser, Cell Saver, Warmer
Estimate Blood Loss	Quantify Blood Loss	Quantify Blood Loss	GIVE MTP, continue QBL

REFERENCE

- A. AABB, Standards for Blood Banks and Transfusion Services, current edition, Bethesda, MD.
- B. Treatment and Prevention of Postpartum Hemorrhage, John Vallee MD. March 16, 2011.

Associated Documents:

External Documents

Associated Documents:

SFOWI-0060 -- TS-Work Priority for Technologists
 SFOWI-0078 -- TS- Platelet Transfusion
 SFOWI-0079 -- TS-Blood Bank Specimen and Requisition
 SFOWI-0113 -- TS-Urgent requirements for Blood and Components
 SFOWI-0204 -- TF0030 MTP Worksheet
 SFOWI-0054 -- TS-Double Check
 SFOWI-0483 -- ISSUANCE RECORD FOR MTP

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Documents Generated:

Document Revision History:

Revision: 15	Date Created: 09/22/2005 Date of Last Revision: 12/24/2018	Last Approval Date: 12/24/2018
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Document Author: Cara H Lim/CA/KAIPERM	Document Manager: Richard Chui/CA/KAIPERM
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Reason for Change:

Revision:	Sec/Para Changed	Change Made:	Date
1	N/A	Initial Issue of Document	
1	Approver	New Lab Director	1/12/07
2	Procedure	Add PTC patient comment for approval of Rhpos RBC for Rh neg patients and RILIS order and result massive transfusion.	5/6/07
3	Approver	New Lab Director	7/1/07
4	Procedure	Delete monitor coagulation during massive transfusion	7/18/07
5	Procedure	Add massive transfusion protocol (MTP)	3/8/09
6	Procedure C. C.1. C.2. E.2. E.3. E.4.	Changed RILIS to RILIS MILLENNIUM functions. Reformatted numbering and paragraphs. Substituted blood pack set# with Set#. Changed Patient Comments to Blood Bank Comments. Changed PLT PHR to platelet pheresis. Changed 'Emergency Release SOP' to 'Urgent requirements for Blood and Components SOP.' Added 'A second ABORh is needed before type specific blood can be dispensed. Otherwise, set up group O Rh compatible RBCs.' Added N/A for 3rd and 4th choices. Added 'available. NOTE: Antigen negative RBC may not be available for those antigens which are of high frequency, i.e. anti-e. Inform the attending physician and the pathologist immediately if antigen negative RBCs are unavailable.' Added 'if patient qualifies. It may be necessary to override the special requirements (CMV-, IRR, SIC-) warnings.' If the patient does not qualify for EXM, use Dispense to emergency release the units. It may be necessary to override the antigen negative and/or special requirements warnings. Added HgbS negative section.	6/1/11
7	Procedure B.4.d. Procedure B.4.e. Procedure B.4.f. Procedure B.4.g. Procedure F. Procedure Notes H. Associated Documents	Added instructions to attach temperature indicators. Added instructions for EXM. Added instructions for notification. Added instructions for continuation of MTP. Added section for Dispense instructions. Added reference to SFOWI-0079 for sample expiration. Added two QSI docs, SFOWI-0089 and SFOWI-0113.	3/2/12
8	Procedure Notes I.	Added obstetric hemorrhage risk assessment.	6/14/12
9	Approver	New Lab Director.	5/16/13
10	Approver Procedure B.4.h. Procedure G. Procedure Notes C. Procedure Notes. Procedure F.9.	New BB Medical Director. New. Added to omit serological XM after 10 units of PRBCs. New section. Added end of MTP. Moved to G.3. Renumbered. New. Added to check cooler 20 min prior to expiration.	8/5/13
11	Procedure D.1.a. & b.	Clarified male and female patients' ages for switching from Rh neg to Rh pos RBC products.	8/21/14
12	Reagents B. Procedure A. Procedure B.3.c. Procedure B.4.c. Procedure G.5. Procedure Notes G.	Added phenotyping sera. Revised. Deleted instructions to notify physician when the amount transfused has exceeded patient's blood volume. Added definition for massive blood loss. Added NOTE to give Rh Neg platelets if available to Rh Neg female <=50 years old. Added MTP Set table for L&D patients. 10 units of cryoprecipitate replace 1 unit platelet pheresis starting with the 3rd set and all subsequent odd# sets. Added reference to SFOWI-0078 for Rhlg recommendation if Rh Pos platelets were given to Rh Neg female <=50 years old. Revised. Deleted specimen expiration time and added reference to SFOWI-0079.	8/21/15

13	Approver	New CLIA Director.	9/28/16
14	Procedure B.	Added that the MTP Coordinator is usually a physician or nurse.	1/18/17
	Procedure B.4. Table All Other Patients. Set 2. Equipment and Procedure F.7.b.	Changed from 10 cryoprecipitate* to 1 platelet pheresis*. Deleted specific coolers and expiration times.	
	Procedure F.	Specified 10 minutes TAT for MTP to align with SFOWI-0060 Work Priority for Technologists.	3/13/18
	Procedure F.2.	Added NOTE that MTP is exempted from Prepare Order for BPAM, implementation scheduled 3/20/18.	
Procedure G.1.	Besides the physician, the MTP Coordinator can call to end MTP.	3/14/18	
Purpose	Updated MTP definitions.		
15	Whole document	Reformatted.	11/27/18
	Procedure B.	Added instructions for handling MTP activation phone call and to thaw additional 2 FFP immediately after phone call.	
	Procedure B.6.c.	Specified NO a-la-carte orders except for cryo. Added instructions to inform MD to cancel MTP if MD wants to deviate.	
	Procedure B.6.h.	Added instructions to keep track of blood products on MTP Wkst.	
	Procedure B.6.j.	Added instructions to write the Set# on top right corner of PCC.	
	Procedure F.6. Procedure F. and G.	Added instructions to omit readback at Dispense. Added instructions on how to use TF0032 MTP Issuance Record for Dispense and Return.	
Procedure H.	Added instructions to complete questionnaire about problems on the back page of the MTP Wkst.		

Notification List:

Approvals:

First Approver's Signature

Name: Maria F Serrano/CA/KAIPERM
Title: Transfusion Service Medical Director

Dec 20, 2018 03:57:03 PM PST - Approved by: Maria F Serrano/CA/KAIPERM

Second Approver's Signature

Name: Eric Suba/CA/KAIPERM
Title: Chief of Pathology; CLIA Director

Dec 24, 2018 09:20:54 AM PST - Approved by: Eric Suba/CA/KAIPERM

Document History Section