Title: The Ministry of Health blood transfusion management policy 2: Massive Transfusion Protocol (MTP)	
Policy Owner: MOH committee on hospital clinical services and policies	Policy code: C-LAB-003
Section location: All General Hospitals	Effective date: 01/06/2024
Applies to: General, Allied & Specialized health care services Laboratories & blood banks.	Revision date: 31/05/2026
Approvals:	Signature/Date
Approved by: MOH committee on hospital clinical services and policies	
Approved by: Director of Technical Affairs	
Approved by: Assistant Undersecretary of Technical Affairs	
Approved by:	
Notes:	

1. Introduction

1.1. The use of massive transfusion protocols in a manner in keeping with practice management guidelines has been proven to reduce morbidity and mortality and improve long term outcomes in those patients who have experienced massive exsanguination and hemorrhagic shock.

1.2. It is thus paramount that such pathways of care are unified and organized throughout the Ministry of Health (MOH) healthcare facilities (HCF) to ensure appropriate standards of care.

2. Purpose

2.1. The purpose of this policy is to provide an evidence based cohesive approach to hemorrhagic shock and its management between the laboratory and clinical departments within the Ministry of Health.

2.2. Practice guidelines (see references) have been used where appropriate to maximize resource utilization avoidance of unnecessary utilization and improving patient outcomes.

2.3. It should be acknowledged that guidelines cannot be exhaustive nor be able to address all potential clinical circumstances. They are provided as a guide to assist in the interpretation of different acuity of disease processes. Clinical expertise and judgment are required in all circumstances to ensure the best care is provided in the most appropriate facility and setting.

3. Definitions:

3.1. Blood typing: Test to determine the patients ABO and Rh blood group.

3.2. Alloimmunization: An immune response to foreign antigens after exposure to genetically different cells or issue. Alloimmunization can be a complication of receiving incompatible blood.

3.3. Blind Transfusion: Transfusing universal RBC and Plasma at a ratio of 1:1 or 1:2. With products sent by transfusion services based on these established ratios.

3.4. **Point of Care Transfusion:** Once major bleeding has been controlled and the rate of transfusion has slowed it is appropriate to switch to a laboratory-or point of care (POCT)-based transfusion (according to the lab results).

3.5. **Group Specific uncross matched transfusion:** transfusion of ABO blood of the same patient`s blood group without completing the full crossmatch procedure.

3.6. **MTP Pack:** 4 units PRBC, 4 Units FFP, 6 Units (or 1 adult bag) platelets. Released on hand in a single delivery in a pre-allocated box for MTP. The first pack will be issued without platelets unless otherwise specified by activating physician.

3.7. **Massive Exsanguination:** Bleeding leading to hemodynamic compromise, bleeding of a complete estimated blood volume within 24 hours or bleeding of 50% of estimated blood volume within 3 hours.

3.8. **Estimated blood volume:** 7% of body weight (5.6 L for 80 kg).

3.9. **Type and screen:** Testing of a patient specimen to determine the ABO status and Rh status and screening for the presence of atypical red cell antibodies in the plasma is known as Type & Screen (T&S). The presence of these antibodies may make a crossmatch more difficult**. Standard time to order processing is 45-55 minutes.**

3.10. **Crossmatch**: Is a testing process used to ensure compatibility between donor and recipient of blood. **Standard time to order processing up to 90 minutes.** (provided no atypical antibodies are present and according to methodology used)

3.11. **Massive Transfusion Criteria:**

3.11.1. Replacement of estimated total blood volume over 24 hours.

3.11.2. Acute administration of over half the patients' blood volume per hour.

3.11.3. Administration of 10 or more packed red blood cells in a 24-hour period.

3.11.4. Administration of 4 units of packed red blood cells within 1 hour.

3.11.5. MTP Activation: Activation of a coordinated effort to deliver blood products into a patient as fast as possible while taking key management decisions to mitigate and reduce the complications associated with massive transfusion.

3.11.6. Activating physician: Physician or designee responsible for activating the massive transfusion protocol and ensuing management based on clinical assessment by him/her or supervising senior.

3.11.7. Deactivating physician: Physician responsible for the assessment of physiological and laboratory parameters to deactivate the MTP.

3.11.8. Key Performance Indicators: set of quantifiable measurements used to evaluate the overall performance of a service unit or facility over set period of time.

4. Equipment:

4.1. Activation Panel:

4.1.1. Complete blood count

4.1.2. ABO typing and cross matching.

4.1.3. Coagulation profile.

4.2. Resuscitation Panel (as required by activating physician):

Samples should be collected before the first transfusion of blood products.

4.2.1. Complete Blood Count

4.2.2. Urea, Electrolytes, creatinine, and corrected calcium.

4.2.3. Lactate

4.2.4. Liver function profile, amylase, and lipase.

4.2.5. Coagulation profile
4.2.6. Fibrinogen
4.2.7. Blood gas.
4.2.8. Also consider: TEG, ROTEM and Beta HCG as required.

4.3. Point of care sampling as required during resuscitation.

5. Procedure:

5.1. MTP Activation Triggers:

5.1.1. Early identification of those at risk of massive exsanguination is the cornerstone of preventing adverse outcomes in massive transfusion. The following are suggested parameters:

5.1.1.1.1. Hypotension with a systolic below 80 mmHg in adults and 60 mmHg in neonatal cases, 70 mmHg for infants and 90 for children older than 10 years with evidence of high index of suspicion for bleeding source as a cause for shock.
5.1.1.1.2. Immediate estimated blood loss of 30-40% of estimated blood volume (1400-1700 ml).
5.1.1.1.3. Patients receiving 3 units of packed red cells with ongoing hypotension and transfusion requirements.
5.1.1.1.4. ABC score (2 or more of the following variables)
5.1.1.1.5. Pulse greater than 120.
5.1.1.1.6. Blood pressure less than 90
5.1.1.1.7. FAST ultrasound positive
5.1.1.1.8. penetrating torso injury

5.2. MTP Activation Process:

5.2.1. Due to Pending official ministerial designations of blood product transport duties and responsibilities, the responsibility of transport personnel for blood products during an MTP is based on the facility resources, manpower and clear and official designation.

5.2.2. Communication with blood bank:

5.2.2.1. Phone:

5.2.2.2. Activating physician should call the blood bank directly and communicate the following information by phone:

5.2.2.2.1. Name of the activating physician
5.2.2.2.2. The words "Activate the MTP" or "Activate Massive Transfusion Protocol."
5.2.2.2.3. Communicate the following:
5.2.2.2.3.1. Reason blood required.
5.2.2.2.3.2. Time required for blood.
5.2.2.2.3.3. Number of units required.
5.2.2.2.3.4. Authorizing Doctor's name (responsible for resuscitation)
5.2.2.2.3.5. Patient identification, if available (full name, CID file number or Unique ID)
5.2.2.2.3.6. Destination and direct contact number

5.2.2.2.4. Confirm Patient information with blood bank personnel.
5.2.2.2.5. Confirm Location blood will be used.
5.2.2.2.6. Confirm the need for Blind or group specific uncross matched transfusion packs to be prepared.

5.2.2.2.7. FILL IN transfusion request FORM then OBTAIN BLOOD SAMPLE AND COMMUNICATE WITH LOCAL BLOOD BANKING FACILITY AT THIS POINT.

5.2.2.3. The priority for these samples and blood product units' preparation and processing will be considered due to the urgent situation.

5.2.2.4. The technician in hospital blood bank will for the massive transfusion protocol worksheet to follow up the amount of blood component used.

5.2.2.5. Contact blood bank to halt MTP and return blood products once targets are achieved (Provided that the products can be returned in 30 minutes and stored appropriately).

5.2.3. Bedside:
ACTIVE PLAN FOR HEMORRHAGE CONTROL.

5.2.3.1. Obtain blood samples WITHOUT delay in resuscitation efforts which should include:

5.2.3.1.1. Establishment of venous access (Consider the use of central venous access or intra-osseous after 2 failed attempts or within a 5-to-10-minute timeline)

5.2.3.1.2. Immediate efforts to obtain hemorrhage control.

5.2.3.1.3. Judicious use of crystalloid as a bridge to blood product-based resuscitation.

5.2.3.1.4. Permissive hypotension where clinically warranted such as a point known source of bleeding amiable to rapid surgical or minimally invasive control.

5.2.3.2. Beginning the transfusion process:

5.2.3.2.1. It is recommended that where available a level one rapid transfusion device, pressure infusion bag and blood product warmer be used during the infusion process.

5.2.3.2.2. Every effort should be made to make sure that the ratio of PRBC: FFP: Platelets remains close to 1:1:1.

5.2.3.2.3. The use of a baseline trauma panel and point of care testing is strongly recommended in addition to the use of thromboelastography (TEG/ROTEM) where available.

5.2.3.3. Adjuncts to consider during massive transfusion:

5.2.3.3.1. Tranexamic Acid: 1 gm over 10 minutes then subsequent 1 gram over 8 hours IV can be considered if within a 3-hour window of active hemorrhage.

5.2.3.3.2. Fibrinogen 1 to 2 grams or 10 units cryoprecipitate can be considered if 8 units of combined blood products are given.

5.2.3.3.3. There is NO strong supportive evidence on the use of factor 7 analogues during massive transfusion at this time.

5.2.3.3.4. Calcium replacement as a priority consideration as blood product requirements increase.

5.2.3.3.5. Confirm if patient was previously on anticoagulation and apply adjunctive steps accordingly (see article 6. Reversal of Anticoagulation)

5.2.3.4. Intraoperative adjuncts:

5.2.3.4.1. Patient warmer "Bear Hugger"

5.2.3.4.2. The use of cell saver where appropriate.

5.3. Blood Bank

5.3.1. Once activating physician's name and patients' details are received:

Steps for emergency blood release:

1. **O -ve blood. (Immediate)**
2. **Group Specific uncross matched. (10 to 30 Minutes)**
3. **Immediate spin crossmatched (>30 Minutes)**
4. **Full crossmatch**

5.3.1.1. Prepare blind transfusion or uncross matched products **as required** while waiting for the activation panel/ ABO sample to arrive.

5.3.1.2. Confirm patients' details and release blind MTP pack as required.

5.3.1.3. Begin cross match process and prepare crossmatched MTP pack in a continuous process with the aim of 15 to 30 minutes intervals as required.

5.3.1.4. Confirmed on phone need with bedside team after every 3 MTP packs released.

5.3.1.5. ONLY halt MTP once confirmed on phone with the bedside team.

5.4. Halting MTP -

5.5. It is important to note that physiological parameters may supersede laboratory and point of care investigations. and both should be taken into clinical context.

5.5.1. Physiological Parameters:

5.5.1.1. Improving blood pressure and pulse parameters.

5.5.1.2. Improving end organ perfusion markers such as lactate and base deficit.

5.5.1.3. Decreased vasopressor and inotropic support requirements.

5.5.1.4. Confirmed mechanical hemorrhage control by surgeon/ endoscopist or interventionist or on further imaging.

5.5.2. Transfusion End Points:

Provided that the patient is not actively bleeding or still in the acute resuscitative phase the following endpoints should be considered.

5.5.2.1. Packed red blood cell transfusion target hemoglobin of 8-10 g/dL.

5.5.2.2. Plasma transfusion for a target PT < 18 seconds or less and PTT < 35 seconds INR < 1.5/ APTT ratio < 1.5

5.5.2.3. Platelets transfusion to target a count of > $50X10^9$/l in case of bleeding in general or 100- 150 $X10^9$/l in case of intracranial hemorrhage or intraocular bleeding.

5.5.2.4. Fibrinogen to be given preferentially over cryoprecipitate if serum fibrinogen level is < 1.80g/L (2g/L in case of obstetric bleeding)

5.5.2.5. Where TEG is available the following targets are to be met:

5.5.2.5.1. Plasma for r-value >9 minutes

5.5.2.5.2. Plasma and/or cryoprecipitate (fibrinogen concentrate) for k-time >4 minutes.

5.5.2.5.3. Cryoprecipitate (or fibrinogen concentrate) and/or

plasma for α-angle <60o.

5.5.2.5.4. Platelets for mA <55 mm

5.5.2.5.5. Antifibrinolytics for LY30 >7.5 percent

5.5.2.6. Where rapid TEG is available the following targets are to be met:

5.5.2.6.1. Plasma for ACT >128 seconds

5.5.2.6.2. Plasma and/or cryoprecipitate (fibrinogen concentrate) for k-time >2.5 minutes.

5.5.2.6.3. Cryoprecipitate (fibrinogen concentrate) and/or plasma for α-angle <60.

5.5.2.6.4. Platelets for mA <55 mm

5.5.2.6.5. Antifibrinolytics for LY30 >3 percent

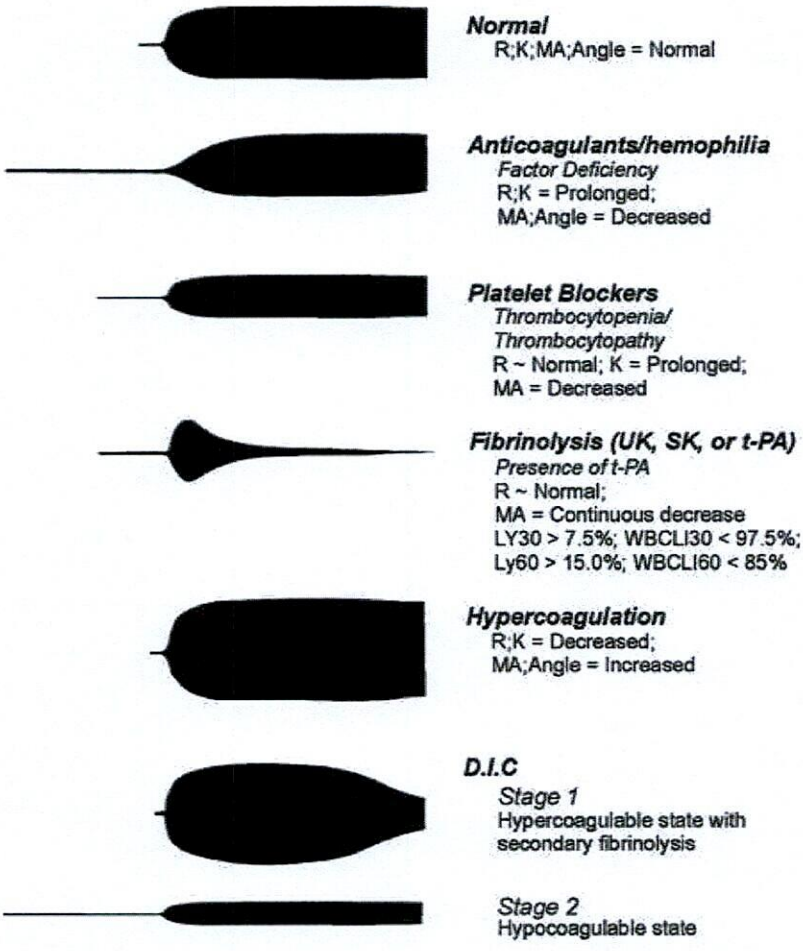
5.5.2.7. Where ROTEM is available the following targets are to be met:

5.5.2.7.1. Plasma for CT exTEM>100 seconds and/or CT inTEM>230 seconds

5.5.2.7.2. Cryoprecipitate (fibrinogen concentrate) and/or plasma for MCF fibTEM<8mm.

5.5.2.7.3. Platelets for MCF exTEM<45mm and MCF fibTEM>10mm

5.5.2.7.4. Antifibrinolytics for ML exTEM>15 percent



Pattern recognition chart of TEG

6. Prevention of Complications during MTP:

Complication and monitoring	Prevention	Treatment
Dilutional coagulopathy -Early monitoring of hemostasis (after each 5 units of packed RBCs or every 60 min) using conventional coagulation tests (PT/aPTT, fibrinogen, platelet) until bleeding ceases	- Transfuse PRBC: FFP: platelets in 1:1:1 ratio	If the PT and/or aPTT are >1.5 times transfuse 2 to 8 units of FFP (according to patient weight)
		If fibrinogen levels <1.5-2 g/d transfuse Cryoprecipitate or fibrinogen concentrate
		If the platelet count is <50 $X10^9$/L, transfuse 6 units of platelet
Hypocalcemia from citrate toxicity - start to monitor calcium level when transfusion rates higher than 1 unit every 5 min or impaired hepatic function	- Frequently monitor arterial blood **ionized calcium concentrations** -Total serum calcium concentrations are not useful in patients requiring MT due to hemodilution	**Calcium chloride**: Give 2 to 5 mL (up to 10 mL) of a 10 % of Calcium chloride solution per unit of RBCS and plasma (preferred in patient with liver failure)
		Calcium gluconate: give 10 to 20 mL of a 10% Calcium gluconate solution (2.5 to 5.0 mmol) per unit of blood
Hyperkalemia -Monitor K level when rates of blood transfusion > 100 - 150 mL/min -in high volume transfusion, ECMO, apheresis machines primed with older, cold-stored blood, underlying renal insufficiency or severe tissue injury -Rapid transfusion through a central venous catheter (hyperkalemic cardiac arrest in vulnerable populations)	-Frequently monitor K level	**-If ECG changes present and/or serum potassium >6.5 meq/L**: Give calcium gluconate 1000 mg (10 mL of 10% solution) **-For ALL hyperkalemic emergencies:** Give insulin and glucose to shift K^+ intracellularly (give insulin only, without glucose, if serum glucose >13.9 mmol/L]). **-Remove potassium from the body**
	Use younger RBCs – RBCs collected <10 days prior to transfusion when available.	
Hypothermia **(continued next page)** (core temperature < 35 °C is associated with acidosis, hypotension and coagulopathy)	-Aim: keep the core temperature > 35 °C -Removal of wet clothing -Cover the patient -Elevation of room temperature	-fluid-warming units -air-warming systems -warm water cushions -adequate control of the temperature of the blood product to be administered by using blood and fluid warmer -Use of extracorporeal warming systems

Multiple organ failure (MOF) -Transfusion of > 6 units PRBCs in the first 12 h post injury increases the possibility of MOF	-Minimize transfusions once hemorrhage is controlled	Supportive care
	-	
Bacterial Infection	Follow general measure to minimize transfusion related bacterial infection	Maintain high index of suspicion to allow for early diagnosis and appropriate treatment (antimicrobial therapy)
TRALI (Transfusion Related Acute Lung Injury)	-Minimize transfusions once hemorrhage is controlled -Consider using PRBCs with a shorter storage time and FFP from men and or nulliparous women	Supportive care

NB: The appropriate transfusion reaction form should be filled by treating doctor then hematologist and blood bank should be contacted especially if TRALI and MOF are suspected.

7. Reversal of Anticoagulation/antiplatelet therapy:

Anticoagulant	Reversal agent	Dose and administration
Warfarin	4 factor PCC (octaplex)	▪ 1500- 2000 units IV over 10 minutes ▪ Check INR after 15 minutes. ▪ If INR is ≥1.5 give additional 4F PCC
	Vitamin K	▪ 10 mg IV over 10 -20 minutes
	FFP (if octaplex is not available)	▪ 2 units rapid infusion ▪ Check INR after 15 minutes. ▪ If INR ≥1.5 administer 2 units of FFP IV ▪ Repeat process until INR ≤1.5
Dabigatran	Idarucizumab	▪ 5 gm (2 vial of 2.5mg) ▪ Infuse each vial over 5min (2nd vial should be infused within 15 minutes of the 1st vial)
Anti XA (apixaban, rivaroxaban)	Specific antidote not available in Kuwait	
	4 factor PCC (octaplex)	▪ 2000 units IV over 10 minutes
UFH	Protamine sulphate (IV)	▪ 1 mg of protamine sulphate per 100 units of heparin ▪ IV slow infusion over 10 minutes ▪ maximum single dose: 50 mg ▪ if aPTT remains elevated, may repeat 0.5 mg of protamine per 100 units of heparin
LMWH (enoxaparin)	Protamine sulphate	▪ 1 mg of protamine per 1 mg of enoxaparin ▪ IV slow infusion over 10 minutes ▪ maximum single dose: 50 mg
Fondaparinux	No specific antidote	
	Novoseven (off label)	▪ 90 µg/kg
Antiplatelet (aspirin / Plavix)	Platelet (avoid platelet transfusion in intracranial hemorrhage except when neurosurgery is needed)	▪ 1 unit/ 10 KG ▪ Average 6 unit

8. Precautions to be taken by activating physician:

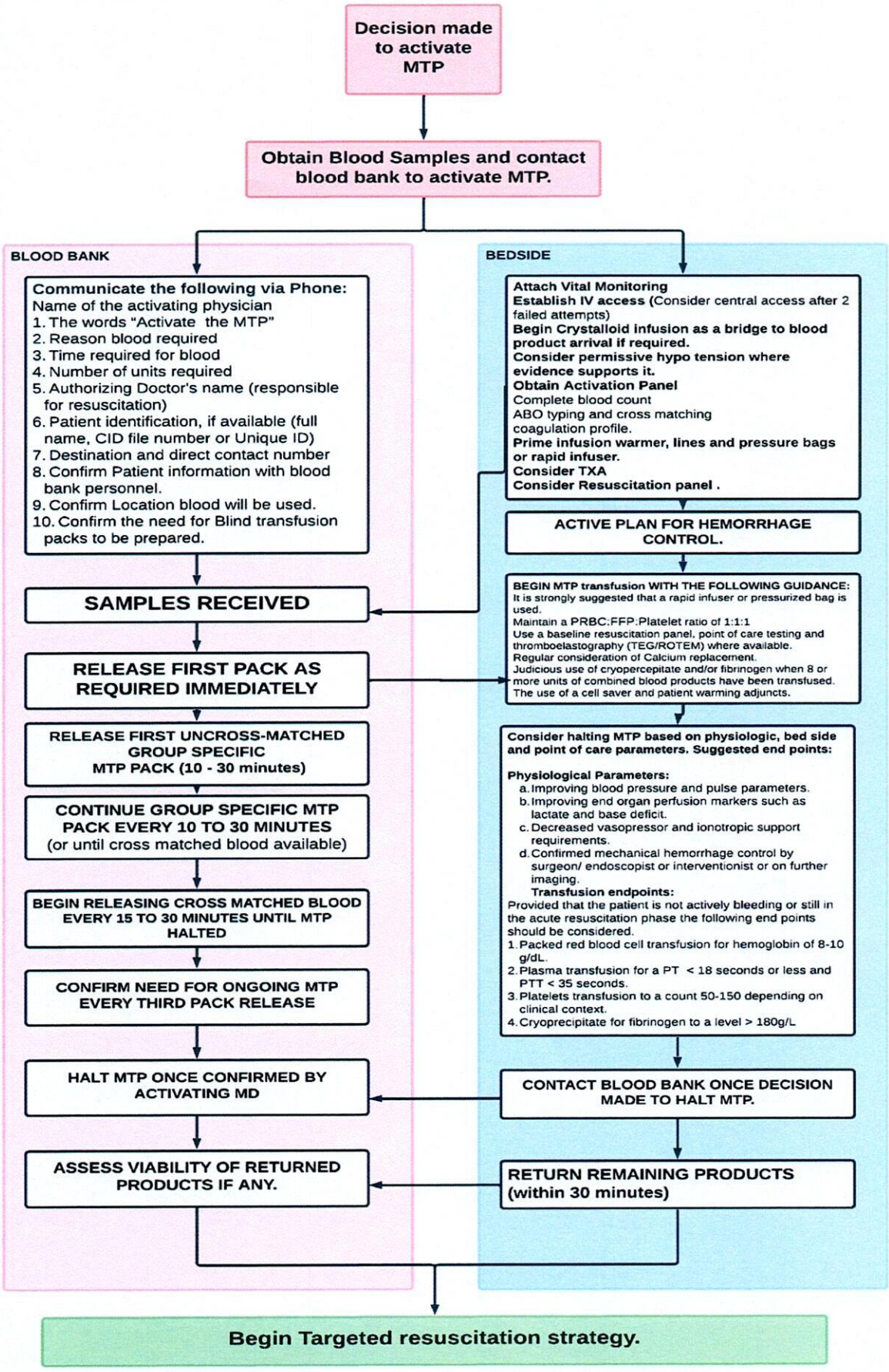
8.1. Limit the use of blind and uncross matched products packs.

8.2. Preferential use of O negative packed red blood cells in women under 50 years of age until RHD status is confirmed.

8.3. Plasma is group specific and use of FFP of AB group type should be curtailed.

8.4. Consider the use of O positive packed red cells in men where clinically warranted.

9. SUMMARY OF PROCESS



10. Forms:

massive transfusion protocol worksheet. (attached)

11. Key Performance Indicators (KPI's):

11.1. Incidence of

11.1.1. coagulopathy
11.1.2. ARDS
11.1.3. TACO
11.1.4. TRALI
11.1.5. Hemolytic reactions.
11.1.6. Wastage or over transfusion.
11.1.7. Death.

11.2. Time intervals

11.2.1. Activating MTP to infusion of first packed red blood cells.
11.2.2. Activating MTP to infusion of plasma.
11.2.3. Adherence to ratio 'ed transfusion within 2 hours of initiation of MTP.
11.2.4. Informing blood bank within an hour of the resolution of need for MTP.

12. Review & Audit

12.1. The department of technical affairs of the MOH will designate a committee to review and oversee the MTP policy, in health care facilities of the MOH, and amend the MOH blood transfusion management policy 2; MTP on an annual basis.

12.2. It is the responsibility of the chairs of blood banks, in the MOH health care facilities, to ensure annual audit and reviews of the following.

1- index health care facility C/T ratio by procedure
2- percent of auto antibodies
3- suggested amendments
4-Adherence to target time of product delivery
5-the following data per requesting department
Number of units crossmatched
Number of units transfused.
C/T ratio
Blood Product return rate. Document any variation in a specific MTP process.

12.3. Document wasted or expired blood units.

12.4. It is the responsibility of the Chief Medical Officer (CMO) of MOH health care facilities with laboratory and blood bank services to establish a Blood Utilization Team or committee with representative member from each department (e.g. departments of surgery, anesthesia etc.) to discuss compliance to, and the applicability of the MOH unified MTP policy, providing awareness, monitoring blood utilization indices, and reporting annually to the central MOH MTP policy committee for review and action.

12.5. It is the responsibility of the chief medical officers of the respective MOH hospitals to ensure article 12.4 is followed.

12.6. It is the responsibility of the CMO to ensure that evidence of the above is reported to the MTP committee for annual review and audit via the office of the undersecretary of technical affairs.

13. References:

British Society of Haematology Guidelines for the management of major haemorrhage. 2022 https://onlinelibrary.wiley.com/doi/10.1111/bjh.18275

The use of viscoelastic haemostatic assays in the management of major bleeding A British Society for Haematology Guideline 2018 https://onlinelibrary.wiley.com/doi/full/10.1111/bjh.15524

American College of Surgeons TQIP Massive Transfusion in Trauma Guidelines 2014 https://www.facs.org/media/zcjdtrd1/transfusion_guildelines.pdf

Multidisciplinary consensus document on the management of massive hemorrhage. First update 2023 (document HEMOMAS-II)

British Society of Haematology Guidelines for the management of major haemorrhage. 2022 https://onlinelibrary.wiley.com/doi/10.1111/bjh.18275

Kristen C. Sihler, Lena M. Napolitano, Complications of Massive Transfusion, Chest, Volume 137, Issue 1,2010

Llau JV, Aldecoa C, Guasch E, Marco P, Marcos-Neira P, Paniagua P, Páramo JA, Quintana M, Rodríguez-Martorell FJ, Serrano A. Multidisciplinary consensus document on the management of massive haemorrhage. First update 2023 (document HEMOMAS-II). Med Intensiva (Engl Ed). 2023 Aug;47(8):454-467. doi: 10.1016/j.medine.2023.03.019. PMID: 37536911. Spanish scientific society of Anesthesiology, intensive care and thrombosis and hemostasis)

British Society of Haematology Guidelines

STATE OF KUWAIT
MINISTRY OF HEALTH
KUWAIT CENTRAL BLOOD BANK
BLOOD TRANSFUSION ADMINISTRATION SERVICES

MASSIVE TRANSFUSION PROTOCOL
WORKSHEET FOR LABORATORY USE ONLY (page 1 of 2)

1. A verbal order to initiate the Massive Transfusion Protocol (MTP) has been received for the following patient.

Patient Name _____

CID # _____

File # _____

2. The verbal order to initiate the MTP:
   Received from _____ on _____ (date/time)
   Received by _____ on _____ (date/time)

3. I acknowledge initiating the Massive Transfusion Protocol and the corresponding lab test and blood product orders for this patient as indicated below.
   _____ (prescriber/title) on _____ (date/time)

Initial Massive Transfusion Order:

1. Issue initial package (As soon as possible of initial order to initiate MTP)

- 4 units of RBC's
- 4 units F FP

Initial package picked up by _____ on _____(date/time)

2. Continue with:

a. Have second package ready within 35 min of issue of first package. Picked up by _____on _____ (date/time)

- 4 units RBC's
- 4 units FFP
- One adult dose Platelet

b. Have third package ready within 35 min of issue of second package. Picked up by _____on _____ (date/time)

- 4 units RBC's
- 4 units FFP
- One "ten-pack" Cryoprecipitate

c. Continue making packages every 35 min until the MT P has been discontinued. All even numbered packages will contain 4 units RBC's, 4 units FFP and 1 adult dose Platelet. All odd number packages (starting with #3) will contain 4 units RBC's, 4 units FFP and "ten-pack" cryoprecipitate. Continue with packages until patient expires or surgeons discontinue the MTP.

d. Fourth package picked up by _____ on _____(date/time)

e. Fifth package picked up by _____ on _____(date/time)

f. Massive Transfusion Protocol stopped by _____on _____ (date/time)

STATE OF KUWAIT
MINISTRY OF HEALTH
KUWAIT CENTRAL BLOOD BANK
BLOOD TRANSFUSION ADMINISTRATION SERVICES

MASSIVE TRANSFUSION PROTOCOL
WORKSHEET FOR LABORATORY USE ONLY (page 2 of 2)

Massive Transfusion Protocol (Lab testing)

I. Order the following lab tests x 3 (order 1st set STAT, 2nd set timed for 2 hrs., and 3rd set pending). Additional orders may be requested by the Blood Bank depending upon the duration and circumstances of the MTE.

• CBC

• Fibrinogen

1st labs drawn _____ (date/time)

2nd labs drawn(date/time)

_____

3rd labs drawn _____ (date/time)

4th labs drawn _____ (date/time)

2. Additional Blood products may be ordered by the Blood Bank, Hematologist, or via Physician verbal order.

- Single adult dose platelets — Ordered on _____ (date/time) by

_____

- "Ten-pack" Cryoprecipitate— Ordered on _____ (date/time) by

_____

3. Massive Transfusion Protocol stopped on _____ (date/time)