



SGH CLIN217 Clinical Business Rule

MASSIVE TRANSFUSION PROTOCOL (MTP) - ST GEORGE HOSPITAL (SGH)

Cross References (including NSW Health/ SESLHD policy directives)	NSW Health GL2017_018 Maternity - Prevention, Detection, Escalation and Management of Postpartum Haemorrhage (PPH) SGH-TSH CLIN148 Blood Products - Administration of Blood and Blood Products SGH-TSH CLIN149 Blood Products – Storage of Outside of Blood Bank SGH-TSH CLIN274 Haematology/Blood Products - Recombinant Factor VIIa for Life Threatening Bleeding SGH-TSH CLIN016 Warfarin Reversal SGH-TSH WCH CLIN009 Postpartum Haemorrhage
1. What it is	A Clinical Business Rule to support the Massive Transfusion Protocol (MTP) This Clinical Business Rule outlines the appropriate use of blood component therapy in adult patients with critical bleeding requiring massive transfusion.
2. Risk Rating	Medium
3. Employees it Applies to	Medical Officers, Nurses/Midwives, Haematology Laboratory staff at SGH

4. Process

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4.1 CRITERIA FOR ACTIVATING THE MTP

If transfusion of less than 4 PRBC units is anticipated, an urgent X-Match request may be more appropriate initially, prior to consideration for MTP activation

The MTP should be activated for patients who have:

- 4.1.1. Actual or anticipated transfusion of 4 units RBC in < 4 hrs, who are haemodynamically unstable, with anticipated ongoing bleeding
- 4.1.2. Haemorrhaging patient already receiving blood products or intravenous fluids and despite ongoing efforts remain shocked and hemodynamically unstable.
High risk patients could include but are not limited to trauma patients with severe thoracic, abdominal, pelvic injuries, O&G haemorrhaging emergencies, gastrointestinal bleeding or severe surgical blood loss.
- 4.1.3. Pre-hospital notification of a Code Crimson or a request for MTP.

The Consultant responsible for the patient / department must be notified if the MTP is activated.

4.2 MTP FLOWCHART

TEAM LEADER (Snr Reg/above)

- Determine that patient meets criteria for MTP activation
- Delegate a Coordinator (M.O. / R.N.)
- Notify Consultant responsible for the patient.
- Consider Rapid Response activation for assistance if criteria met.



Consider Tranexamic Acid (TXA) in trauma patients within 3hr post-injury:

- Administer TXA 1g in 100ml over 10mins (if not given prior to arrival)
- Then 1 gram of TXA in 500 mL of N/saline over 8 hours

Consider TXA for other patients requiring MTP.



Consider early notifications to the:

- Anaesthetist
- Surgeon / Clinician / Intensivist
- Interventional Radiologist
- ED Consultant
- Haematologist



Instruct Coordinator to modify the MTP pack if required in the event of:

- Pre-MTP blood product administration
- Abnormal initial FBC or coagulation test results
- Clinical conditions that suggest coagulopathic risk (e.g. liver failure)



- Instruct Coordinator to order additional blood products based on blood test results ± ROTEM.
- Instruct Coordinator to order a second MTP pack if clinically indicated, even if results are pending.
- Contact Duty Haematologist for guidance if the patient requires a second MTP pack.



If the patient is transferred to ICU/OT, hand over responsibility to the Duty Anaesthetist (OT) or Senior MO (ICU)

COORDINATOR (M.O./R.N./R.M.)

"ACTIVATE THE MASSIVE TRANSFUSION PROTOCOL":

Call Blood Bank (ext 33433 or 33434; after-hours page 464)

- State your name and designation
- Provide patient details

Take sole charge of all communications with Blood Bank.

Consider Rapid Response activation for assistance if criteria met.



Ensure blood samples are collected and sent for: FBC, Group & X-match, EUC, LFT, ionised calcium, coagulation screen (PT, INR, APTT, fibrinogen, D-dimer), A/VBG



Ensure blood products are correctly prescribed, ordered, infused, and recorded.



Send an Authority Form with the staff member collecting blood products.



- Notify Blood Bank EARLY for each MTP pack required.
- Return unused MTP packs to Blood Bank within 2hr of issue
- Return empty boxes and ice packs to Blood Bank



- If the patient is transferred to ICU/OT, inform Blood Bank and transfer blood products with patient
- If bleeding is controlled and no further MTP packs required, inform Blood Bank to "CEASE MTP"

Laboratory Staff

- Notify Duty Haematologist
- Prepare and issue blood products as requested
- Anticipate repeat testing and blood product requirements
- Minimise turnaround times
- Consider staff resources

Duty Haematologist

- Liaise regularly with laboratory and clinical teams
- Assist in interpretation of results and advise on blood product support

OPTIMISE:

- oxygenation
- cardiac output
- tissue perfusion
- metabolic state

MONITOR

(every 30-60 mins):

- FBC
- coagulation screen
- ionised calcium
- A/VBG

AIM FOR:

- temperature > 35°C
- pH > 7.2
- base excess < -6
- lactate < 4 mmol/L
- Ca²⁺ > 1.1 mmol/L
- platelets > 50x10⁹/L
- PT/APTT < 1.5 x normal
- INR ≤ 1.5
- Fibrinogen > 1.5 g/L

MTP Pack:

- 4 units RBC (Group O or group specific)
- 4 units FFP (Group A/AB or group specific)
- 4 units apheresis cryoprecipitate
- 1 adult pooled platelets



4.3 TEAM LEADER ROLE AND RESPONSIBILITIES

- 4.3.1 Determine that the patient fulfils criteria for activation of the MTP. (See [Section 4.1](#) and [Appendix 1](#)).
- 4.3.2 Delegate a Coordinator (Medical Officer / Registered Nurse or Midwife) to “Activate the Massive Transfusion Protocol”.
- 4.3.3 Notify the Consultant responsible for the patient.
- 4.3.4 In trauma patients with or at risk of significant haemorrhage presenting within 3 hours of injury, prescribe IV Tranexamic acid (TXA). Consider TXA for other patients requiring MTP.
- Administer TXA 1g in 100mL 0.9% sodium chloride over 10 minutes (if not given prior to arrival)
 - Then 1g of TXA in 500mL of 0.9% sodium chloride over 8 hours
- 4.3.5 Consider early Senior Medical input to enable early decision making for operative intervention or radiological embolisation if required. Early notifications may include:
- Anaesthetist
 - Surgeon / Clinician / Intensivist
 - Interventional Radiologist
 - ED Consultant
 - Haematologist
- 4.3.6 Instruct the Coordinator to modify the MTP pack if required in the event of:
- Pre-MTP blood product administration
 - Abnormal initial FBC or coagulation test results
 - Clinical conditions that suggest coagulopathic risk (e.g. liver failure etc.)
- 4.3.7 Instruct the Coordinator to order additional blood products based on blood test results \pm ROTEM if available, guided by clinical evaluation and resuscitative end points. The Team Leader may instruct the Coordinator to order a second MTP pack if clinically indicated, even if test results are pending.
- 4.3.8 Contact the Duty Haematologist for guidance if the patient requires a second or additional MTP pack.
- 4.3.9 If the patient is transferred to ICU / OT, the Team Leader must hand over responsibility to the Duty Anaesthetist (OT) or Senior MO (ICU)
- 4.3.10 Ensure adherence to damage control principles:
- Minimise macrovascular bleeding - direct pressure control of external bleeding points, haemostatic sutures over bleeding sites.
 - Minimise microvascular bleeding and coagulopathy by appropriate initial fluid volume resuscitation targeting BP > 80mmHg or > 90mmHg (if associated head injury) whilst determining site(s) of bleeding, active fluid (“Ranger / Level 1) and patient (“Bair Hugger”) warming, and avoidance of hypothermia, acidosis and hypocalcaemia.
 - Refer to [Section 4.11](#) for general principles of coagulopathy during massive transfusion.
- 4.3.11 Consider the use of Recombinant Factor VIIa (rFVIIa), obtained from Blood Bank, in the event of life threatening bleeding and failed conventional support, in the absence of surgical causes of bleeding. Usage should be in accordance with [SGH-TSH CLIN274 Haematology/Blood Products - Recombinant Factor VIIa for Life Threatening Bleeding](#), particularly with regard to the correction of hypothermia, acidosis, thrombocytopenia, and coagulation parameters prior to the use of rFVIIa. An initial dose of 90 microg/kg of



rFVIIa is reasonable. The routine use of rFVIIa in trauma patients with critical bleeding requiring massive transfusion is not recommended because of its lack of effect on mortality and variable effect on morbidity.

- 4.3.12 Consider Prothrombinex, fresh frozen plasma (FFP) and Vitamin K1 in bleeding patients with an elevated INR of >1.5. See [SGH-TSH CLIN016 Warfarin Reversal](#)

4.4 COORDINATOR ROLE AND RESPONSIBILITIES

- 4.4.1 This role is delegated by the MTP Team Leader. The Coordinator calls Blood Bank (ext 33433 or 33434; after-hours page 464) to “Activate the Massive Transfusion Protocol”:
- State your name and designation.
 - Provide details of the patient.
 - Take sole charge of all communications with the Blood Bank. Communication with the Blood Bank must be restricted to the Coordinator at all times. Should this role be delegated, the Blood Bank must be clearly informed.
- 4.4.2 Consider a Rapid Response activation if assistance is required and criteria met.
- 4.4.3 Ensure blood samples are collected and sent to the laboratory for:
- Baseline tests: FBC, group and cross-match, EUC, LFT, ionised calcium, coagulation screen (PT, INR, APTT, fibrinogen, D-dimer), A/VBG
 - Repeat blood tests every 30 to 60mins: FBC, EUC, ionised calcium, coagulation screen (PT, INR, APTT, fibrinogen, D-dimer), A/VBG
- 4.4.4 Ensure blood products are correctly prescribed, ordered, infused and recorded. Red cells, plasma and cryoprecipitate to be transfused should be warmed using a blood warmer. Platelets should not be infused through a warmer.
- 4.4.5 Send an Authority Form with the staff member collecting the blood products because more than one MTP may be activated at any time.
- 4.4.6 Notify Blood Bank EARLY for each MTP pack required. Arrange for the return to Blood Bank of:
- Unused blood products within the specified time window (see [section 4.5.3](#)).
 - Empty boxes and ice packs.
- 4.4.7 If the patient is transferred to ICU or OT the Coordinator must inform Blood Bank, transfer unused blood products and hand over the Coordinator role.
- 4.4.8 If bleeding is controlled and no further MTP packs are required, the Coordinator must inform the Blood Bank immediately to “Cease the Massive Transfusion Protocol”.

4.5 MTP PACK

- 4.5.1 The MTP pack consists of:
- 4 units RBC (Group O or group specific)
 - 4 units FFP (Group A/AB or group specific)
 - 4 units apheresis cryoprecipitate
 - 1 unit pooled platelets
- 4.5.2 The issue of some blood products may be delayed, depending on thawing (FFP, cryoprecipitate) or availability (platelets).
- 4.5.3 The blood products in the MTP esky must be administered within 2 hours from the time the products leave Blood Bank. (NB: this time is written on the top of the MTP box). Any unused



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MTP products must be notified to Blood Bank and returned to Blood Bank within this 2 hour window.

4.6 RESUSCITATIVE END-POINTS IN MASSIVE TRANSFUSION

- Temperature > 35°C
- pH > 7.2
- Base excess < -6
- Lactate < 4 mmol/L
- Ca²⁺ > 1.1 mmol/L
- Platelets > 50x10⁹/L
- PT/APTT < 1.5 x normal
- INR ≤ 1.5
- Fibrinogen > 1.5 g/L

Poor prognostic values:

- SBP < 70
- Temp < 34°C
- Base Deficit > -6
- pH < 7.1
- lactate > 4mmol/L
- Ionised calcium < 1.1mmol/L

4.7 BLOOD BANK AND HAEMATOLOGIST ROLE

4.7.1 If the MTP is activated:

- Note the requestor's name (Coordinator) and contact phone number.
- Note the patient's details (Name, MRN, DOB).
- Obtain from the Coordinator the name of the Team Leader.
- Prepare and issue blood components as requested.
- Inform the Coordinator once cross matched blood is available.
- Maintain close communication with the Coordinator (NB: The Duty Anaesthetist can be an alternate point of contact on mobile 0438 803 447 or ext. 8009).

4.7.2 If the MTP is activated, the Duty Haematologist is available to provide advice and guidance on appropriate use of products and laboratory testing. The Team Leader should contact the Duty Haematologist for guidance if a second or further MTP pack is required.

4.8 MTP: NURSING AND MIDWIFERY CONSIDERATIONS

4.8.1 A Registered Nurse (RN) or Registered Midwife (RM) may act in the role of the Coordinator (see [section 4.4](#)).

4.8.2 A blood warmer should be considered for all patients receiving MTP. The following products can be placed through the blood warmer:

- Red cells



- Plasma
- Cryoprecipitate

NB: Platelets should NOT be infused through a warmer.

For further information on blood warmers, refer to [SGH-TSH CLIN148 Blood Products - Administration of Blood and Blood Products](#)

4.8.3 Blood and blood product compatibility during infusion:

- Platelets must be transfused through a separate and new blood administration set unless a second line is not available for infusion, in which case the same administration set may need to be used.
- It is ideal to infuse red cells via their own administration set. However, in MTP situations, red cells may follow platelets if necessary through the same blood administration set, but not precede platelets.

4.8.4 Administration set frequency of change:

- Any number of red cell units may be transfused using the same giving set in a 12-hour period, provided the flow rate remains adequate and the products are compatible/interchangeable (see [section 4.8.3](#)).
- The blood administration set should be changed at least every 12 hours or if there is to be an infusion of another fluid, medication or platelets after the current transfusion. This reduces the risk of bacterial growth and incompatible fluids or drugs causing haemolysis of residual red cells in the administration set or drip chamber.

4.9 SPECIAL CONSIDERATIONS IN MATERNITY

- The MTP must be activated early in obstetric bleeding, as bleeding is often underestimated.
- In maternity patients, fibrinogen levels increase to an average of 5–6 g/L by term. Hypofibrinogenaemia is < 2.0g/L in maternity patients, so consideration to correcting hypofibrinogenaemia should be made at this level or if levels are rapidly falling.
- Otherwise the use of platelets, FFP, tranexamic acid and recombinant factor VIIa should be as per the non-obstetric patient.
- See also [SGH-TSH WCH CLIN009 Postpartum Haemorrhage](#).

4.10 SPECIAL CONSIDERATIONS IN TRAUMA

4.10.1 Haemorrhaging trauma patients who have already received blood products or intravenous fluids from the ambulance / retrieval and despite ongoing efforts, remain shocked and hemodynamically unstable, must be considered for the MTP

4.10.2 Consider administering Intravenous (IV) Tranexamic Acid (TXA) if < 3 hours post-injury:

- Administer TXA 1g diluted in 100mL 0.9% sodium chloride and infuse via IV route over 10 minutes (if not given prior to arrival).
- Following this, administer 1g TXA in 500mL 0.9% sodium chloride and infuse via IV route over 8 hours.

4.11 PRINCIPLES OF COAGULOPATHY DURING MASSIVE TRANSFUSION

4.11.1 **Fresh Frozen Plasma:** It is prudent to be aggressive with FFP early rather than to wait for an abnormal result as a trigger to replace coagulation factors. Coagulation factors are often at inadequate levels in patients suffering non-compressible or microvascular



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bleeds, despite normal APTT and PT. These measurements are also underestimated in the presence of coexistent hypothermia. Once the APTT, PT are abnormal, coagulation factor levels may be only 30 – 40% of normal levels.

4.11.2 Cryoprecipitate: Fibrinogen is the first clotting factor to deplete to critical levels in massive haemorrhage. Hypofibrinogenaemia should be corrected early with cryoprecipitate, which takes approximately 15 min to thaw.

- Crystalloids should be avoided as hypofibrinogenaemia may be worsened by prior infusion of crystalloids or colloids to maintain normovolaemia.
- Low-grade Disseminated Intravascular Coagulopathy (DIC) may occur in many massive transfusion settings.
- The endpoint of the coagulation cascade is the conversion of fibrinogen to fibrin. Even with adequate factor replacement, haemostasis will be impaired unless sufficient fibrinogen is present.
- It is recommended that the plasma fibrinogen level be maintained at > 1.5g/L during massive transfusion, as determined by laboratory testing or monitored by ROTEM. For post-partum haemorrhage, see [section 4.9](#).
- Four units of apheresis cryoprecipitate (equivalent to 8 units of single-donor cryoprecipitate) contain approximately 3.5g of fibrinogen, which may be expected to raise the plasma fibrinogen level by 1.0g/L in a 70kg adult, assuming a plasma volume of 45mL/kg. FFP also contains approximately 1.5g/L of fibrinogen.

4.11.3 Platelets: Significant thrombocytopenia is usually a late occurrence. Platelets fall to < 50x10⁹/L from normal levels after approximately two exchanges of blood volume, unless there is significant DIC or other causes of platelet consumption. Despite adequate levels, platelet function is affected by hypothermia and acidosis. Damage control resuscitation to minimise hypothermia and acidosis is therefore critical to platelet function and overall haemorrhage control.

5. Keywords	massive, transfusion, blood
6. Functional Group	Blood and Blood Products
7. External References	<p>1. National Blood Authority. Patient Blood Management Guidelines: Module 1 Critical Bleeding/Massive Transfusion. 2011. http://www.blood.gov.au/pbm-module-1</p> <p>2. Australian Red Cross Blood Service. Massive Transfusion. http://www.transfusion.com.au/disease_therapeutics/transfusion</p> <p>3. CRASH-2 collaborators, Roberts I, Shakur H, Afolabi A, Brohi K, Coats T, Dewan Y, Gando S, Guyatt G, Hunt BJ, Morales C, Perel P, Prieto-Merino D, Woolley T. The importance of early treatment with tranexamic acid in bleeding trauma patients: an exploratory analysis of the CRASH-2 randomised controlled trial. Lancet. Mar 26;377(9771):1096-101. 2011.</p> <p>4. Levy JH, Welsby I, Goodnough LT. Fibrinogen as a therapeutic target for bleeding: a review of critical levels and replacement therapy. Transfusion. 2014 May;54(5):1389-405</p> <p>5. Clinical Excellence Commission. Safety Information 001/18: ABO Compatibility for Blood Products in an Emergency. 19th June 2018</p>



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<p>8. Consumer Advisory Group (CAG) approval of patient information brochure (or related material)</p>	<p>Not applicable</p>	
<p>9. Implementation and Evaluation Plan Including education, training, clinical notes audit, knowledge evaluation audit etc</p>	<p>Established process. Published on the SGSHHS intranet page. Communicated by policy report.</p> <p>Evaluation by clinical review of patients requiring massive transfusion and monitoring of IIMS.</p>	
<p>10. Knowledge Evaluation</p>	<p><i>1. When should the MTP be activated?</i> The MTP should be activated for patients who have:</p> <p>4.1.1. Actual or anticipated transfusion of 4 units RBC in < 4 hrs, who are haemodynamically unstable, with anticipated ongoing bleeding</p> <p>4.1.2. Haemorrhaging patient already receiving blood products or intravenous fluids and despite ongoing efforts remain shocked and hemodynamically unstable.</p> <p>4.1.3. Pre-hospital notification of a Code Crimson or a request for MTP.</p> <p><i>2. Who is responsible for activating the MTP and how is it activated?</i> The Team Leader (Senior Registrar / above) delegates a Coordinator (Medical Officer / Registered Nurse or Midwife) to activate the MTP. Call Blood Bank (ext 33433 or 33434 (after hours page 464) State your name and designation. Provide patient details.</p> <p><i>3. Which is the first coagulation factor to fall to critically low levels during massive haemorrhage?</i> Fibrinogen. Hypofibrinogenaemia should be corrected early with cryoprecipitate, which takes approximately 15min to thaw. It is recommended that the plasma fibrinogen level be maintained at > 1.5g during massive transfusion, as determined by laboratory testing or monitored by ROTEM.</p>	
<p>11. Who is Responsible</p>	<p>Director of Medical Services SGH Director of Haematology SGH Blood Bank Senior Scientific Officer in charge, SGH Director of Emergency, SGH Director of Anaesthetics, SGH Director of Trauma, SGH</p>	<p>Director of Surgery, SGH Director of Intensive Care, SGH Director of Gastroenterology, SGH Director of Obstetrics and Gynaecology, SGH Director of Cardiothoracic Surgery, SGH</p>



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Approval for Massive Transfusion, SGH	
Specialty/Department Committee	Committee title: Blood Transfusion Committee, SGH Chairperson name/position: Dr Szu-Hee Lee, Staff Specilaist Date: 28.08.20
Medical Head of Department	Name/position: Dr Shir-Jing Ho, Medical Head, Haematology Date: 23.10.20
Executive Sponsor	Name/Position: Dr Heidi Boss, Director of Medical Services Date: 23.10.20
Contributors to CIBR development e.g. CNC, Medical Officers (names and position title/specialty)	Rochelle Cummins, CNC ED Rebecca Hughes, CNC Deteriorating Patient Programs Louise Everitt, CMC Obstetrics and Gynaecology Dr Ilana Delroy-Buelles, Department of Anaesthetics Dr Rob Scott, Department of Anaesthetics Dr Mary Langcake, Trauma Dr Trevor Chan, Emergency Department Peter Loizou, Blood Bank Kathleen McGrath, Blood Bank Sarah O'Hare, A/CNC Blood & Blood Products

Revision and Approval History

Date	Revision number	Reason	Author (Position)	Revision due
May 2003	0	New	Staff Specialist ED Chair, Blood Transfusion Committee SGH	May 2006
Oct 2008	1	Review	Staff Specialist ED Chair, Blood Transfusion Committee SGH	Oct 2011
Mar 2013	2	Review	Chair, Blood Transfusion Committee SGH Director of Haematology	Mar 2016
Jun 2014	3	Review:	Chair, Blood Transfusion Committee SGH Director of Haematology	Jun 2017
July 2016	4	UPDATE: changes to Blood Bank Policy included. Approved by Dr Martin Mackertich, DCS, 21.07.16	Szu-Hee Lee, Staff Specialist, Department of Haematology	Jun 2017
Nov 2016	5	Update	Szu-Hee Lee, Staff Specialist, Department of Haematology	Jun 2017
Mar 2018	6	Review	Szu-Hee Lee, Staff Specialist, Department of Haematology	Mar 2021



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Aug 2018	7	UPDATE: Inclusion of Blood Group Compatibility	Szu-Hee Lee, Staff Specialist, Department of Haematology	Mar 2021
Mar 2020	8	UPDATE: trauma specific information included, and Trauma MTP policy archived	Szu-Hee Lee, Staff Specialist, Department of Haematology	Mar 2021
Sep 2020	9	REVIEW: Updates of Team Leader and Coordinator roles, new MTP flowchart, guidelines for nursing staff and special considerations for trauma and obstetric cases.	Szu-Hee Lee, Staff Specialist, Department of Haematology Sarah O'Hare, A/Blood & Blood Products CNC	Sep 2023

General Manager's Ratification

Name: Paul Darcy (SGH) Date: 24.09.20



APPENDIX 1: Suggested Criteria for Activation of MTP

Suggested criteria for activation of MTP

- Actual or anticipated 4 units RBC in < 4 hrs, + haemodynamically unstable, +/- anticipated ongoing bleeding
- Severe thoracic, abdominal, pelvic or multiple long bone trauma
- Major obstetric, gastrointestinal or surgical bleeding

<div style="background-color: #4b0082; color: white; padding: 2px; text-align: center; font-weight: bold;">Initial management of bleeding</div> <ul style="list-style-type: none"> Identify cause Initial measures: <ul style="list-style-type: none"> - compression - tourniquet - packing Surgical assessment: <ul style="list-style-type: none"> - early surgery or angiography to stop bleeding 	<div style="background-color: #4b0082; color: white; padding: 2px; text-align: center; font-weight: bold;">Resuscitation</div> <ul style="list-style-type: none"> Avoid hypothermia, institute active warming Avoid excessive crystalloid Tolerate permissive hypotension (BP 80–100 mmHg systolic) until active bleeding controlled Do not use haemoglobin alone as a transfusion trigger 								
<div style="background-color: #4b0082; color: white; padding: 2px; text-align: center; font-weight: bold;">Specific surgical considerations</div> <ul style="list-style-type: none"> If significant physiological derangement, consider damage control surgery or angiography 	<div style="background-color: #4b0082; color: white; padding: 2px; text-align: center; font-weight: bold;">Special clinical situations</div> <ul style="list-style-type: none"> Warfarin: <ul style="list-style-type: none"> • add vitamin K, prothrombinex/FFP Obstetric haemorrhage: <ul style="list-style-type: none"> • early DIC often present, consider cryoprecipitate Head injury: <ul style="list-style-type: none"> • aim for platelet count > 100 × 10⁹/L • permissive hypotension contraindicated 								
<div style="background-color: #4b0082; color: white; padding: 2px; text-align: center; font-weight: bold;">Cell salvage</div> <ul style="list-style-type: none"> Consider use of cell salvage where appropriate 	<div style="background-color: #4b0082; color: white; padding: 2px; text-align: center; font-weight: bold;">Considerations for use of rFVIIa^b</div> <p>The <i>routine</i> use of rFVIIa in trauma patients is not recommended due to its lack of effect on mortality (Grade B) and variable effect on morbidity (Grade C). Institutions may choose to develop a process for the use of rFVIIa where there is:</p> <ul style="list-style-type: none"> uncontrolled haemorrhage in salvageable patient, <u>and</u> failed surgical or radiological measures to control bleeding, <u>and</u> adequate blood component replacement, <u>and</u> pH > 7.2, temperature > 34°C. <p>Discuss dose with haematologist/transfusion specialist</p> <p>^b rFVIIa is not licensed for use in this situation; all use must be part of practice review.</p>								
<div style="background-color: #4b0082; color: white; padding: 2px; text-align: center; font-weight: bold;">Dosage</div> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="padding: 2px;">Platelet count < 50 × 10⁹/L</td> <td style="padding: 2px;">1 adult therapeutic dose</td> </tr> <tr> <td style="padding: 2px;">INR > 1.5</td> <td style="padding: 2px;">FFP 15 mL/kg^a</td> </tr> <tr> <td style="padding: 2px;">Fibrinogen < 1.0 g/L</td> <td style="padding: 2px;">cryoprecipitate 3–4 g^a</td> </tr> <tr> <td style="padding: 2px;">Tranexamic acid</td> <td style="padding: 2px;">loading dose 1 g over 10 min, then infusion of 1 g over 8 hrs</td> </tr> </table> <p>^a Local transfusion laboratory to advise on number of units needed to provide this dose</p>	Platelet count < 50 × 10 ⁹ /L	1 adult therapeutic dose	INR > 1.5	FFP 15 mL/kg ^a	Fibrinogen < 1.0 g/L	cryoprecipitate 3–4 g ^a	Tranexamic acid	loading dose 1 g over 10 min, then infusion of 1 g over 8 hrs	
Platelet count < 50 × 10 ⁹ /L	1 adult therapeutic dose								
INR > 1.5	FFP 15 mL/kg ^a								
Fibrinogen < 1.0 g/L	cryoprecipitate 3–4 g ^a								
Tranexamic acid	loading dose 1 g over 10 min, then infusion of 1 g over 8 hrs								

ABG	arterial blood gas	FFP	fresh frozen plasma	APTT	activated partial thromboplastin time
INR	international normalised ratio	BP	blood pressure	MTP	massive transfusion protocol
DIC	disseminated intravascular coagulation	PT	prothrombin time	FBC	full blood count
RBC	red blood cell	rFVIIa	activated recombinant factor VII		

NBA Patient Blood Management Guideline: Module 1 Critical Bleeding/Massive Transfusion. 2013¹



APPENDIX 2

Red cells compatibility

Table 1: ABO Blood group compatibility chart for red cell transfusions

Patient ABO type	Best option	Ok to use	Never use
Unknown	O RhD negative	-	A, B, AB
O	O	-	A, B, AB
A	A	O	B, AB
B	B	O	A, AB
AB	AB	O, A, B	-

Patient RhD type	Best option	Ok to use	Never use
RhD negative	RhD negative	-	RhD positive*
RhD positive	RhD positive	RhD negative	-

*RhD negative males and females without child-bearing potential may safely be given RhD positive blood but have a risk of developing Anti-D antibodies.

Pooled Platelets compatibility

Table 2: ABO Blood group compatibility chart for Pooled Platelets

RhD compatible is idea. If RhD positive platelets are given to an RhD negative female of child-bearing capacity, then give Anti-D.

Patient ABO type	Best option	Ok to use	Avoid if possible
Unknown	O or A RhD negative	-	B, AB
O	O	A	B, AB
A	A	B, O	AB
B	B	A, O	AB
AB	AB (not routinely available)	A, B	O



Plasma compatibility

Table 3: ABO Blood group compatibility chart for Plasma

Patient ABO type	Best option	Ok to use	*Warning
Unknown	AB	A	B
O	O	A, B, AB	-
A	A	AB	B
B	B	AB	A
AB	AB	-	A, B

*Always check with the lab before administering.

Unknown blood group in an emergency

Table 4 shows the correct blood groups for the three products likely to be given. In emergency situations the patient's blood group should be determined as soon as possible and once known the patient should receive ABO-matched blood products whenever possible.

Table 4: ABO blood group compatibility chart for plasma product transfusions when the blood group is unknown

Patient ABO Group Unknown			
	Red Cells	Plasma Products	Platelets
First Choice	O	AB	A or O
Second Choice		A (low titre anti-B)*	

*Group A Plasma Products may be issued as the second choice due to stock restrictions. These should have a low titre anti-B identified on the label.