

The background is a dark blue medical illustration. It features a human silhouette with a visible circulatory system of red and blue vessels. To the right is a blood bag with red liquid inside. Below the bag is a row of test tubes. On the left, there are stylized representations of cells or molecules. A large gear is visible on the right side. The overall theme is medical and scientific.

Massive Transfusion Protocol

**Department of Transfusion Medicine,
Hospital Tuanku Ja'afar**

Massive Transfusion Protocol (MTP): Critical Workflow

ACTIVATION & PHASE 1 RESPONSE

Activation Criteria:
ABC Score ≥ 2



Safe 'O' Blood Availability

Safe 'O' stock remains available for emergency use prior to formal MTP activation.



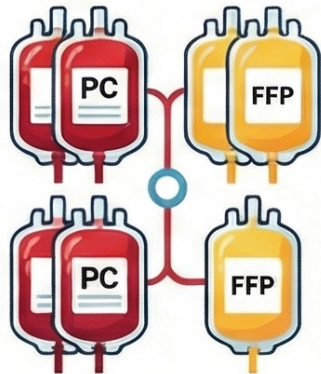
For a start, this new MTP activation is only in ED.

MTP must be activated only by a Specialist.

MTP Coordinator to inform Blood Bank MO On-call.



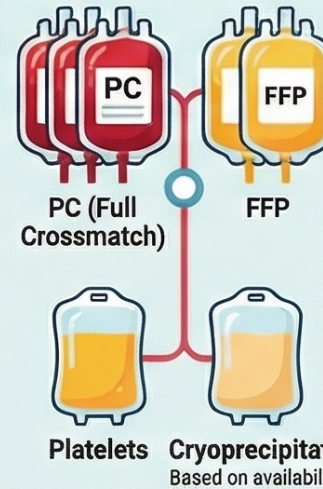

**1st Package:
Under 30 Minutes**



Initial supply includes 4 units of PC (emergency crossmatch) and 4 units of FFP.

CONTINUATION & REQUIREMENTS


**Package 2 &
Subsequent Cycles**



Delivered within 45 minutes; includes 4 units PC (full crossmatch), 4 FFP, and potential platelets/cryoprecipitate

The MTP Kit Requirement

Requires 10mL blood in 4 EDTA tubes and 4 GXM forms every 2 cycles.



MTP Coordinator Transition

The Anaesthesiology MO takes over as coordinator once the patient enters the Operating Theater.



45 Minutes within any package supply

MTP Coordinator must update Blood Bank MO On-call for MTP Continuation / Deactivation or Auto-termination

MTP - Content

- MTP Introduction
- Massive Haemorrhage and Massive Transfusion Definitions
- Options @ HTJS
- Criteria for activation
- Roles – BB Team & Clinician Team
- MTP Packages
- MTP Flow
- MTP Kit
- Challenges
- Gantt Chart
- Tabletop Exercise

Massive Transfusion Protocol – Introduction

- MTP : Process of blood transfusion management in the massive haemorrhage patient.
- Agreeable protocol between blood bank & stakeholder
- Based upon a **fixed ratio** of Packed Red Blood Cells (PRBCs), Fresh Frozen Plasma (FFP), Platelet and Cryoprecipitate in each pack / cycle (1:1:1:1 ratio).
- MTP allows ;
 - rapid volume restoration
 - maintenance of circulating volume
- improve organ perfusion and tissue oxygenation

OP17 OUTCOME EVALUATION OF MASSIVE TRANSFUSION PROTOCOL IN EMERGENCY DEPARTMENTS, HOSPITAL PUTRAJAYA AND HOSPITAL AMPANG: A 3-YEAR RETROSPECTIVE STUDY

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Introduction: Massive transfusion protocol (MTP) is defined as the delivery of ten or more units of packed red cell within 24 hours, replacement of 50% total blood volume within 3 hours or replacement of one entire blood volume within 24 hours. It facilitates close adherence to ideal haemostatic resuscitation - a transfusion ratio of 1:1:1 of fresh frozen plasma (FFP), platelets (PLT) and a packed red blood cell (PRBC), which interrupts the lethal triad of acidosis, hypothermia and coagulation, thus affecting the outcome of patients in terms of survival and mortality.

Data was obtained from patient's electronic medical record (EMR). They were divided into two groups, which are MTP activated and non MTP activated groups. The outcome was evaluated based on transfusion delivery time (time from MTP activation to time of blood transfusion), 24 hour and 30 days mortality, length of hospital stay (LOS) and presence of transfusion error.

Results: Out of 253 patients who received blood transfusion, MTP is only activated in 49 (20%) patients. The prevalence of MTP is higher in trauma patients compare to non trauma (35.1% vs 7%). The results showed that MTP resulted in shorter transfusion delivery time (median 35 min vs 55.5 min, $p < 0.001$) in MTP group compare to the non MTP, and reduced 24 hour mortality (36.8% vs 63.8%) and 30 hour mortality (10.7% vs 89.3%,) ($p = 0.016$). There were no significant association between MTP activation and length of hospital stay (LOS). Meanwhile, no data on transfusion error was obtained.

Conclusion: In conclusion, MTP results in shorter transfusion delivery time and reduced 24 hours and 30 days mortality. There was no significant association between MTP and length of hospital stay (LOS), and data was not obtained for transfusion error.

STUDY ON PRACTICE OF MASSIVE TRANSFUSION PROTOCOL ACTIVATION IN HOSPITAL UNIVERSITI SAINS MALAYSIA

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Abstract

Massive transfusion protocol (MTP) was designed to improve the outcome of patients at risk of massive haemorrhage. This study focused on the prevalence, indications, factors associated with indication of MTP activation cases and twenty-four-hour mortality among those who received MTP in Hospital Universiti Sains Malaysia (USM). A retrospective cross-sectional study was performed on 110 patients for whom MTP was activated in Hospital USM. Data were extracted from the medical records and blood bank system (MyTransfusi). Descriptive statistics and logistic regression were used for statistical analysis. A total of 273,087 patients were admitted to Hospital USM and 193 patients required MTP activation during the study period. The prevalence of MTP activation was only 0.07%. This study included 110 MTP activation cases which consisted of 62 (56.3%) trauma and 48 (43.7%) non-trauma patients. The overall mean age of patients was 40.0 years old, and majority were male (66.4%). The two most common MTP activation indications were motor vehicle accidents (93.5%) and gastrointestinal bleeding (50%). Female and presence of comorbidity significantly associated with MTP activation indication. Meanwhile, no emergency procedure and non-compliance to activated MTP were significantly associated with high mortality within twenty-four-hour post MTP activation. The prevalence of MTP was low. Our result suggested that early emergency procedures and compliance towards MTP improved patient outcomes.

Keywords: Compliance, Indications, Massive Transfusion Protocol (MTP), Mortality.

Massive Haemorrhage

- Active ongoing haemorrhage at the rate of 150ml/min with hemodynamic instability (systolic blood pressure < 90mmHg and/or heart rate > 110 per minute).
- Loss of 50% of blood volume** within 3 hours.
- Loss of total body blood volume** in 24 hours.

*** Adult blood volume is approximately 70ml/kg*

Massive Transfusion

- Transfusion of $> 50\%$ total body blood volume in 3 hours
- Transfusion of $>$ total body blood volume in 24 hours.

Options @ HTJS available now...

Product	Emergency TAT	Routine TAT
Safe 'O'	Immediately	NA
Emergency GXM	30 minutes	NA
Full GXM	NA	2 hours
GSH - GXM	30 minutes	2 hours
Blood Component (FFP, Plt, Cryo)	30 minutes	2 hours

Criteria for MTP Activation

ABC

PWH

TASH

Meeting on 20/11/2024 ; decided for ABC

Criteria for MTP Activation

ASSUMPTION OF BLOOD CONSUMPTION (ABC)

Score Items	Points	Points
Positive Focused Assessment with Sonography for Trauma (FAST)	Yes = 1	No = 0
Systolic BP \leq 90 mmHg in the Emergency Department	Yes = 1	No = 0
HR \geq 120 in the Emergency Department	Yes = 1	No = 0
Penetrating mechanism	Yes = 1	No = 0
Score 0 or 1 : Patient is less likely to require massive transfusion Score 2, 3 or 4 : Patient is likely to require massive transfusion		

score of ≥ 2 was found to predict the need for massive transfusion with a sensitivity of 75% and specificity of 86%

Criteria for MTP Activation

PRINCE OF WALES HOSPITAL / RAINER (PWH)

Score items	Points
SBP < 90 mmHg	3
GCS ≤ 8	1
HR > 120 bpm	1
Displaced Pelvic Fracture	1
CT scan or FAST positive	2
Base deficit > 5 mmol/L	1
Haemoglobin (Hb) ≤ 7g/dL	10
Haemoglobin (Hb) 7.1 - 10 g/dL	1
Total score > 6 indicated the need for MTP	

Criteria for MTP Activation

Trauma Associated Severe Haemorrhage (TASH) Score

Score items	Description	Points
Gender	Male	1
	Female	0
Systolic Blood Pressure	<100mmHg	4
	<120mmHg	1
	≥120mmHg	0
Heart Rate	<120 bpm	2
	≥120 bpm	0
Clinically unstable pelvic fracture		6
Open or dislocated femur fracture		3
Positive Focused Assessment with Sonography for Trauma (FAST) for intra-abdominal fluid		3
Haemoglobin	< 7 g/dL	8
	< 9 g/dL	6
	< 10 g/dL	4
	< 11 g/dL	3
	< 12 g/dL	2
	≥ 12 g/dL	0
Base Excess	< -10mmol/L	4
	< -6mmol/L	3
	< -2mmol/L	1
	≥ -2mmol/L	0

Trauma associated severe haemorrhage score of 18 corresponds well to a massive transfusion probability of almost 50% of the time

MTP HTJS - Roles

Trauma Team



Blood Bank

- Decision for **MTP activation/deactivation** only by **Specialist –EP / Surgeon**
 - **MTP coordinator (MO-appointed by Specialist)** to contact **MO Blood Bank on call** for MTP activation
 - **MTP runners (HO-appointed by MTP coordinator)** to take blood sample, fill & bring up MTP kit to blood bank and to collect MTP packages
 - **MTP runners** must have good communication with
 - MTP coordinator**
 - Blood Bank staff (MLT)**
 - **MTP coordinator** to update **MO Blood Bank on call** for MTP continuation / deactivation
 - To take **baseline blood investigation** : FBC, ABG, PT/APTT/INR, fibrinogen
- **MO BB** on call will inform **blood bank staff (MLT) & Specialist BB** on call
 - **MO BB** on call coordinates with **blood bank staff (MLT) & MTP coordinator**
 - To prepare blood components according to packages in time
 - Proceed MTP upon continuation
 - Stop MTP upon deactivation / auto termination

MTP Packages

1st
package
4 : 4

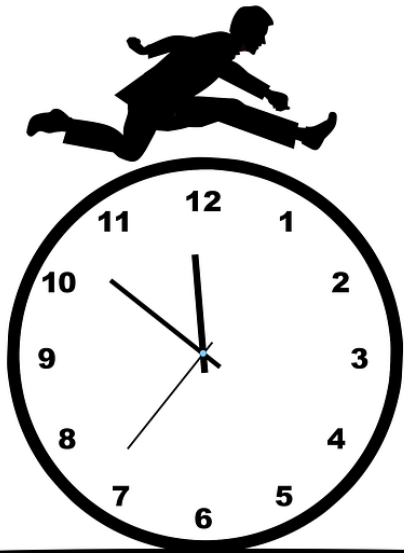
- 4 PC emergency cross match
- 4 FFP

≤ 30
minutes

Subsequent
packages
4 : 4 ± PLT*,CRYO

- 4 PC full cross match
- 4 FFP
- ± 4 PLT* and/or 6 CRYO

≤ 45
minutes



*based on availability



Massive Transfusion Protocol

Department of Transfusion Medicine & Trauma Team, Hospital Tuanku Ja'afar



Criteria to activate MTP ;

Assumption of Blood Consumption(ABC) ≥ 2

Information required by Blood Bank

- Name of Specialist who activates MTP
- Patient's details
- MTP Coordinator's name & contact number

Sample and form (MTP Kit) required*

- 10 mL of blood sample in 4 EDTA tubes
- 4 GXM forms

*Each complete **MTP Kit** is used for **2 cycles** of MTP package. **Every time after 2 cycles**, new complete **MTP Kit** is required (if planned to continue MTP)

If antibody detected ;

- Blood components (FFP, platelet, cryoprecipitate will be supplied as planned)
- For PC, full cross match compatible will be supplied

To activate MTP

- Only by **Specialist**
- **MTP coordinator to inform Blood Bank MO on call**

1st package (≤ 30 minutes)

- 4 units PC emergency crossmatch
 - 4 units FFP

45 minutes within previous package supply →
MTP coordinator must update Blood Bank MO on call →
MTP Continuation / Deactivation OR Auto-termination

2nd package and subsequent MTP packages (≤ 45 minutes)

- 4 units PC full cross match
 - 4 units FFP
- Consider 4 units platelet* and/or 6 units cryoprecipitate
*based on availability

To deactivate MTP

MTP coordinator to notify Blood Bank MO on call

Information

Safe 'O'

- Safe 'O' blood stock is available for emergency cases in the ED
- Safe 'O' blood should be transfused prior to MTP activation

MTP Coordinator

- Must be available to discuss cases with Blood Bank MO on call
- Once the patient is in the OT, **anaesthesiology MO** will be the **MTP coordinator**.
- To fill up MTP feedback form

MTP Runners

- To take blood sample, fill & bring up MTP kit to blood bank

Baseline Blood Investigation

- FBC, ABG, PT/APTT/INR, fibrinogen

List of Items for MTP Kit

Item	Quantity	Remark
1) EDTA tube	4	2-3 mL blood sample per tube
2) GXM forms	4	4 GXM forms <div>MTP : 1</div> 4 units PC (1 st package) <div>MTP : 1</div> 4 units FFP (1 st package) <div>MTP : 2</div> 4 units PC (2 nd package) <div>MTP : 2</div> 4 units FFP (2 nd package)
3) MTP Stamp	1	<div>MTP :</div> For GXM forms & Slip Permintaan Darah for MTP
4) Tube labels (blank sticker)	4	
5) Slip permintaan darah	4	
6) Biohazard plastic	1	
7) Despatch book	1	

Each complete **MTP Kit** is used for 2 cycles of MTP package. Every time after 2 cycles, new complete **MTP Kit** is required.

MTP Kit :

- 10 ml of blood sample in 4 EDTA tubes
- 4 GXM forms

MTP Package	MTP Kit needed?*
1 st package	YES
2 nd package	NO
3 rd package	YES
4 th package	NO
5 th package	YES

*Each complete **MTP Kit** is used for 2 cycles of MTP package. Every time after 2 cycles, new complete **MTP Kit** is required.

Form IV – FFP/PLT/CRYO

[illegible]

Example of complete Blood Request Form

[illegible]

Deactivation of MTP

- MTP Coordinator to update Blood Bank MO on call
- Blood bank will stop to preparing MTP packages
- ED to return all used blood bags and unused blood products
- MTP Coordinator to fill up feedback form (for audit purposes) within 24 hours



Draft for MTP Feedback Form

(to be filled by MTP Coordinator)



MTP FEEDBACK FORM

Name	
Department	
Position	
Role during MTP	
Date of MTP	
Who activate the MTP	
Patient's name	
Diagnosis	
Location of patient/ward	
If pregnant, specify gestation, parity and gestational age	
Criteria for activation	
How many MTP package	
Time activate	
Time received blood product	
Patient outcome	
Any suggestion to improve	

Challenges

- BB and ED distance (decanting)
- No safe O stock @ ED
- Inadequate blood sample, incomplete form
- Limited MLT to handle MTP case especially after office hour
- Limited blood product (platelet)
- Blood bank not updated for MTP continuation / deactivation



GANTT CHART

Task	October 2024	November 2024	December 2024	January 2025	February 2025
MTP Discussion – Blood Bank	/				
MTP Discussion – Trauma Team		/			
Training – (Blood Bank & ED)			/		
Drill & Review				/	
Implementation					/

MTP TABLETOP EXERCISE

- Total participants : 25 (15 ED, 5 Surg, 5 Anes)
- 4 teams ---(5-6 participants/team)
- 2 case scenarios

**Blood Bank Counter
@ STAGE**

Team 1 @ ED

Team 2 @ OT

Team 3 & Team 4 waiting

A top-down photograph of a workspace. A silver laptop is open, showing a portion of its keyboard. A white card with the words "Thank you" written in a black cursive script is placed on the laptop's surface. To the left of the card is a brown paper envelope. A black pen with a silver clip and tip lies diagonally across the bottom left of the card. The entire scene is set against a light-colored wooden background.

Thank you