MASSIVE TRANSFUSION PROTOCOL FOR TRAUMA
HOSPITAL SULTANAH AMINAH
JOHOR BAHRU

TRAUMA-TRANSFUSION COMMITTEE COLLABORATION
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Trauma Surgeon

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Emergency Physician

Dr Muhammad Ramdhan Bin Abd Aziz
Emergency Physician
TITLE

Massive Transfusion Protocol (MTP) for patients presenting with exsanguinating haemorrhage in hospitals with on-site Blood Banks.

INTRODUCTION

Blood is transfused at the Emergency Department or Operation Theatre only in emergency potentially life-threatening situations; usually in response to on-going haemorrhage. In approximately 3 - 6% of these situations, the exsanguinating haemorrhage requires massive transfusions. Massive Transfusion Protocols for traumatic haemorrhage have been shown to improve outcomes if initiated early in the course of treatment (Cotton 2008). Initiating a Massive Transfusion Protocol requires a mechanism to accurately identify patients that will need it, a critical pathway to ensure efficient activation of the protocol, safe and rapid delivery of blood products and effective coordination of available resources.

DEFINITION

Massive Blood Transfusion

• Transfusion of half of one blood volume in 3 hours or more than one blood volume in 24 hours (adult blood volume is approximately 70ml/kg)

• Transfusion of more than 40ml of blood /kg in child (blood volume of children older than neonates is approximately 80ml/kg)

Massive Blood Loss

• Massive and rapid blood loss of 30% blood volume (approximately 1500 ml in average adult) within 3 hours or more than 150ml/min leading to haemodynamic instability and/or circulatory failure.
RATIONALE

Factors improving outcomes from exsanguinating haemorrhage are:

1. Early identification
2. Early control of bleeding
3. Initial resuscitation of the shock state
4. Early initiation of blood transfusions
5. Early initiation of critical care measures

Clinical conditions where exsanguinating haemorrhage occurs include Severe Trauma (intra-peritoneal bleed, retroperitoneal bleed, complex long bone fractures, pelvic fractures, complex facial fractures, penetrating chest and abdominal injuries and high force blunt torso injuries).

Prediction tools to identify need for massive transfusions rely on simple scoring systems eg. ABC Score¹ (Assessment of Blood Consumption Score) and TASH Score² (Trauma-associated severe haemorrhage score) (See Appendix 1). In certain clinical scenarios, a senior clinician’s assessment may provide valuable information on the need to initiated MTP. This is important as injudicious transfusion of blood products may lead to unwarranted complications namely Acute Respiratory Distress Syndrome, infection, Multiple Organ Dysfunction and sepsis (Inaba 2010).

OBJECTIVES

To develop a commonly agreed pathway for Massive Transfusions that will ensure the following

- accurately identify patients that will need massive transfusions,
- ensure efficient activation of the protocol,
- ensure safe and rapid delivery of blood products,

² Yucel et al. Trauma Associated Severe Haemorrhage (TASH) Score. J Trauma 2006;60:1228-1236
• coordinate communications to ensure most effective use of available resources, and
• prepare a mechanism for audit and review of the protocol.

COMMITTEE

Trauma Committee-Transfusion Committee Collaboration.

• Emergency and Trauma Department
• Surgery Department
• Anaesthesiology Department
• Department of Transfusion Medicine

ACTIVATION

Authority

• Emergency Physician
• Surgeon
• Anaesthesiologist

Location

• Emergency Department
• Operation Theatre

Criteria for Activation

• Decision made by 2 of attending specialist (EP/ Surgeon/ Anaesthesiologist) with at least 2 out of 4 of the ABC score.
• Decision is made on the clinical judgement of one attending specialist mentioned above but if made must include the subsequent ABC score of 3 or more.
Assessment of Blood Component (ABC) Score

The ABC score consists of four dichotomous components that are available at the bedside of the acutely injured patient early in the assessment phase. The presence of any one component contributes one point to the total score, for a possible range of scores from zero to four. The parameters include:

- Penetrating mechanism (0 = no, 1 = yes)
- ED SBP of 90mm Hg or less (0 = no, 1 = yes)
- ED HR of 120 bpm or greater (0 = no, 1 = yes)
- Positive FAST (0 = no, 1 = yes)

<table>
<thead>
<tr>
<th>Cutpoint</th>
<th>Prediction need of MTP (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>≥ 2</td>
<td>38</td>
</tr>
<tr>
<td>≥ 3</td>
<td>45</td>
</tr>
<tr>
<td>≥ 4</td>
<td>100</td>
</tr>
</tbody>
</table>
WORKFLOW

Criteria: Assessment of Blood Consumption (ABC) Score (2 out of 4)

<table>
<thead>
<tr>
<th>Criteria (HPSF)</th>
<th>Score (1)</th>
<th>Score</th>
<th>Prediction need of MTP (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>HR ED &gt; 120 bpm</td>
<td></td>
<td>2</td>
<td>38</td>
</tr>
<tr>
<td>Penetrating Trauma</td>
<td></td>
<td>3</td>
<td>45</td>
</tr>
<tr>
<td>SBP ED &lt; 90 mm Hg</td>
<td></td>
<td>4</td>
<td>100</td>
</tr>
<tr>
<td>FAST Positive</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Activate MTP through the Blood Bank MO on call

MTP BOX 1
2 UNIT SAFE O PACKED CELLS
@ 4 UNIT SPECIFIC BLOOD GROUP (KNOWN BLOOD GROUP)

MTP BOX 2
4 UNIT PACKED CELLS
4 UNIT FFP
4 UNIT PLATELET CONCENTRATE

MTP BOX 3
4 UNIT PACKED CELLS
4 UNIT FFP
6 UNIT CRYOPRECIPITATE

NOTIFY BLOOD BANK FOR MORE MTP BOX:
- Alternate MTP Box 2 & Box 3

NOTIFY BLOOD BANK TO CEASE MTP

Baseline Investigations:
- FBC
- Coagulation Profile
- Biochemistry (+ ionised calcium)
- Arterial blood gases

Then monitor ABG closely every 30 mins

Requirements:
- All MTP patient will be identified using the Emergency Department HSAJB registration number (ED RN) and name.
- Blood Form: Name, RN ED and IC number
- At least 2 large bore IV access (14/16 gauge)
- Patient sample for GXM prior to MTP & each time MTP Box is required
- Blood coordinator by Surgical MO on call in ED to ensure blood sample and MTB Boxes are managed effectively.
- Blood goes through without blood bank counter and OT airlock check

AIM FOR:
- Temperature > 35°C
- pH > 7.2
- Base excess < -6
- Lactate < 4 mmol/L
- Ca²⁺ > 1.1 mmol/L
- Platelets > 50 x 10⁹/L

If involves CNS:
Multiple trauma platelet >100 x 10⁹/L
- PT/APTT < 1.5 x normal
- Fibrinogen > 1.0 g/L

Estimated Time for Availability of Blood
- Safe “0”: Immediate
- Group Specific Blood:15 minutes
- Saline Cross Match (Emergency GXM): 30 minutes
- Full Cross Match Blood: 1 to 2 Hours
- FFP/Cryo: 30 minutes to thaw
- Platelet: Immediately

Immediately:
- Document the details of transfusion
- Return ALL USED blood & components
- Return ALL UNUSED blood & components
TERMINATION

- The Emergency Physician/Surgeon is/are responsible to terminate the MTP if patient in ED while the Anaesthesiologist/Surgeon is/are responsible for patients in OT/ICU.

CLERICAL AND ADMINISTRATION

- All MTP patient will be identified using the Emergency Department HSAJB registration number (ED RN) and name including referral from district hospital.
- For unknown patient name will be identified as UNKNOWN + ED RN. Example Unknown12345.
- All MTP patient will be wearing a MTP identification hand tag (MTP+ NAME + ED RN) + Red sticker.
- The IC column for unknown patient will be filled with (-).
- Once MTP activated, the ED RN will be used until stand down.
- The hospital registration will proceed as usual.
- Hospital registration number will be used only after termination of MTP.
- For all cycles, blood sample and form are required.
- MTP boxes will be collected by doctor straight to ED or OT, skip the checking at blood bank counter or OT airlock.
- Blood form is stamped MTP in red (available in ED and OT). (Appendix 2)
- Blood chart for blood labels and stickers. Thus, chart will be made available in ED and OT. (Appendix 3).
- Blood coordinator is Surgical MO on call in ED to ensure blood sample and MTP Boxes are managed effectively.
- The doctors “running” for blood shall be surgical HO from the male surgical ward/ED HO.
- Patient’s sample
  - If initial blood sample is not available, the patient should still receive safe O blood followed by blood sampling later.
  - Ideally 1st sample requires 2 (two) patient’s sample in EDTA tubes with a GXM form
- The rest of MTP Box- 1 sample with a GXM form
• Blood request form (all column must be filled up as usual with additional below)
  • Blood request form accompanied first sample must have
    1. Patient’s Identification- name, ED RN and IC number (if available).
    2. Patient’s Location
    3. Name and contact number - specialist who activated MTP (stamp)
    4. Name and contact number - Blood Coordinator/ Surgical MO on call
• Subsequent Blood request form
  1. Patient’s Identification- name, ED RN and IC number (if available).

EQUIPMENTS REQUIREMENT

1. Under counter blood bank refrigerators in ETD for Safe O blood
2. Level 1 fast flow fluid warmer with integrated air detector/clamp
3. Blood insulated box (Appendix 4)
   • Size should be enough to fit in at least 12 - 16 blood and products
   • Minimum 3 insulated box (labelled as MTP Box) to be placed in Blood Bank.
   • Validation will be done by Blood Bank to ensure the temperature is within 1-10 degree Celsius
   • The blood and component will be packed by Blood Bank staffs
     - small ice pack will be provided by Blood Bank
     - return the reusable ice packs together with MTP Box to Blood Bank
   • Platelet will be placed in a sealed plastic bags and will be attached outside the MTP Box
   • GXM form with MTP Box number and details of the blood and product will be attached outside the MTP Box
DETERMINATION OF RATIOS

- MTP Box 1: 2 units Safe ‘O’ positive \(^3\) PC if blood group unknown, or 4 units uncrossmatched group specific PC
- MTP Box 2: 4 units urgent crossmatched PC, 4 units FFP, 4 units Platelet
- MTP Box 3: 4 units full GXM PC, 4 unit FFP, 6 units cryoprecipitate.
  - After receiving Box 3, Blood Bank should be notified if MTP is to be continued.
  - After Box 3 if MTP need to be continued then transfusions will be alternating between Box 2 and 3
  - Parameter to be monitored every 30 minutes (ionised calcium, ABG) and FBC and Coagulation profile if available.
  - All unused blood and products must be return to blood bank.

PERFORMANCE INDICATOR

- Return unused blood products are appropriately stored (number of units not properly stored)
- Number of unused blood returned/number of requested.
- Number of unit not appropriately stored/ number of unused blood return.

\(^3\) 99% of the Malaysian population are Rhesus positive. Around 1% are Rhesus negative with a large proportion of them are of Indian descent. Caution should be exercise when considering massive transfusion in female Indian patients of child bearing age. If a female RhD negative of child bearing age receive Rh D positive blood or platelets inadvertently, advice from a hematologist be sought.
## Trauma-associated severe haemorrhage (TASH) score

### Appendix 1

<table>
<thead>
<tr>
<th>Variables</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Haemoglobin (g/dl)</strong></td>
<td></td>
</tr>
<tr>
<td>&lt; 7</td>
<td>8</td>
</tr>
<tr>
<td>&lt; 9</td>
<td>6</td>
</tr>
<tr>
<td>&lt; 10</td>
<td>4</td>
</tr>
<tr>
<td>&lt; 11</td>
<td>3</td>
</tr>
<tr>
<td>&lt; 12</td>
<td>2</td>
</tr>
<tr>
<td><strong>Base excess (mmol/L)</strong></td>
<td></td>
</tr>
<tr>
<td>&lt; -10</td>
<td>4</td>
</tr>
<tr>
<td>&lt; -6</td>
<td>3</td>
</tr>
<tr>
<td>&lt; -2</td>
<td>1</td>
</tr>
<tr>
<td><strong>Blood pressure systole (mmHg)</strong></td>
<td></td>
</tr>
<tr>
<td>&lt; 100</td>
<td>4</td>
</tr>
<tr>
<td>&lt; 120</td>
<td>1</td>
</tr>
<tr>
<td><strong>Heart rate (beats/min)</strong></td>
<td></td>
</tr>
<tr>
<td>&gt; 120</td>
<td>2</td>
</tr>
<tr>
<td><strong>Free intraabdominal fluid (e.g. by FAST)</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>3</td>
</tr>
<tr>
<td><strong>Clinically unstable pelvic fracture</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>6</td>
</tr>
<tr>
<td><strong>Open or dislocated femur fracture</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>3</td>
</tr>
<tr>
<td><strong>Male gender</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1</td>
</tr>
</tbody>
</table>
**SAFETY**

**PUSAT PERKhidMATAN DARAH**
**BORANG PERMOHONAN TRANSFUSI DARAH**

(Mesti dipenuhi dalam dua salinan oleh Pegawai Perubatan. Tulis dengan pen mata bulat dan sila √ yang disediakan)

<table>
<thead>
<tr>
<th>No. Makmal:</th>
<th>No. Kad Pengenalan</th>
<th>No. Daftar</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Hospital Unit</th>
<th>Wad</th>
<th>Bangsa</th>
<th>Umur</th>
<th>Jantina</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Pegawai Karjajaan ya/tidak</th>
<th>Kelas</th>
<th>Bayar/Percuma</th>
<th>Pakar Perunding</th>
<th>Kumpulan Darah (ada/ada)</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Diagnosa</th>
<th>Sebab transfusi darah</th>
<th>Hb%</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Transfusi masa lalu? ya/tidak</th>
<th>Jika ya, sebulan tarikh transfusi darah yang terakhir</th>
<th>Kompilasi?</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Sekiranya pesakit seorang wanita, nyatakan →</th>
<th>Bil. Kehamilan</th>
<th>Bil. lahir mati</th>
<th>Tanda-tanda &quot;Haemolytic Disease of Newborn&quot;</th>
</tr>
</thead>
</table>

**Contoh darah dibamil oleh**

**Contoh darah disieki oleh**

**Pada** jam pg/pg

**Nota:**

(1) Sila hati-hati siri contoh darah dalam tanda antarabangsa.

(2) Dalam kesadaan kesamaan, sila telefon makmal transfusi darah. Ujian keserasian darah memerlukan masa 2 jam. Sila darah diencerkan dengan segara, ujian keserasian darah boleh disesuaikan, tetapi harap kesamaan penggunaan darah adalah berlaku dan Pegawai Perubatan yang menggunakan darah tersebut bertanggungjawab atas seluruh urusan yang terlibat seiringan ata. Untuk kesehatan yang tidak memerlukan darah dengan segara, harap kontak darah 24 jam sebelum selanjutnya.

(3) Darah yang tidak digunakan pada waktu yang dietaskan dalam tempoh 24 jam akan dibakar lewat Pegawai Perubatan menunaikan dianggarkan tempoh limpasannya.

(4) MUSTAHIL - Sila larutkan PPD dengan segara sebaiknya darah yang diminta tidak dipelupukkan.

(5) AMANAH: Setiap transfusi darah boleh menyebabkan risiko kecenderuan infeksi. WARNING: Every blood transfusion carries a small risk of infection.

**KHAS UNTUK KEGUNAAN KHATANGAN MAKMAL PUSAT PERKhidMATAN DARAH**

**Permintaan diterima**

<table>
<thead>
<tr>
<th>Ant A</th>
<th>Ant AB</th>
<th>Ant B</th>
<th>Sel A</th>
<th>Sel B</th>
<th>Sel C</th>
<th>Rh D</th>
<th>KUMP. DARAH</th>
<th>T.T.</th>
<th>Tarikh &amp; Masa</th>
</tr>
</thead>
</table>

**Serum pesakit diserasikan dengan beg darah no.**

<table>
<thead>
<tr>
<th>RT.</th>
<th>37°C</th>
<th>AHG</th>
<th>T.T.</th>
<th>Tarikh dan Masa</th>
</tr>
</thead>
</table>

**PPDK 5**

**MTP**

Specialist(name/HP): / 
Surgical MO (name/HP): /
Appendix 3

MASSIVE TRANSFUSION PROTOCOL
BLOOD AND BLOOD COMPONENT ADMINISTRATION CHART
HOSPITAL SULTANAH AMINAH JOHOR BAHRU

| NAME             | ________________________________ |
| HOSPITAL RN #    | ________________________________ |
| COORDINATOR      | ________________________________ |
| ED RN #          | ________________________________ |
| ctc #            | ________________________________ |

<table>
<thead>
<tr>
<th>DATE &amp; TIME RECEIVED</th>
<th>BLOOD COMPATIBILITY STICKERS</th>
<th>VERIFIED BY</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</tbody>
</table>
Blood Insulated Bag
CARTA ALIR PERMOHONAN DARAH SAFE BLOOD O JABATAN KECEMASAN DAN TRAUMA HSAJB

MULA

PERAWATAN PESAKIT

TERDAPAT INDIKASI TRANSFUSI DARAH

INDIKASI TRANSFUSI SAFE BLOOD O

TIDAK

MAKLUM PAKAR PERUBATAN KECEMASAN

RUN FOR BLOOD DI BANK DARAH

SEMAK KOMPONEN DARAH DAN KEIZINAN TRANSFUSI DARAH

TRANSFUSI DARAH KEPADA PESAKIT

TAMAT

YA

SETUJU TRANSFUSI SAFE BLOOD O

AMBIL SAMPEL DARAH DAN ISI PERMOHONAN GXM

MO JKT HUBUNGI MO/PAKAR TRANSFUSI

DAPATKAN SAFE BLOOD O DI BANK DARAH

TRANSFUSI SAFE BLOOD O KEPADA PESAKIT
REFERENCES


