

**Toolkit for the Management of Major Haemorrhage**

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Steering group of NW RTC Major Haemorrhage Guidelines Group

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**1.** **Introduction**

Excessive blood loss can jeopardise the survival of patients in many clinical settings. During the period October 2006 to September 2010, the National Patient Safety Agency (NPSA) was made aware of 11 deaths and 83 incidents where the patient came close to death as a result of delays in the provision of blood in an acute situation 1

The early recognition of major blood loss and the institution of effective actions are vital if avoidance of hypovolaemic shock and its consequences are to be avoided. One such action is the rapid provision of blood and blood components. A key element is the effective communication between all staff who will be involved in the provision and transportation of blood. The urgent provision of blood for life threatening haemorrhage requires a rapid focussed approach.

In 2009, the North West Regional Transfusion Committee incorporating North Wales (NW RTC) commissioned a group of key stakeholders to develop a toolkit for the management of major haemorrhage (see Appendix 2). The first version was published in January 2011. . In October 2011, the steering group met to review new evidence and feedback from version 1. Version 2 was produced in April 2012. A further review was undertaken by the guidelines group in May 2013 and Version 3 has been in June 2013. A further review has been planned for January 2015, or sooner, should new evidence become available

Sections 3 to 6 are algorithms that can be adapted for local use. They are also available in PowerPoint and word format for easy editing. The documents can be found on the NW RTC section of the transfusionguidelines.org website, under management of major haemorrhage.

The audit proforma has been revised following a second round of regional audit in 2012.

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***Abbreviations:***

HTC Hospital Transfusion Committee

NPSA National Patient Safety Agency

NWRTC North West Transfusion Committee incorporating North Wales

SABRE Serious Adverse Blood Reactions and Events reporting scheme

SHOT Serious Hazards of Transfusion Haemovigilance scheme

**2. Changes in Version 3:**

1. Haemoglobin unit of measurement has been changed to g/L from g/dl
2. A new flowchart has been developed for management of patients who are bleeding whilst taking a novel anticoagulant (Dabigatran, Rivaroxaban and Apixaban) (section 8) – an editable version will be available on the RTC website
3. A recommendation on training has been inserted under New Recommendations (section 3)
4. Suggested key performance indicators are listed in section 12
5. The audit proforma has been updated (section 13)
6. The specialty specific sections have been reviewed and updated
7. **New recommendations**

**Training**

It is now increasingly recognised that successful outcome of critical clinical situations is dependent not only on technical skills but also on non-technical skills. There are sometimes termed “team resource management” or “Human Factors” skills, and include (but are not confined to) leadership, followership, situational awareness, task management, anticipation and planning. Successful treatment of a major haemorrhage requires teams to be proficient in both technical and non-technical skills. The Steering group recommends that teams should train and practice for management of major haemorrhage on a regular basis in order to develop these important non-technical skills in team management and to become familiar with the algorithm and guidelines. There are local facilities available which can provide this training such as high-fidelity patient simulator laboratories

**4.**



**5**



**Explanatory Notes for paediatrics:**



**6.**



**7**.



**Management Of Bleeding In Patients Taking a Newer Oral Anticoagulant (NOAC)**

The NOACs currently licensed for stroke prevention in atrial fibrillation (SPAF) are dabigatran and rivaroxaban.

Dabigatran is a direct thrombin inhibitor

Rivaroxaban and apixaban are factor Xa inhibitors

**There is no specific antidote available for any of these agents**. Management of bleeding should be through cessation of the drug and general haemostatic measures (see subsequent flow chart). For major and life threatening bleeding, follow the Trust Major Haemorrhage pathway

The agents work by direct clotting factor inhibition and not clotting factor depletion. Therefore the administration of clotting factors (FFP, PCC etc) is not anticipated to be wholly effective in reversing their effect. Discussion with a haematologist is recommended.

None of the agents work by blocking the effect of Vitamin K in the production of clotting factors therefore vitamin K administration will have no benefit.

Interpretation of routine laboratory coagulation tests may prove difficult and the relevance of these should be discussed with a haematologist.

Based on pathway developed by Cheshire and Merseyside Clinical Networks – Stroke Network with adaptations by NW RTC

Editable version available on RTC website in major haemorrhage section



**8. Seven Steps for Successful Coordination in Major Haemorrhage**

1. **Recognise trigger and activate pathway for management of major haemorrhage**; **assemble the emergency response team**

populate with local arrangements for how to activate team (eg: through switch) and which people need to be contacted

1. **Allocate team roles**
   1. Team leader
   2. Communication lead– dedicated person for communication with other teams, especially the transfusion laboratory and support services – not the most junior member of the team
   3. Sample taker / investigation organiser / documenter
   4. Transporter - porter, member of team from clinical area) ,

Insert local arrangements here

1. **Complete request forms / take blood samples, label samples correctly / recheck labelling**

U+E, FBC, Crossmatch, PT, APTT, Fibrinogen, ABG, Calcium, lactate

Insert sample labelling and requesting rules here eg: minimum patient identifiers, need for written request from; also sample containers and availability of near patient testing

1. **Request blood / blood components**

**Team leader should decide on use of:**

* 1. Emergency O Neg (immediate)

Insert location of emergency O Neg blood here and number of units

* 1. Group specific insert time to availability here
  2. Crossmatch insert time to availability here

**Communication lead to contact laboratory:**

Contact numbers for lab here : in working hours and out of working hours

and inform the BMS of the following:

* + 1. Your name, location and ext number
    2. ‘this relates to the major haemorrhage situation’
    3. The patient’s details: ideally surname, forename, hospital number, DOB (insert acceptable details for unknown casualty here)
    4. Whether O Neg has been used and how many units
    5. Order major haemorrhage pack(s)
    6. Contact lab if blood has been transferred in with patient from another Trust or patient is being transferred to another Trust

1. **The clinical / laboratory interface**
2. Communication lead to arrange for transport of samples / request form to the laboratory
3. BMS to ring communication lead with results of urgent investigations
4. BMS to ring communication lead when blood / blood components are ready
5. Communication lead to arrange to collect blood and blood components from the laboratory

populate with local transport arrangements eg: porter contact details, designated Healthcare assistant

1. **Communicate stand down of pathway** and let lab know which products have been used
2. **Ensure documentation is complete** 
   1. Clinical area: monitoring of vital signs, timings of blood samples and communications, transfusion documentation in patient casenote record, return traceability information to laboratory, completion of audit proforma
   2. Laboratory: keep record of communications / telephone requests in patient laboratory record

**9. Aims of the toolkit**

* 1. To produce a simple algorithm for the transfusion management of major haemorrhage based on current evidence that can be customised according to local circumstances (Trust or speciality specific) (see sections 5,6 & 7). Implementation of the toolkit will support trusts in meeting requirements of the NPSA Rapid Response Report on emergency availability of blood and blood components
  2. The toolkit will be updated by the steering group as new evidence becomes available
  3. The toolkit is not meant to be a full guideline, but is a means of putting current evidence into practice. Three recent guidelines and the Canadian Consensus Statement are recommended for further reading: (AAGBI, Australian, European 3,6,7)
  4. The circumstances considered in detail during the production of the toolkit include:
     1. Major trauma
     2. General and vascular surgery
     3. Cardiac surgery
     4. Obstetrics
     5. Gastrointestinal haemorrhage
     6. Paediatrics

Examples of guidance on these subgroups / specialities are covered in Appendix 1 of this document.

There is a paucity of good randomised controlled trials on which to base recommendations – most publications contribute Level III or Level IV evidence. The evidence for use of major haemorrhage packs (i.e. early empirical use of fresh frozen plasma and platelets) comes mainly from retrospective studies in major trauma (military and civilian) and major vascular surgery (particularly ruptured aortic aneurysm8). The use of such packs has been extended in this toolkit for use in other situations of life threatening haemorrhage in the absence of definitive evidence, but should be used with caution. The following table sets out some of the pros and cons of formula driven care:

|  |  |
| --- | --- |
| Pros and Cons of Formula Driven Major Transfusion Protocols | |
| Pros   * Reduce mortality from bleeding * Improve speed of delivery of blood components * Decrease need for communications back and forth between clinical area and lab * Prevent onset of coagulopathy * Reduce dependency on lab testing in acute resuscitation phase | Cons   * Based on level III and IV evidence mainly in major trauma * Exposure to additional units of FFP and platelets will increase risk of complications such as TRALI, organ failure, thrombosis and sepsis * Inappropriate triggering of use of formula driven care in non major transfusion patients * Increased wastage of FFP and platelets * Depletion of platelet and plasma stocks |

The toolkit does not advocate the availability of thawed AB FFP and A platelets on standby but rapid requesting and provision once the blood group for the patient is known. Trusts will need to make an individual risk assessment according to the frequency of major haemorrhage episodes, and the distance from the blood centre (for the platelet supply). There have been recent shortages of AB FFP reported by NHSBT so this scarce resource must be managed responsibly.

* 1. The stakeholders also considered the central theme of communication, which is at the heart of the effective management of major haemorrhage. The group have developed Seven Steps for Successful Coordination in major haemorrhage (see section 7), which can be adapted for local use.

**10. Who is the toolkit for?**

The toolkit has been produced for hospital transfusion teams and committees. It is hoped that the algorithm can be used as a template for production of a flow chart for each Trust that will compliment the Trust guideline(s) for management of major haemorrhage.

The transfusion management algorithm is aimed at:

1. The junior doctor / senior nurse who may be the first person to see the patient and must be able to recognise the early stages of major haemorrhage and know when and who to call for support
2. The senior staff called as part of the emergency response team
3. The laboratory staff and supporting services (eg portering services)

**11. Monitoring the management of major haemorrhage**

The key stakeholders will continue to oversee the implementation of the toolkit by commissioning regional audit of the process and development of an audit proforma (see section 12) that can be used locally in Trusts. The following Key Performance Indicators have been developed:

1. Number of cases receving 2 units or fewer of emergency O red cells (denominator = those transfused <5%
2. FFP wastage due to mismanagement 0%
3. Platelet wastage due to mismanagement 0%
4. Red cell wastage due to mismanagement 0%
5. Emergency O red cell wastage due to mismanagement 0%
6. Number of cases of rAAA with open surgical repair where cell salvage commenced >80%
7. Number of obstetric cases with caesarean section where cell salvage commenced >80%
8. Baseline Hb within 4 hours of activation 100%
9. Baseline plt count within 4 hours of activation 100%
10. Baseline PT & APTT within 4 hours of activation 100%
11. Baseline Clauss fibrinogen within 4 hours of activation 100%
12. Was TEG used?
13. Was TXA used?
14. Was TXA given (trauma calls)? 100%
15. Time from activation to grouped red cells being ready for dispatch
16. Time from activation to fresh frozen plasma being ready for dispatch
17. Cases receiving rFVIIa <2%
18. Was lab informed of stand down? 100%

**Transfusion Standard from Major Trauma Service Specification**

Appropriate major haemorrhage protocols must be in place in the Major Trauma Centre and across the network Trauma Units. Activations should be regularly audited. In the Major Trauma centre there should be clinical transfusion leadership and a transfusion specialist is available for advice 24 hours a day. *Please supply protocol and audit data*

All incidents where there are delays of problems in the provision of blood in an emergency must be reported and investigated locally, and if the patient comes to harm the incident should be reported to the NPSA (or equivalent) and SABRE / SHOT scheme. The HTC should maintain oversight of the reported incidents and ensure that corrective and preventive actions are put in place.

**12. Audit Proforma**

Presentation

Allocated case number………………………………………………………

Hospital identification number…………………………………………………Date of Birth…………………………………

Date and Time Haemorrhage (24 hour clock) hh:mm……………………………………………………………………………

Elective / Emergency

Location: Emergency Department / Theatre / Ward / Labour ward or theatre / critical care / other

Other: state other location / if ward state which ward / if theatre state which theatre

Was the pathway activated? Yes / No

Was the laboratory informed? Yes / No

Grade of person activating: Consultant / SpR,ST,middle grade / Specialty doctor / Foundation doctor / Senior nurse / Senior midwife / Nurse / Midwife / Other

Other: ……………………………………………………………………..

Presentation of bleed : GI upper / GI Lower / Obstetric – with caesarean / Obstetric- all others / Gynae / Vascular- aortic aneurysm (open surgical repair) / Vascular –other / Intraoperative / Cardiac / Trauma

Other…………………………………………………………………………………

Final diagnosis……………………………………………………………………

Was a trauma call put out? Yes / No

Blood components used

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Component | Number ordered  (units –mls if paediatric) | Number transfused | Wastage- Avoidable (state units or mls if paeds) | Wastage- Unavoidable (state units or mls if paeds) |
| Emergency O red cells |  |  |  |  |
| Other red cells |  |  |  |  |
| Platelets |  |  |  |  |
| FFP |  |  |  |  |
| Cryoprecipitate |  |  |  |  |

Length of time in hours: minutes from activation to transfusion of Emergency O red cells (if used) (can be a minus time if given before activation) ……………………………………………hh:mm

Actual time (24 hour clock) that request was logged on lab system ……………………………………………hh:mm

Length of time in hours: minutes from activation to transfusion of Other red cells(can be a minus time if given before activation)……………………………………………hh:mm

Actual Time (24 hour clock) that grouped red cells were ready for dispatch to patient on lab system………………hh:m

Actual Time (24 hour clock) that FFP was ready for dispatch to patient on lab system………………hh:m

Cell salvage

Was cell salvage used? Yes/ No If Yes, volume returned if known …………………….(mls)

If processed but not returned, record P ……………………

Laboratory results

Was TEG/ROTEM used? Yes / No

Was Clauss fibrinogen checked? Yes / No

Results – should be result closest to activation and within 4 hours of actviation

|  |  |
| --- | --- |
| Parameter | 1st result after activation |
| Hb g/L |  |
| Platelets x 109/L |  |
| Clauss Fibrinogen g/L |  |
| Other coagulation parameters (PT,APTT, INR) | Normal / Abnormal |

Adjuncts, Risk, Outcome

Was tranexamic acid used? Yes / No

If yes, was it within 3 hours? Yes / No what dosing?...............................................

Were other adjuncts used ? PCC / Fibrinogen conc. / rVIIa / other………………………

Were there any other risk factors? Warfarin / novel oral anticoagulants / Liver disease /

Other risk factors …………………………………………….

If yes to novel oral anticoagulants: which one was patient on Dabigatran / Rivaroxaban / Apixaban

Complications? None / Thrombosis / Organ failure / Transfusion reaction /

Other……………………………………………..

Was patient admitted to critical care? Yes / No

Was lab informed of “Stand down”? Yes / No

|  |  |  |  |
| --- | --- | --- | --- |
| Survival at 24 hours |  | Survival at 30 days |  |
| Survived |  | Survived |  |
| Discharged |  | Discharged |  |
| Transferred |  | Transferred |  |
| Deceased |  | Deceased |  |

Cause of death?......................................................................................

Was this an appropriate activation? Yes / No

Were there any reportable incidents?...................................................................................

Any other comments



**13. References**

1. The transfusion of blood and blood components in an emergency: National Patient Safety Agency Rapid Response Report NPSA/2010/RRR017 October 2010



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4. The decrease of fibrinogen is an early predictor of the severity of postpartum hemorrhage. [J Thromb Haemost.](http://www.ncbi.nlm.nih.gov/pubmed/17087729##) 2007 Feb;5(2):266-73. Charbit B et al
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6. Australian Patient Blood Management Guideline Module 1 Critical bleeding / major transfusion 2011 http://www.nba.gov.au/guidelines/module1/cbmt-qrg.pdf
7. Johansson PI et al. Proactive administration of platelets and plasma for patients with a ruptured abdominal aortic aneurysm: evaluating a change in transfusion practice *Transfusion* 2007: 47; 593-8

**14. Appendix 1**

**Speciality specific information**

* 1. **Major trauma**

**1.1 Who should be included in the team?**

In general, this should be all the personnel included in the Trauma Team with the addition of the lab response, appropriate portering service and haematological advice.

The ideal is consultant led care. When a consultant is not immediately available an appropriate senior doctor within the department must be informed. The senior doctor should become the trauma team leader and make the decisions as to whether O neg and group specific blood are used.

The majorly bleeding trauma patient is highly likely to need urgent/immediate surgery. The appropriate surgical and anaesthetic staff should have been contacted immediately as part of the trauma team. If the team has not been activated, they will need calling immediately. If the patient is expected to go to critical care, critical care should be informed early.

**1.2 Additional management aspects**

Turning off the tap is just as important as immediate resuscitation and should run along side the initial ABC approach. The British Military uses a C-ABC approach which involves dealing with catastrophic haemorrhage first by simple first aid measures such as direct pressure and tourniquet use where there is obvious external haemorrhage.

About one quarter to one third of major trauma patients (ISS > 16) are coagulopathic on arrival 1,2. Managing this with appropriate use of blood products is essential.

**1.2.1 Airway with C Spine**

Ensure the patient has a patent airway. Give High flow Oxygen (Mask with reservoir, 15L/min) if not intubated and ventilated.

Maintain C Spine protection where appropriate.

**1.2.3 Breathing**

Ensure breathing adequate and monitor RR and SpO2. Treat using ATLS principles (APLS for paediatrics)

**1.2.4 C (Circulation)**

1. Insert wide bore peripheral cannulae and take blood samples including a venous gas.
2. Institute basic monitoring: P, BP, ECG if available.
3. Arrest bleeding:
4. Early surgical/radiological/endoscopic intervention.
5. If external bleeding apply pressure/tourniquet as appropriate.
6. Monitor CVP and arterial line if possible.
7. For patients with **ongoing losses** in whom haemostasis will be achieved by **surgical/radiological/endoscopic** intervention, use “hypotensive resuscitation” until haemostasis can be achieved3. Aim for a blood Pressure adequate to maintain conscious level (usually a systolic pressure **90-100 mmHg**). In a ventilated patient aim for a systolic of 90mmHG. Once haemostasis has been achieved, patients should be resuscitated to normal haemodynamic values. For children, aim for BP values referenced in Table 1 on page 21 (section 5.2.1) **Hypotensive resuscitation is not appropriate for patients with an associated head injury;** such patients should have a mean arterial pressure of at least 90mmHg.
8. Keep the patient warm. Dry the patient and keep them covered as much as possible. Use warm fluids and a warm air blanker. All intravenous fluids should be warmed using equipment designed for that purpose. Use a level one infuser (or equivalent) when available to ensure warm blood given.
9. Normocalcaemia, and a pH>7.2 must be maintained

**1.2.5 Tourniquet use**

1. It is appropriate to use a tourniquet in a shocked patient with a major bleed from a limb wound/amputation where direct pressure and elevation are unsuccessful in controlling the bleed.
2. Appropriate devices such as the combat action tourniquet or equivalent are the ideal; if not available, a normal sphygmomanometer blown up above arterial pressure will suffice.
3. Use proximal to the bleeding site, but as distal as practically possible to control bleeding.
4. It should not be applied over joints as this is unlikely to work. It can be difficult to obtain control when placed over the forearm or lower leg because of the structure (two bones) and if control is not reached in these sites the cuff should be moved more proximally.
5. **The time of application of the tourniquet MUST be recorded.**
6. Definitive surgical care to allow removal of the tourniquet must be a priority following tourniquet use.

Departments may find it useful to produce a Major Haemorrhage Equipment pack to contain all the necessary equipment for use in major transfusion situations.

**1.3 Transfusion Goals in patients actively bleeding**

1. Hb 80-100g/L (>100g/L if actively bleeding)
2. Fibrinogen >1.5g/L.
3. Platelets >75 x 109/L except in head trauma where should be >100 x 109/L.
4. PT & APTT ratio <1.5
5. Ca2+ ≥ 1 mmol/L

Tranexamic acid: As per CRASH-2 study 4 1g over 10 mins, then 1g in infusion over 8 hours – give within 3 hours of injury and ideally within 1 hour

* 1. **General and vascular surgery**

**2.1 Who should be included in the team?**

The clinician who identifies the need for a major transfusion episode should seek appropriate assistance from senior colleagues and/or other medical specialties/disciplines. A consultant vascular and/or general surgeon and a consultant anaesthetist should be informed as soon as a major transfusion is expected to be required.

It is the responsibility of the Duty Haematologist to provide advice and support to the managing doctor during such an episode

**2.2 Additional management aspects**

* If the patient is expected to go to critical care, critical care should be informed early.
* General Measures

The cornerstone of management is an ABCDE Approach.

**2.2.1 A, B (Airway and Breathing)**

Ensure the patient has a patent airway and is breathing adequately, ensure adequate oxygenation and monitor SpO2.

Give High flow Oxygen (Mask with reservoir, 15L/min) if not intubated and ventilated.

**2.2.2 C (Circulation)**

1. Insert wide bore peripheral cannulae.
2. Institute basic monitoring: P, BP, ECG if available.
3. Monitor CVP if possible
4. Arrest bleeding:
5. Early surgical/radiological/endoscopic intervention
6. If external bleeding apply pressure/tourniquet as appropriate.
7. For patients with **ongoing losses** in whom haemostasis will be achieved by **surgical/radiological/endoscopic** intervention, use “hypotensive resuscitation” until haemostasis can be achieved. Aim for a blood Pressure adequate to maintain conscious level (usually a systolic pressure **90-100 mmHg**). Once haemostasis has been achieved, patients should be resuscitated to normal haemodynamic values. Hypotensive resuscitation is not appropriate for patients with an associated head injury; such patients should have a mean arterial pressure of at least 70mmHg.
8. Normothermia, normocalcaemia, and a pH>7.2 must be maintained5. All intravenous fluids should be warmed using equipment designed for that purpose. Use a warm air blanket.

**2.3 Transfusion Goals in patients actively bleeding**

1. Hb 80-100g/L (>100g/L if actively bleeding)
2. Fibrinogen >1.5g/L.
3. Platelets >75 x109/L.
4. PT & APTT ratio <1.5

**Dosage information for tranexamic acid**

Tranexamic acid: As per CRASH-2 study 4 1g over 10 mins, then 1g in infusion over 8 hours

1. **Obstetrics**

**3.1 Who should be included in the team?**

It may be a midwife or a junior doctor in obstetrics who alerts the ‘team’ which should include middle grade trainees from obstetrics and anaesthetics and senior midwife plus midwife in charge but should rapidly involve consultant obstetrician and consultant anaesthetist, ODA, theatre team, one member of the team (the scribe) to keep records, HCA/porter and the lab staff and consultant haematologist for advice and support.

**3.2 Additional management aspects**

Follow the ABCD approach –

**3.2.1 A, B (Airway and Breathing)**

Ensure the patient has a patent airway and is breathing adequately, ensure adequate oxygenation and monitor SpO2.

Give High flow Oxygen (Mask with reservoir, 15L/min) if not intubated and ventilated.

**3.2.2 C (Circulation):**

1. Insert wide bore peripheral cannulae x 2
2. Institute basic monitoring – ECG, pulse oximetry, NIBP
3. Infuse crystalloid/colloid until blood is available – O Neg to be used if necessary and resort to MHP1 as soon as available – fibrinogen levels fall early in obstetric haemorrhage
4. Check uterine tone – uterotonics like syntocinon 5 units iv slowly or ergometrine 0.5mg by slow iv or im injection, syntocinon infusion at 10 units per hour, carboprost 0.25mg im repeated at 15 min intervals if required, (max 8 doses) or misoprostol 1000 mcgs pr and bimanual compression
5. If these fail, surgical measures may be required – EUA in theatres
6. Surgical interventions in ascending order of complexity – balloon tamponade, brace sutures, ligation of uterine or internal iliac arteries and ultimately hysterectomy (see next point re interventional radiology)
7. Interventional radiology - embolisation if available needs to be considered
8. Invasive BP monitoring, CVP monitoring, level 1 infusors, fluid warmers, forced air warmers and cell salvage may be required.
9. Normothermia,  normocalcaemia, and a pH>7.2 must be maintained. All intravenous fluids should be warmed using equipment designed for that purpose. Use a warm air blanket.

**3.3 Transfusion Goals in patients actively bleeding**

1. Hb 80-100g/L (>100g/L if actively bleeding)
   * 1. Fibrinogen >2.0g/L.
     2. Platelets >75 x 109/L.
     3. PT & APTT ratio <1.5

Other agents for controlling haemostasis, like rVIIa, may be appropriate on the advice of the Haematologist depending on clinical situation/lab results.

**4 Gastrointestinal haemorrhage**

**4.1 Who should be included in the team?**

Initial assessment to establish the severity of the bleed by calculating Glasgow-Blatchford score, (and Rockall score used post-endoscopy).

Medical history will alert to the risk of liver disease and possible variceal haemorrhage. Involve Medical SpR, +/- Gastro SpR (where rota exists)

Alert the locally available endoscopy service, as the key to successful management is resuscitation and early haemostasis, where treatment will require interhospital transfer it is recommended the senior clinician and anaesthetic team on call is involved.

Emergency endoscopy will need to be arranged, for unstable patients anaesthetic support for airway protection and resuscitation is recommended.

**4.2 Specific management aspects for major haemorrhage guidelines** 6,7

**4.2.1 Prognostic factors**

Factors associated with a poorer outcome in upper and/or lower gastrointestinal haemorrhage defined in terms of severity of bleed, uncontrolled bleeding, rebleeding, need for intervention and mortality are:

* initial shock
* advanced age
* co-morbidity
* liver disease
* in-patients
* continued bleeding after admission
* initial haematemesis or haematochezia
* specific drugs (aspirin or NSAIDs).

**4.2.2 Upper gastrointestinal endoscopy**

Early diagnosis and haemostasis achieved endoscopically is the ideal. Whilst resuscitation and stabilisation is desirable prior to endoscopy, in cases when this cannot be achieved, particularly because of ongoing haemorrhage, endoscopy should not be delayed. Anaesthetic support to safeguard airway and continue fluid resuscitation is required

The endoscopist and endoscopy nurse assisting should be skilled in all modalities of therapy for variceal and non-variceal bleeding. For the former, modalities include oesophageal band ligation, cyanoacylate glue and Sengstaken Blakemore tube placement and for the latter at least dual therapies of injection of 1 in 10000 adrenaline, thermal therapy gold probe and haemostatic clips for Forrest 1a-2b lesions.

Failed haemostasis at endoscopy or instability in the post-endoscopy period should trigger involvement of surgical and /or interventional radiology on call teams. The former can offer laparotomy as an intervention for peptic ulcer disease; the interventional radiologist can coil bleeding arterial lesions, or arrange TIPS for persistent bleeding due to varices and portal hypertension.

Endoscopy should be performed immediately after initial resuscitation in cases of severe upper GIB, and within 24 hrs for all other patients

Endoscopy and endo-therapy should be repeated within 24 hours when initial endoscopic treatment was considered sub-optimal or in patients in whom rebleeding is likely to be life threatening.

Endotracheal intubation is necessary if active haematemesis or unstable vital signs or altered mental state as is the case in acute alcohol withdrawal or hepatic encephalopathy often seen in cases of variceal haemorrhage

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**4.2.3 Lower gastrointestinal endoscopy**

Early endoscopic examination should be undertaken within 24 hours of initial presentation, where possible. Consultation with the surgical team will guide the timing of this and surgical intervention.

**4.2.4 Pharmacological therapy**

Although the place of Intravenous (IV) proton pump inhibition therapy in patients with major peptic ulcer bleeding following endoscopic therapy is recommended, it is often administered prior to endoscopy. There is evidence that its use can result in a shorter length of stay, fewer actively bleeding ulcers, and more ulcers with a clean base8.

The commencement of IV terlipressin is recommended if there is a risk of variceal haemorrhage.

Antibiotic therapy should be commenced in patients with chronic liver disease who present with acute upper gastrointestinal haemorrhage.

Nasogastric aspiration may identify high-risk upper GI haemorrhage, allow lavage and facilitate endoscopy but no evidence that it alters outcome has been identified.

**4.2.5 Other modalities**

Angiography and coil embolisation may need to be considered in those in whom endoscopic treatment is not possible or successful (especially if they have had a second unsuccessful attempt at endoscopic haemostasis) and are not fit for surgery.

Transjugular intrahepatic portosystemic stent shunting (TIPPS) is recommended as the treatment of choice for uncontrolled variceal haemorrhage.

Balloon tamponade using a Sengstaken-Blakemore tube should be considered as a temporary salvage treatment for uncontrolled variceal haemorrhage.

The availability of the above interventions will depend on local resources and cases must be treated on an individual basis.

**4.2.6 Transfusion goals in major gastrointestinal haemorrhage\***

1. Hb80-100g/L
2. Fibrinogen >1.5g/L.
3. Platelets >50 x109/L.
4. PT & APTT ratio <1.5

\* **Transfusion in GI haemorrhage**

1. In the absence of major haemorrhage and shock the threshold for transfusion of red cells is 70-80 g /L (there is some evidence to suggest that transfusion at higher thresholds increases the risk of rebleeding9 )
2. **Paediatrics**

**5.1 Who should be included in the team?**

This will depend on the facilities available in hospital.

In district general hospitals, a major haemorrhage in a neonate or child should trigger a “Paediatric Crashcall” to ensure that at least a Paediatric middle grade doctor (Specialist Registrar, Speciality Trainee 4 or above) and Paediatric Specialty Trainee 1-3 are in attendance. A Consultant Paediatrician should be alerted to the situation urgently if not already present.

Other team members will depend on the specifics of the situation as outlined in the other specialty sections, for example the Trauma Team in a trauma situation, or surgical team in the case of a post-operative bleed.

Staff present should be familiar with the location and use of all equipment necessary such as vascular access devices, rapid infusors, fluid warmers and advanced airway equipment.

Discussions should begin with the local Paediatric Intensive Care Unit, and with specialist paediatric services such as Paediatric Surgery as soon as is practicable for advice regarding continuing management and definitive care.

In tertiary paediatric hospitals, the members of the team to be alerted may more closely mirror those in adult situations.

For a Major Haemorrhage on ward, a senior Paediatrician should be alerted at least, but most of these events are likely to trigger a crashcall.

**5.2 Additional Management Aspects**

Many of the general principles outlined in the other specialty sections equally apply to when those situations occur in children, and the guidance given in those sections should be considered.

However, physiologically and psychologically, neonates and children behave differently to adults, and so there are some specific points which should be noted.

**5.2.1 Shock**

Indicators of shock in children are as follows:

combination of at least 2 of:

Tachycardia, bradycardia, BP less than 5th centile (see table 1) or pulse pressure <20mmHg, capillary refill time >3 seconds centrally or central / peripheral gap, abnormal conscious level – agitation, confusion, lack of normal social interaction, Glasgow Coma Score<13 or falling, responds to only voice, pain or unresponsive

Of these, tachycardia is the most reliable early indicator, but all the available clinical information must be used to decide whether a patient is shocked.

The normal ranges of these vary with age. A reference table is provided to aid decision making:

Table 1: Paediatric reference values 10

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Age** | **Heart Rate**  beats/min | | **Respiratory Rate**  breaths/min | **Systolic BP**  mmHg |
| Tachycardia | Bradycardia |
| 0-7 days | >180 | <100 | >50 | <59 |
| 7-28 days | >180 | <100 | >40 | <79 |
| 1 month –  1 year | >180 | <90 | >34 | <75 |
| 2-5 years | >140 | <60 | >22 | <74 |
| 6-12 years | >130 | <60 | >18 | <83 |
| 13-18 years | >110 | <60 | >14 | <90 |

Children’s responses to pain and frightening situations can make this assessment difficult, and experienced clinical input is essential as soon as is practicable.

Hypotension is a late, pre-terminal, sign in children.

In a hypotensive child with on-going haemorrhage, or who has not responded to 20 ml/kg of crystalloid solution, O negative blood should be used unless type-specific or cross-matched blood is immediately available.

In a haemodynamically unstable child, the Major Haemorrhage algorithm is part of an overall strategy of care aiming to deliver the child safely to definitive care as quickly as possible.

**5.2.2 Vascular access**

Large bore intravenous access should be obtained. This is often difficult in young, shocked children and early use of intraosseous access is recommended. If intravenous access is not obtained within 90 seconds in a bleeding or shocked child, the intraosseous route should be used.

**5.2.3 Hypothermia**

Infants and young children have a relatively large surface area:volume ratio and so lose heat quickly. Care must be taken avoid inadvertent hypothermia.

**5.2.4 Hypoglycaemia**

Infants and young children are prone to hypoglycaemia and care must be taken to monitor and treat hypoglycaemia.

**5.2.5 Drug doses**

Drug doses and fluid volumes for resuscitation are calculated based on weight. The widely used formula for estimating weight in children aged 1-10 years is:

Weight (kg) = (Age (yrs) +4) x 2

For term newborns use 3kg and 6kg at 6 months.

The volumes of blood products administered are outlined in the algorithm and are based on replacing blood components in specific quantities and ratios to achieve target values both in terms of laboratory results and clinical condition (vital signs within the parameters identified in the reference tables).

In general, it is usual to give volume in 20ml/kg aliquots. In blunt and penetrating trauma it may be safer to give smaller volumes and assess response as outlined below. Once the targets are reached, then it may be appropriate to withhold further blood product administration but continue monitoring for deterioration.

Although the tables recommend “administering up to” an amount, this is not a hard limit but a way to anticipate the need for on-going blood component therapy and a trigger to continue down the algorithm.

**5.2.6 Trauma**

1. An ABCDE approach should be followed. The primary survey should include control of obvious haemorrhage as well as cervical spine immobilisation.
2. In the paediatric population, trauma more commonly results in contained bleeds that require conservative management rather than aggressive resuscitation and treatment. The trigger for entry into the algorithm should take into account the clinical condition of the child.
3. It is not recommended to wait until the loss of a peripheral pulse before administering fluid in a trauma situation. Small volume resuscitation may be appropriate in blunt or penetrating trauma, but not in the head injured patient. Small volume resuscitation involves giving volume in aliquots or 10ml/kg and assessing response and need for further volume. If the patient responds, maintains an adequate heart rate, blood pressure and mental status then no more fluid is given until definitive treatment or there is a deterioration in clinical condition necessitating further fluid resuscitation.
4. **Cardiac Surgery**

**6.1 Who should be included in the team?**

Consultant Surgeon

Surgical Registrar

Theatre Scrub Team

Consultant Anaesthetist

Anaesthetic Registrar

Perfusionist (Bypass)

Perfusionist (Cell Saver)

Anaesthetic Nurse/ODP (Rapid Infusor)

Communicator (ITU nurse or member of above staff if patient in theatre and no ITU nurse available)

Laboratory Staff notified who should in turn notify the on call Haematologist

**6.2 Additional Management Aspects**

The availability of cardiopulmonary bypass, rapid infusion technology and near patient testing (TEG, Blood Gases Multiplate etc) in Cardiac units will influence and aid how the patient is managed. There should be routine use of tranexamic acid and possible use of Prothrombin Complex Concentrate (PCC) or Factor VIIa in appropriate patients. Haematology advice should be sought on the use of PCC and Factor VIIa.

**6.3 Transfusion goals in actively bleeding patients**

The initial goal is to keep the patient alive until the haemorrhage can be controlled surgically.

Once the decision is made that the situation is one of “major haemorrhage”, definitive surgical control needs to be facilitated as soon as possible, this is the second goal of therapy.

This may allow transfer to theatre or it may require surgery to be performed (at least initially) on the ward or ITU. Because of the risk of tamponade occurring with major cardiac bleeding, rapid surgical exploration is especially important and may necessitate opening patient in ward or ITU.

The third goal is to restore satisfactory coagulation to the patient. This will need to commence during the initial treatment (in line with above protocol) but will continue after definitive surgical control has been obtained.

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**15. Appendix 2**

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**16. Appendix 3:**

**North West Regional Transfer of Blood Policy**

