

CLINICAL PRACTICE GUIDELINES



MASSIVE TRANSFUSION PROTOCOL (MTP)

2nd Edition, 2024



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Statement of Intent

This clinical practice guideline is based on the best available evidence at the time of development. All health care providers are responsible for the management of their patients based on the clinical picture. The management depends on the options available locally.

Review of Guidelines

This guideline was issued in 2013 and will be reviewed regularly if new evidence becomes available.

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INTRODUCTION

MASSIVE HAEMORRHAGE

The management of massive haemorrhage may be part of a component of treating a critically unwell patient and is often challenging. The definition of massive haemorrhage varies and has been described as one of the following:

1. Adult :
 - a. A loss of one blood volume (70mls/kg or ~ 5 litres) within a 24 hour period
 - b. A loss of 50% blood volume within 3 hours
 - c. A rate of loss of 150 ml/min
2. Children :
 - a. A loss of ≥ 80 mls/kg in the first 24 hours
 - b. A loss of ≥ 40 mls/kg within 3 hours

However, these definitions have limited value as blood may need to be transfused before such blood loss has occurred.

The main management goals in massive hemorrhage are:

- a) Identify source of bleeding and securing hemostasis
- b) Restoration of circulatory volume
- c) Improving tissue oxygenation
- d) Correction of coagulopathy
- e) Consider initiating massive transfusion protocol (MTP) based on local policy

MASSIVE TRANSFUSION

Massive transfusion is defined as infusion of ≥ 10 units of red cell within 24 hours or a transfusion of blood and blood components equivalent to or more to the patient's total blood volume in less than 24 hours or replacement of 50% or more of the estimated blood volume within 3 hours.

1. TEAMWORK AND ROLES

A multi-disciplinary team comprised of adequate personnel is paramount to handle this taxing event. Once massive haemorrhage or the need to transfuse is recognized, a capable team leader calls for help and assign roles:

- 1.1 Appropriate surgical team(s) to arrest the bleeding
- 1.2 Collection of blood samples
- 1.3 Secure large bore intravenous access and blood/blood product transfusion
- 1.4 Alert the blood bank doctor regarding the case and also for urgent processing of samples and transfusion products
- 1.5 Blood sample dispatch to the laboratory
- 1.6 Blood and blood product collection from the blood bank
- 1.7 Technician skilled in utilizing cell salvage auto-transfusion if this is deemed to be a viable method
- 1.8 For certain cases, radiological stenting or embolisation may be considered

2. IMMEDIATE ACTION

- 2.1 Control obvious bleeding points
- 2.2 Administer high F_iO₂
- 2.3 Secure large bore intravenous access
- 2.4 Obtain baseline blood sample, which include:
 - 2.4.1 Full blood count
 - 2.4.2 Coagulation profile
 - 2.4.3 Crossmatch (1 x 6ml EDTA tube), if this has not been done previously.

For the MTP protocol of blood product support, please refer to No. 6 and Appendix 1

2.5 Volume resuscitation

Crossmatched blood may be readily available for certain surgical procedures. If not, in terms of time of availability, uncrossmatched O red cells (UCO) is the quickest, followed by group specific emergency crossmatched, then crossmatched blood. Other fluids (crystalloid and colloid) can be given whilst waiting for blood.

2.6 Warm the patient and all transfused fluids

Blood and blood products must be warmed and administered only using devices which were validated and manufactured specifically for such tasks.

3. BLOOD CHECKING AND DELIVERY

- 3.1 The blood, blood products and documents issued by the blood bank must be cross-checked with the patient's details by two medical personnel to verify that they are matched.
- 3.2 Blood can be warmed using specially manufactured warm water bath prior to transfusion and/or transfused using devices designed for warming the intravenous line.
- 3.3 Blood administration set (with 170um filter) must be used, which may require change to a new set due to deposits of aggregate following multiple transfusions.

- 3.4 Blood bag can be pressurised to generate a higher a flow rate with automated pressurised infuser or pressurised bag up to a maximum of 300mmHg. Some devices (e.g Level 1®) incorporate both warming and pressurisation. This can be utilised early when the need for massive blood transfusion is recognised.

4. FURTHER MANAGEMENT

- 4.1 Regarding surgery,
- 4.1.1 If not yet commenced, this must be an early consideration
 - 4.1.2 If ongoing, it may have to be limited to “damage control”
- 4.2 In order to optimise oxygen delivery to the tissues, maintain good oxygenation and cardiac output.
- 4.3 If there is continuous bleeding, obtain blood sample every 60 minutes to monitor the:
- 4.3.1 Full blood count/Haemoglobin
 - 4.3.2 Coagulation profile
 - 4.3.3 Arterial blood gases
 - 4.3.4 Ionised calcium
- 4.4 If further units of blood are required, a repeat sample must be taken for cross-matching. Inform the blood bank doctor to avoid delay.
- 4.5 Aggressively treat and aim for the following (these are easier to achieve once the bleeding is controlled):
- 4.5.1 Temperature > 35°C
 - 4.5.2 pH > 7.2
 - 4.5.3 Base excess < -6
 - 4.5.4 Lactate < 4 mmol/L
 - 4.5.5 Ca^{2+} > 1.1 mmol/L
 - 4.5.6 Platelets $\geq 50 \times 10^9/\text{L}$
 - 4.5.7 PT/APTT < 1.5 x normal
 - 4.5.8 Hb > 8.0 g/dl
 - 4.5.9 Fibrinogen > 1.5 g/L

These laboratory criterias should be used in conjunction with clinical condition.
Repeat transfusion of blood and blood products transfusion as required.

5. PHARMACOLOGICAL INTERVENTION

- 5.1 Recombinant factor VIIa, is not routinely recommended, but can be considered as an off-label intervention for massive haemorrhage in:
Uncontrollable haemorrhage in salvageable patient AND
failed surgical or radiological intervention to arrest bleeding AND adequate blood component replacement.

Following agreement with the patient's family members regarding the financial implication related to this drug, the pharmacy (for out of hours, the on-call pharmacist) must be alerted and the drug is prescribed online.

- 5.2 The patient must be transferred to a ward or area with a level of high dependency care for further management and correction of physiological status. Additional transfusion may be required.

6. MASSIVE TRANSFUSION PROTOCOL (MTP)

- 6.1 Massive transfusion protocol is a site-specific protocol that outlines the processes, people and blood components required to treat a patient who is bleeding. It is a treatment algorithm that pre-specifies the order and ratios of how different blood components (or products) can be delivered to treat the bleeding. MTP enable rapid provision of blood components to a bleeding patient through agreed communication channels of clinical team, pathology laboratory and the blood bank.
- 6.2 Suggested criteria for activation of MTP:
- Actual or anticipated greater than 3 units of blood in one hour
 - Blood loss of more than 150ml/min
 - Blood loss of more than 50% of blood volume within 3 hours
 - Those who meet criteria using a validated score. The most common

one is the ABC score. Consider activating MTP when 2/4 are present:

- Penetrating mechanism
- Systolic blood pressure < 90 mmHg
- Heart rate >120 beats per minute
- Positive ultrasound FAST (The Focused Assessment with Sonography in Trauma) exam

- 6.3 Activation and cessation of the MTP should be clearly communicated to all relevant teams
- 6.4 Early communication with haematology laboratory doctor and blood bank is required.
- 6.5 Appropriate laboratory investigation is important in the evaluation and monitoring of patients with massive hemorrhage and massively transfused which includes coagulation and biochemical tests .
- 6.6 Blood sample for blood grouping and crossmatching should be taken prior to transfusion of uncrossmatched O red cells.
- 6.7 Please refer to Appendix 1 for MTP in HCTM

7. CLINICAL CASE REVIEW

- 7.1 A clinical review will be conducted within two weeks following each activation of MTP (if needed such as inappropriate MTP activation, wastage of significant amount of blood products etc), this is to monitor and ensure the judicious use of the blood products and to identify the weaknesses of the protocol for continuous improvement.

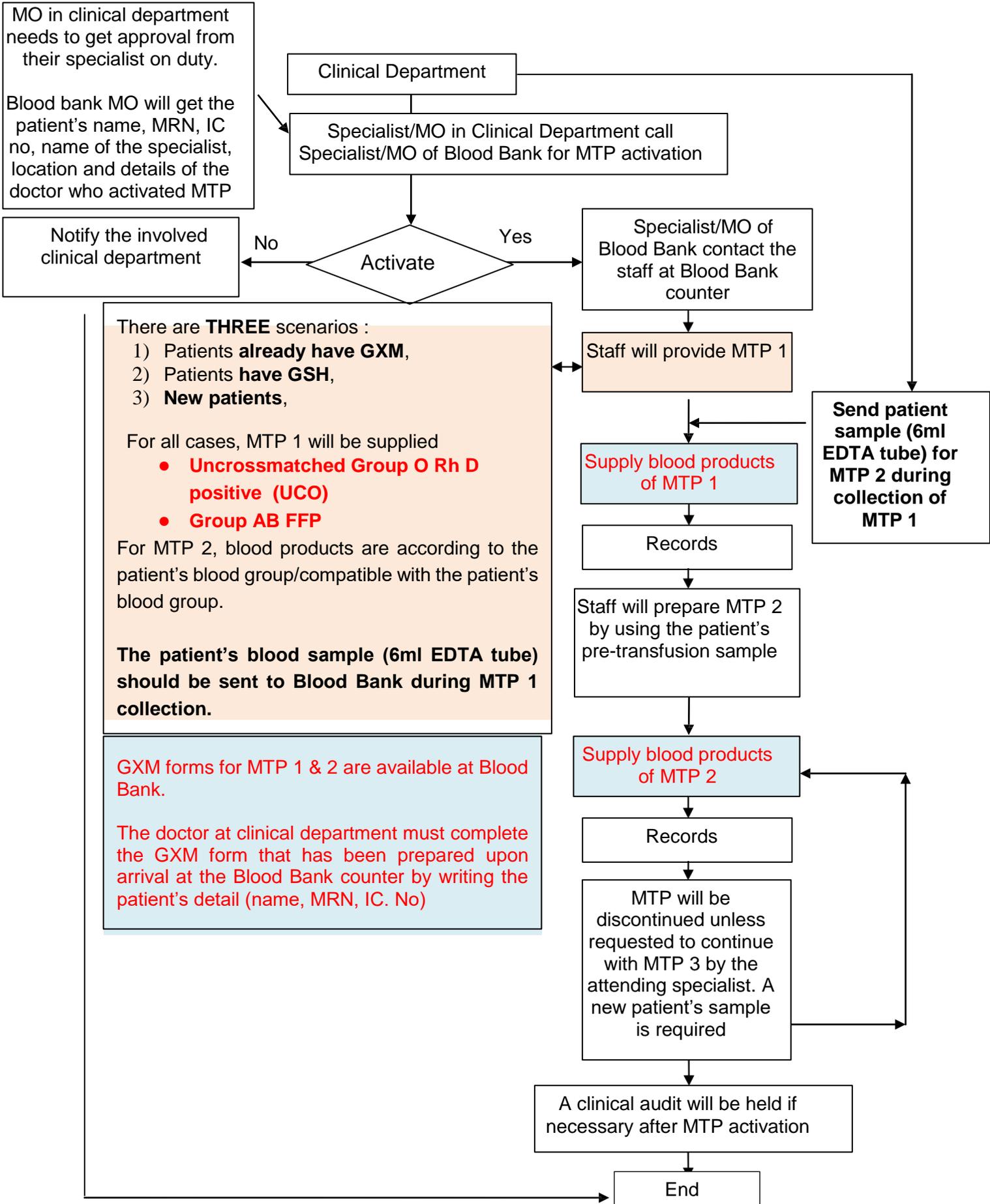
ADAPTED FROM

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4. Transfusion Practice Guidelines for Clinical and Laboratory Personnel, National Blood Centre, Ministry of Health Malaysia, 4th Edition 2016
5. Association of Anaesthetists of Great Britain and Ireland. Guidelines: Blood Transfusion and the Anaesthetist: Management of Massive Haemorrhage 2010.
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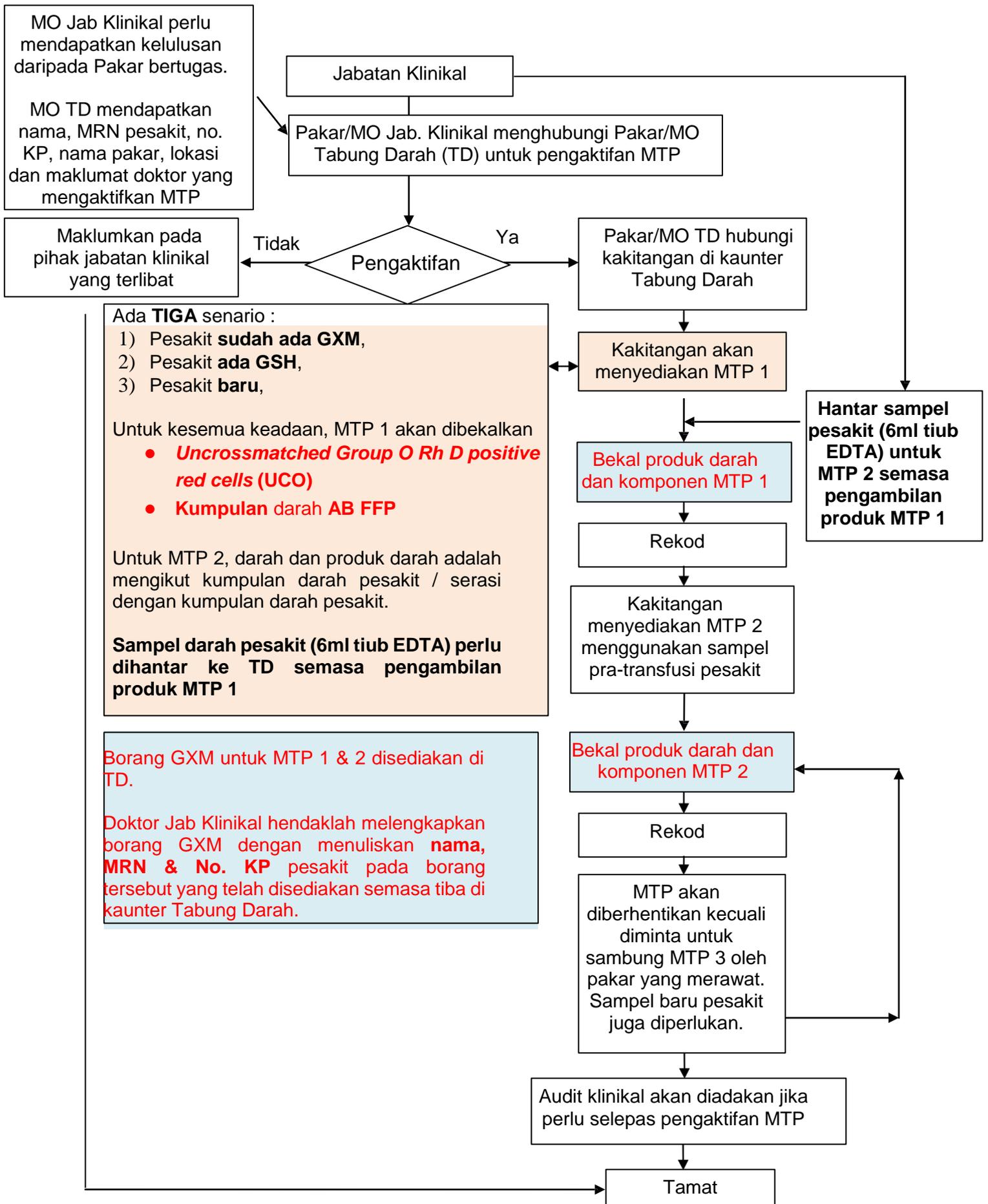
Appendix 1

1. Blood Product Support

MTP 1 (1st cycle)	≤ 20 KG (A)	> 40KG (B)
Uncrossmatched Group O Rh D positive red cells (UCO)	2 units	4 units
FFP (AB blood group)	2 units	4 units
<p>Following the release of the MTP 1 products (component are collected from the laboratory), Blood Bank staff will automatically start to prepare for the MTP 2 products</p> <p>UNLESS INFORMED NOT TO CONTINUE BY THE WARD STAFF AT TIME OF COLLECTION OF MTP 1 PRODUCTS</p>		
MTP 2 (2nd cycle)	≤ 20 KG (A)	> 40KG (B)
*Group specific red cells after an immediate spin cross match {emergency cross match} or full cross match compatible blood units}	2 units	4 units
Group specific FFP	2 units	4 units
** Group specific platelet	2 units	4 units
Group specific cryoprecipitate	2 units	4 units
<p>Following the released MTP 2 products, MTP will be TERMINATED AUTOMATICALLY unless requested by the treating doctor</p> <p>*For emergency crossmatch, inform clinician in charge to stop transfusion and return unused blood if the full crossmatching is found to be incompatible.</p> <p>**Group specific platelets can only be issued depending on the current stock. Suitable compatible units will be issued as a second option.</p> <p>*** MTP 3 requires new samples (1x6ml EDTA) for subsequent request***</p>		
MTP 3	Blood products as in MTP 2	



Note: The risk of error is particularly high in an emergency situation, kindly follow safe practices in blood request and blood administration



Nota: Risiko kesilapan adalah amat tinggi dalam situasi kecemasan. Sila ikuti amalan selamat dalam permintaan dan pemindahan darah