



Massive Haemorrhage

Introduction

Standards for Trauma (T14-1C-106) dictate that: There should be a network agreed massive transfusion protocol covering both adults and children which is used in all trauma units.

The protocol should include the administration of tranexamic acid and blood products including plasma, cryoprecipitate and platelets in the early stages of transfusion.

Each provider for the network will have a Major Haemorrhage Protocol for adults and children.

Each provider to have a policy or protocol on the use of tranexamic acid in adults and children.

The MTC to define the impact of pre hospital transfusion on the initial phase of blood component release with special consideration to:

- (i) The early release of platelets and cryoprecipitate
- (ii) The use of pre thawed plasma

Each provider will have a system for the audit and/or review of MHP activations.

Each provider must be able to evidence review of the MHP at:

- (i) Defined time periods as agreed by the network (or as requested by network for governance).
- (ii) On publication of new guidance
- (iii) As audit evidence directs.

Each hospital transfusion team (from all providers) will be invited to send member(s) to attend an annual meeting to discuss transfusion concerns across the network. A report will be compiled for submission to the network CAG.

The MTC to send representation to the London and South East Haematology and Trauma Group.

Each provider to give annual assurance to the network of their MHP.

Network Transfusion Protocol: Guidance notes

Introduction:

There are a number of definitions of massive blood loss (or massive transfusion) but these are not always applicable to the acute situation, as they are mostly retrospective. The requirement is for the rapid identification of actual, or suspected, major haemorrhage, with or without traumatic coagulopathy by the responsible clinician, paramedic, helicopter emergency medical team (HEMs) or the trauma team leader.

On recognition of the need for rapid transfusion support, a co-ordinated system (Major Haemorrhage Protocol (MHP)) must be activated for the collective management of the haemorrhage. This should include provision of the required blood components for the clinical team in the Emergency Department (ED), and subsequently theatres and the Intensive Care Units (ICU). This will require direct and immediate communications between the clinical team and the Blood Transfusion Laboratory (BTL) and allow for the transportation of blood components between the laboratory and ED without delay (to include the consideration of storage of emergency components within ED).

The British Society for Haematology guidelines for the haematological management of major haemorrhage (British Journal of Haematology 2015) and the National Institute for Health and Care Excellence (NICE) ng39 guidelines for Trauma have been published.

The National Patient Safety Agency published a rapid response report (NPSA/2010/RRR017) on the transfusion of blood components in an emergency. Further guidance and publications can be found in the reference section.

A high percentage of trauma patients will present with a coagulopathy. This is exacerbated by consumption and dilution of clotting factors due to bleeding and massive transfusion/ fluid resuscitation. As current laboratory procedures cannot provide “real time” guidance for targeted component therapy there is a requirement for pro-active treatment with early administration of components such as fresh frozen plasma (FFP), and potentially platelets and cryoprecipitate.

The importance of tranexamic acid (TA) in the trauma setting was highlighted in the 2010 study (Clinical Randomisation of Antifibrinolytics in Significant Haemorrhage (CRASH-2)).

Major haemorrhage will be identified in patient groups other than trauma, for example obstetric, surgical or gastro-intestinal. MHPs across the network should reflect the needs of the patient demographic most commonly presenting, either as ED admissions or during in-patient treatment.

Definitions:

MTC: Major Trauma Centre

TU: Trauma unit

Emergency group O red cells: Group O Negative and group O Positive red cells selected for immediate issue in the major haemorrhage setting with or without an available patient sample. Sometimes referred to as “flying squad” or “crash blood”.

2222: Standardised crash call number

Trigger phrase: An agreed phrase which has clearly defined meaning to all participants from any specialty, in a common clinical event.

Trauma Team Activation: An agreed process to gather the required team with clearly defined roles for all members.

Trauma Team Leader: Instruction, leadership and guidance to trauma team and responsible for Code Red activation.

Code Red: An agreed term, common to all the MTCs in London, for the activation of the Major Haemorrhage Protocol.

Major Haemorrhage Protocol (MHP): A protocol to ensure effective treatment is delivered to a patient actively bleeding or suspected of significant haemorrhage.

Laboratory Major Haemorrhage Protocol or Code Red procedure: This defines the laboratory response, role and responsibilities as part of the MHP.

Massive Haemorrhage: There are many definitions, mostly retrospective, for this e.g. loss of one blood volume in 24 hours, loss of 50% blood volume in 3 hours.

Major Haemorrhage: There are a number of definitions, pragmatically based and these are often agreed locally. Examples include heart rate >110 bpm, systolic BP <90, worsening lactate, loss of 1 litre of blood etc.

Trauma Packs: A trauma pack will contain a defined amount of red cell units and fresh frozen plasma units, designed as a balanced resuscitation until patient is haemodynamically stable. Platelets and cryoprecipitate may also be included. Contents can vary due to the type of haemorrhage commonly encountered in a particular hospital and volume of patients annually.

Component ratios: A trauma pack will consist of red cells and plasma in a pre-determined ratio designed to provide optimal component support in a minimal timeframe. Current guidance proposes a 1:1 ratio for trauma and 1:1.5 - 2.0 for haemorrhage in other clinical settings.

Scope and Purpose

The aim of this policy is to provide a comprehensive guide for all staff involved in the transfusion process supporting the treatment of patients undergoing, or suspected of, massive or major haemorrhage in the trauma setting.

This guidance can be extended to support the transfusion process for major haemorrhage in other clinical settings.

Duties

All staff involved in the transfusion process at any stage must be aware of their roles and responsibilities, to include any limitations imposed by their professional designation.

Staff should be trained to undertake tasks as appropriate to role, assessed as competent, and compliance with all relevant Trust policies should be monitored.

Protocol

Major Trauma Centre:

A clinical guideline is in place for activation of the trauma team. This defines the escalation once a major haemorrhage is determined or suspected for activation of the MHP.

Trauma Unit:

There should be locally agreed procedure for activation of teams and escalation for MHP activation.

The use of the "2222" system is recommended.

Declaring the Massive Haemorrhage Protocol (Code Red or locally agreed trigger phrase):

1. The recognition and activation of the MHP should be made by the attending Consultant where possible, otherwise the most senior person available.
2. There should be locally agreed definitions or triggers for the MHP. Examples:
 - i. Systolic blood pressure < 90 mmHg
 - ii. Heart rate > 110 beats per minute (bpm)
 - iii. Active haemorrhage suspected or Haemoglobin < 90 g/L
 - iv. Increasing lactate concentration
3. Protocols for the use of tranexamic acid should reflect local patient requirements and use should be considered in both the adult and paediatric setting.
4. Code Red may be activated by HEMs pre admission or on rapid transfer from a TU.
5. On activation of the MHP details of any transfusions in the pre hospital, or pre transfer to MTC, setting should be communicated to the laboratory.

Paediatric Code Red

The MHP may need to be activated for paediatric patients. A specific paediatric MHP should be in place if the volume of patients treated warrants this otherwise consideration should be given to the following:

- The transition point from mls/kg to units for older children where the weight is greater than 70 kg.

- The use of specialised components i.e. Methylene Blue treated FFP, Apheresis platelets.
- The responsible person for making the decision to switch from specialised components to standard adult components.
- Laboratory guided component therapy should be based on results suitable for the paediatric setting.

Alerting the Blood Transfusion Laboratory:

There should be a clearly defined person in the trauma team whose role is to alert the BTL and communicate clearly the requirements for the patient. This should include the impact of pre-hospital transfusion on provision, significant comorbidities i.e. Sickle Cell Disease or immune compromise or pregnancy.

At the MTC it is the trauma team leader (TTL) that will notify the blood bank using the phrase “Code Red”.

NB: TUs should note that the London MTCs have agreed on the phrase “Code Red”

The TTL will provide the following information:

- Code Red emergency and location
- Estimated arrival time of patient if applicable
- The patient’s name or MTC pre-generated name (e.g. Alpha AB)
- Hospital Number
- Date of birth, if known, otherwise use MTC generated DoB (e.g. 01.01.1900)
- Sex
- Weight (if paediatric)

The requestor should provide details of any components administered pre-hospital.

The requestor should indicate usage of emergency group O red cells if not alerted by local blood tracking equipment.

A logbook is recommended for data capture and audit.

Notification of the MHP activation should be made to a senior haematology clinician as soon as possible.

Blood Components:

Two units of emergency group O Negative red cells should be rapidly available.

There should be clear guidance on the use of group O Negative red cells and who the responsible person should be, if switching an RhD Negative person to RhD Positive red cells. There should be clear criteria for the use of group O RhD Positive red cells as emergency group O red cells.

A locally agreed ratio of red cells to fresh frozen plasma (FFP) should be in place with the aim of providing 1 unit of FFP per 1.5 (or 2.0) units of red cells in non-trauma patients.

The MTC (and TUs) should aim for a 1:1 ratio of FFP:RBCs for the initial resuscitation of trauma patients, in line with recent BCSH guidance.

The MTC should include the impact of pre hospital transfusion on the initial release of components plus the potential earlier release of platelets and/or cryoprecipitate within the MHP.

Other components should be released as required. The stock holding of platelet components and/or the use of pre thawed plasma should be based on a number of regularly audited criteria, which could include number of activations, distance from NHSBT supply centre or hub/spoke site, wastage data and most common type of haemorrhage encountered.

The initial component release should not require approval from a Haematology clinician.

A system should be in place for the rapid replenishment of emergency group O red cells.

A system should be in place to allow transition from uncross-matched to ABO compatible (type specific) to fully cross-matched red cells, with recall of uncrossmatched components once the group and screen is completed.

A concessionary issue process should be in place for audit of any deviation to the standard procedures for blood component issue.

The system should allow flexibility for patients with traumatic brain injury.

Tranexamic Acid:

Tranexamic acid is an antifibrinolytic used in the management of significant bleeding in the trauma patient. The recommendations for use came from the Clinical Randomisation of Antifibrinolytics in Significant Haemorrhage (CRASH-2) study. Tranexamic acid will often be given in the pre-hospital setting but otherwise should be given within three hours of injury.

For adults:

Initial dose: 1g iv over 10 minutes

Second dose: 1g over 8 hours

Paediatric use:

A dosage regime should be agreed locally

Accurate documentation is required for the use of tranexamic acid as its administration is considered to be part of the "Best Practice Tariff" for trauma patients.

Transportation:

A system must be in place to ensure rapid availability of blood components to the Emergency Department (ED).

The MTC has a blood fridge located in ED for storage of emergency group O red cells. It is recommended that an agreement is in place for a dedicated runner or Porter

Pre-Hospital transfusion:

Patients may have received blood components in the pre hospital setting. London HEMS and Kent, Surrey and Sussex (KSS) HEMs carry 4 units of group O Negative red cells (“Blood on board”). KSS also carry 4 units of lyophilised plasma. The current KSS protocol recommends the administration of 1 unit of reconstituted plasma, assess patient, administer 1 unit of red cells followed by re-assessment of the patient and then repeat component administration as required.

The MTC, or TUs which issue “trauma packs”, should be responsive to prehospital transfusion and adjust component issues to maintain the agreed ratio of red cells to plasma.

If there has been pre-hospital administration of red cells only, then consideration should be given to the early release of FFP.

There should be an agreed protocol for the use of pre-transfusion samples taken by the HEMs teams, to include labelling.

Traceability:

It is a legal requirement under the Blood Safety Quality Regulations 2005 that 100% of blood components transfused can be traced and that confirmation of transfusion is unequivocal. This includes the emergency use of group O red cells.

There should be a process whereby all traceability tags are signed and dated; it is recommended that a team member is allocated to this role when emergency group O red cells are being used.

Continuation of “Code Red”:

All further telephone calls to the blood bank should relate to the use of the local trigger phrase.

If trauma packs are used the contents of such packs should be clearly defined. If platelets and cryoprecipitate are not included in a pack, a clearly defined procedure should be in place to guide the release of these components.

The cycle of release of trauma packs must be clearly understood by both clinical teams and laboratory, especially with regard to automatic or requested release of subsequent packs,

For sites that do not hold platelets in stock, there must be clear instruction on emergency ordering procedures and/or the re-allocation of platelets from medical patients.

The blood transfusion laboratory should be notified immediately when the massive haemorrhage is over and all unused components must be returned to BTL immediately. Clear communication is required between teams with regard to blood component use and availability when a patient is transferred internally to theatres or to ICU.

Laboratory and point of care guided transfusion:

There are recognised limitations in the turnaround times of certain laboratory tests (hence the use of trauma packs in the initial phase of haemorrhage control).

Once the haemorrhage is deemed controlled, laboratory testing should be used to guide the further administration of blood components.

Serial haemostatic testing, including platelet count, PT, APTT and fibrinogen, should be performed regularly. For example: at 30-60 minute intervals (BCSH guidance), after trauma pack completion, at transition points (theatre, recovery, ICU).

The use of TEG or ROTEM should be considered but must be utilised as a research tool under current guidance.

The use of point of care devices should be validated for the patient demographic tested.

There should be agreed guidance for the ordering and release of further blood components once bleeding has stabilised, the examples below are from recent BCSH guidance but levels used should be based on the type of haemorrhage treated at each site within the network.

FFP issued at 15ml/kg if PT or APTT is >1.5 times normal

Fibrinogen supplementation should be given if levels fall below 1.5g/l.

Cryoprecipitate is the standard source of fibrinogen and two units (5 donor pools each) will increase levels by 1g/l

Platelets should be kept at $>50 \times 10^9 /l$ but with on-going bleeding request platelets when the level falls below $100 \times 10^9 /l$.

Transfer of blood:

Adherence to the content of the rapid response report (NPSA/2010/RRR017) has ensured that all Trusts have systems to ensure the rapid provision of blood components in the emergency setting. This has reduced the requirement to transfer blood with patients between sites.

If blood is to be transferred with a patient the MTC and TUs should have systems in place for the following:

- Direct communication between the recipient and sending transfusion laboratories
- A maximum of two units of red cells to be transferred and only if staff who accompany the patient can perform a transfusion.
- That all blood component transfers are managed by the receiving and sending transfusion laboratories.
- That any specialised components (antigen matched blood, antigenmatched platelets) are packed and sent directly by the transfusionlaboratory to ensure cold chain compliance as per requirements of BSQR 2005. This will allow update of the laboratory computer system at the receiving hospital to ensure continuity of specialised blood component provision.

Direct oral anticoagulants and the use of prothrombin complex concentrates:

There should be a local procedure to enable rapid clinical input from a consultant haematologist when a patient on DOAC is admitted with significant haemorrhage.

There should be local procedure to ensure that the use of PCC in major haemorrhage is limited to clinical trials or requires consultant level agreement for use.

PCC should be rapidly available for reversal of vitamin K antagonists.

Blood Refusers:

There should be local policy on the management of patients who refuse blood transfusion.

Training:

Consideration should be given to the performance of MHP activation drills if staff are not frequently exposed to “live” activations.

The MHP should be included in blood transfusion update training.

Dedicated teaching sessions should be considered in the high risk areas, such as ED, the transfusion laboratory and theatres.

Audit and Incident reporting:

There is a requirement to prospectively audit MHP activations.

Transfusion data should be provided to a clinical co-ordinator for incorporation into the clinical database in the MTC Adverse incident data should be available in local reporting structures.

SABRE reporting of adverse incidents and events is mandatory and it is recommended that SHOT reporting is classed as mandatory.

Research:

The co-operation of the members of the hospital transfusion team should be considered for the collation of transfusion data to support clinical studies.

Governance:

There should be close links between the governance pathways involved and local agreement with regard to the escalation of risk.

There should be representation from all relevant clinical areas at the quarterly Hospital Transfusion Committee meetings.

Blood shortages:

The NHS Blood and Transplant (NHSBT) has a contingency plan in place for the release of blood components should there be significant reduction of availability with associated guidance for the patient groups to be supported at each stage of availability (green, amber or red). Each HTC should have a plan in place for such an event.