Emergency framework for rationing of blood for massively bleeding patients during a red phase of a blood shortage - Synopsis for Triage Team

Purpose and Scope

The National Advisory Committee on Blood and Blood Products *(*NAC—an advisory committee, composed of hospital-based transfusion medicine experts chosen by their respective Provincial Ministries of Health and Canadian Blood Services representatives that report to a joint Canadian Blood Services/Provincial and Territorial Ministries of Health committee) developed the National Plan for the Management of Shortages of Labile Blood Components (The National Shortages Plan). The National Shortages Plan required further expansion for dealing with patients who require massive blood transfusion during a red phase blood shortage. This document has been developed as an adjunct to the National Shortages Plan (available at www.nacblood.ca) to address these massively hemorrhaging patients as they can consume up to 25% of the national blood supply and urgent decisions are needed to ration blood to these patients during a red phase blood shortage.

The document for the rationing of blood for massive hemorrhage (defined as expected blood loss of one blood volume over less than a 24 hour period; 0.5 blood volume in 3 hours; or four or more units of red blood cells in one hour) is a guide for the management of patients in need of massive transfusion (trauma patients, patients undergoing liver/lung/heart transplantation, patients requiring ventricular assist devices or extracorporeal membrane oxygenation, patients with ruptured aortic aneurysms or gastrointestinal bleeding and obstetrical patients) during a red phase blood shortage. A red phase blood shortage is defined as the availability of less than 48 hours of red blood cell units in Canada where it is not foreseeable that a shortage will be averted by increasing the collection of blood or by reducing elective surgical procedures. In other words, the blood inventory levels are insufficient to ensure that patients with non-elective indications for transfusion will receive the required transfusion.

This document has been developed to ensure that blood transfusions are provided to Canadians during a red phase blood shortage in an ethical, fair, and transparent way to ensure that the greatest numbers of lives are saved and to minimize the suffering and maximize the use of alternatives for those who may not survive due to insufficient availability of blood.

Target Audience

This emergency framework is intended to be used by key blood system participants who are defined to be Canadian Blood Services, hospitals and regional health authorities, the Provincial and Territorial Ministries of Health and the National Emergency Blood Management Committee (NEBMC) as per the National Shortages Plan.

Summary of the Development Process

In 2009, a working group of experts was convened to develop an emergency framework. The working group members were from large tertiary care centres in Canada and had expertise in transfusion medicine, trauma, anesthesiology, gastroenterology heart/lung/liver transplantation, obstetrics, cardiovascular surgery, allied health, medical ethics, law and

methodology. The working group also included members of the National Advisory Committee on Blood and Blood Products. The working group did not include patient representatives, although widespread lay consultation was sought during the development process.

A systematic search was conducted of the literature to identify predictors of massive blood loss and mortality to guide the working group members in determining which patients would be the most likely to benefit from blood transfusion.

An extensive literature search was also conducted for ethical frameworks and allocation protocols dealing with the allocation of scarce resources as the allocation of any scarce resource is one of the most challenging ethical issues faced in health care. This emergency framework was developed to ensure a fair, transparent and just distribution of blood when the demand for transfusion will exceed the available resources. This framework may transcend the needs of a single patient, health care professional or institution but represents a focus on the 'greater good'.

The working group through an iterative process developed recommendations that were assigned a level of evidence and grade of recommendation according to the Canadian Task Force (www.canadiantaskforce.ca). In addition to the recommendations, the working group also adapted a previously published Canadian critical care triage protocol developed for pandemic influenza planning. Recommendations for the patients who are massively hemorrhaging do not address comorbidities that may impact on the survival of patients.

National experts including professional societies, the blood provider and lay groups reviewed the final recommendations to provide input on the recommendations. Their agreement to all recommendations and the overall document review was elicited and all comments were subsequently addressed in the final document.

The Triage Team

It is recommended that triage teams be established in advance of a shortage. The role of the triage team is to provide a structure that formally oversees the triage process be it provincial /regional or at the hospital level during a crisis. The triage team should receive comprehensive information on the triage framework in advance of a blood shortage being declared. The triage team must be a multidisciplinary team with adequate background knowledge in terms of patient triage and managing patients under a 'crisis standard of care'.

Membership

The triage team should be comprised of any of the following and be appointed by the regional/hospital transfusion committee or regional/hospital emergency blood management committee (the number of team members should be proportional to the transfusion volume of the institution or region):

1. Triage Team Leader. The triage team leader should be an experienced physician with familiarity in triaging critically ill patients, broad based knowledge of resources and capabilities of healthcare organizations. Will have final responsibility and authority over clinical decisions

2. A Management Representative. A management representative is required to provide guidance on the capability of the organization regarding resources, personnel, external support, and internal and external communications.

3. An ethicist.

4. A nursing supervisor to provide direction on alternate care

5. Representative from the emergency room, trauma, transplantation, cardiovascular surgery, gastroenterology, and obstetrics to provide updates on demand, impact and assist in decision making.

6. Palliative care nurse or physician for patients not triaged to receive blood.

7. Social worker

8. Chaplain

9. Medical laboratory technologist

In addition, the triage team leader should have another triage physician available to them for assistance with decision making for difficult cases. The regional/hospital transfusion committee or Regional/Hospital Emergency Blood Management Committee should appoint members of the triage teams with the number of individuals proportional to the transfusion volume of the institution or region. It will be the responsibility of the triage teams to report back to the transfusion committee or emergency blood management committee all triage decisions made.

The triage teams must be educated on the background information and how to apply the triage tool in advance of a blood shortage. The responsibility for education of physicians and triage teams rests with the Regional Emergency Blood Management Committee in collaboration with the Hospital/Regional/District Health Authority. Specific training at dedicated intervals is difficult to achieve as there is varying frequency with which simulation exercises occur, the level of involvement of various medical services during a simulation and a large turnover of physicians throughout the system. However, through simulation exercises, continuous education, and dissemination of the National Blood Shortages Plan and this emergency framework, physicians would be more inclined to align with the National Blood Shortages Plan to ensure all patients receive quality levels of care during a shortage. Post simulation reporting may provide the best training opportunities in that lessons learned can be addressed at the Medical Advisory Committee level. Training and development modules should occur in collaboration with Canadian Blood Services as they will be instrumental in invoking the National Blood Shortages Plan. A core part of this pre-shortage education should clearly focus the triage team on their

role in ensuring the best care for the community of patients that they serve, rather than the needs of individual patients.

Responsibilities

The responsibilities of the triage team are to ensure

- documentation of the state of emergency (i.e., that an emergency has been activated, that all existing resources are exhausted, the rationale for withholding transfusion, and that all supportive care and blood conservation strategies will be instituted);
- documentation of inclusion/exclusion criteria;
- adherence to decisions and alternate levels of care;
- efficient and regular re-evaluation of patients;
- reevaluation of triaged patients daily and every 10^{th} red blood cell transfusion;
- physicians receive the required assistance; and,
- the public receive information about the status of the emergency and where to obtain further information.

Implications

The triage team should not be directly involved in the care of the patient. The triage team assigned to allocate blood components needs to be clearly cognizant that their duty is to the population, not just to the individual patient. The triage teams should be blinded to identifying patient information when presented with clinical information in determining if a patient is eligible to receive transfusion as per the triage criteria. It is suggested that the triage team convene in an area not within the immediate vicinity of the patient bedside. Typically given the acute and emergent nature of the presenting cases, it is anticipated that there will be no ability to manage an appeals process in the middle of the mass casualty situation or other disaster. In addition, decisions during a massive hemorrhage must be made within minutes and therefore a formal appeals process is not clinically feasible as such the triage decisions must be final with no appeal process. The triage teams should be offered adequate administrative and psychological support.

There must be sufficient coverage of the triage team to allow for 24 hour coverage. The triage team decisions need to be reported daily to the Regional/Hospital Emergency Blood Management Committee to ensure 'over triage' and 'under triage' errors are minimized. Consideration needs to be given by the hospital of having a joint intensive care and transfusion triage teams, where possible, to maximize the use of resources. The triage decisions need to be transparently communicated to the patient, the patient's family, the clinical team caring for the patient and recorded clearly in the patient's chart. Patients should be re-assessed at a minimum

of daily, every 10th unit of red blood cells, or sooner if their clinical status improves or deteriorates substantially prior to 24 hours.

In the setting of a scarcity of multiple hospital resources, the blood triage tool should be utilized sequentially with the other rationing tools. It is possible that a blood shortage may occur as an isolated event or in the setting of multiple resource scarcity (e.g., ventilators or critical care beds). In the setting of an isolated blood shortage, all other available therapies, including blood conservation strategies, should be offered to all patients. In addition, ensuring pain and symptom management should be a core part of the triage team's oversight responsibility so that patients and their families do not feel abandoned.

Documentation

Clear and complete documentation will be essential for a complete patient record and for evaluation after the red phase. In the patient chart, the triage team shall document the following: phase of blood shortage, triage decision, reason for exclusion if applicable, date/time of next planned re-evaluation, a copy of the triage documentation tool, and the number to page if the clinical status of the patient substantially improves or deteriorates before the next planned re-assessment. Extensive clinical notes will not be possible, or appropriate, as the triage team will be required to triage multiple patients. Documentation can be delegated to any member of the triage team and need not be done by the triage physician. Documentation on the triage documents should include a triage tracking log of all cases and a triage sheet for each patient. Efforts should be made to be as complete as possible to allow for the best possible review of triage decisions after the resolution of the red phase. At the end of each shift, a copy of the documents should be given to the chair of the Regional/Hospital Emergency Blood Management Committee, or their designate, and the original documents given to the next triage team with appropriate verbal handover. At the completion of the red phase, copies of all triage tools should be forwarded to the Provincial Emergency Blood Management Committee for review and analysis.

The Framework

Patient Population: This framework applies only to patients experiencing massive hemorrhage (defined as expected blood loss of one blood volume over less than 24 hours; 0.5 blood volume in three hours; or four or more units of red blood cells in 1 hour) during a red phase blood shortage.

In general all patients should receive access to all available blood conservation strategies including but not limited to: erythropoiesis-stimulating agents, intravenous iron, oral iron, antifibrinolytics, intraoperative cell salvage, interventional radiologic procedures, rapid access to endoscopy, and non-invasive surgeries.

Figure 1 – Algorithm for the Triage Team (page 1)

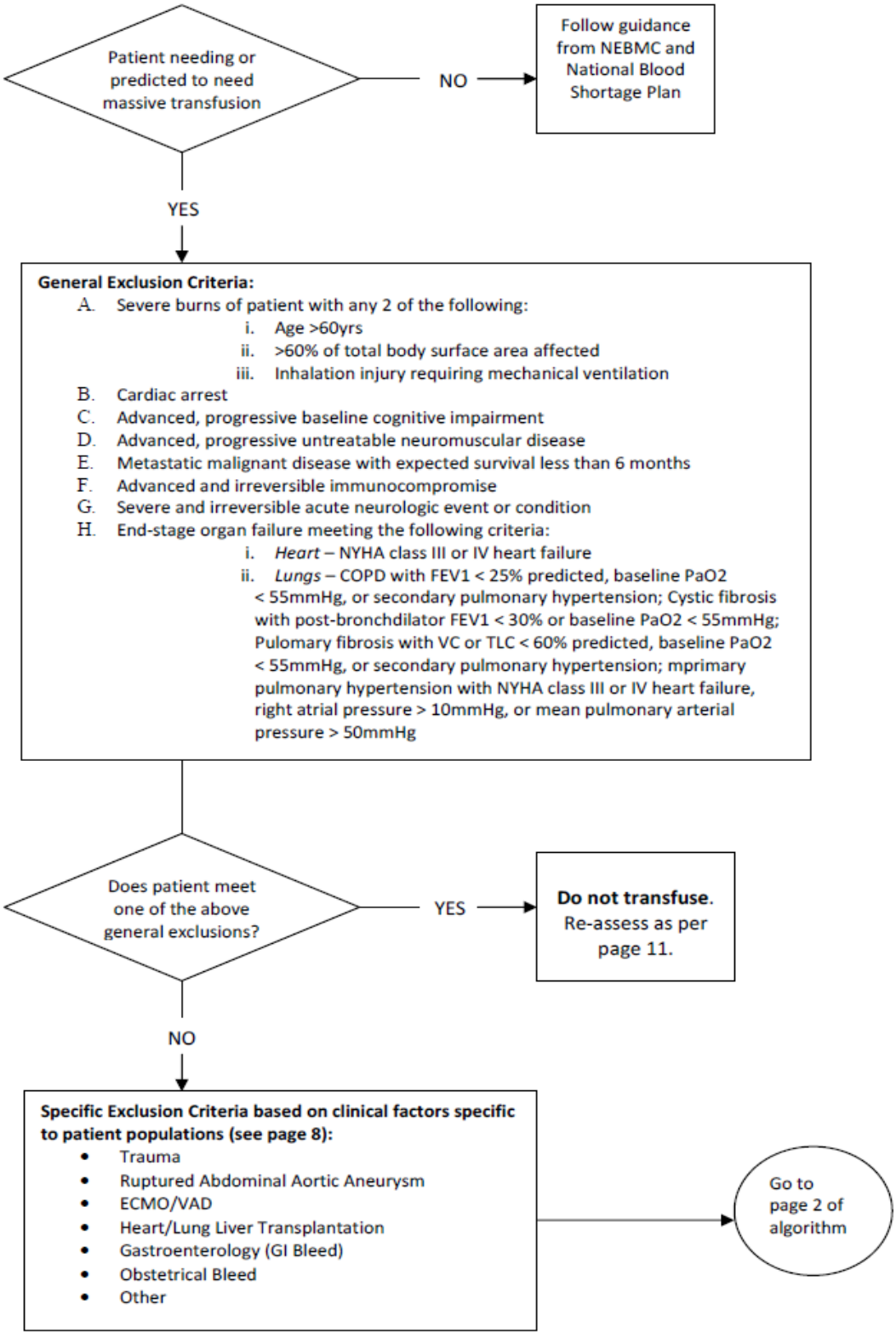
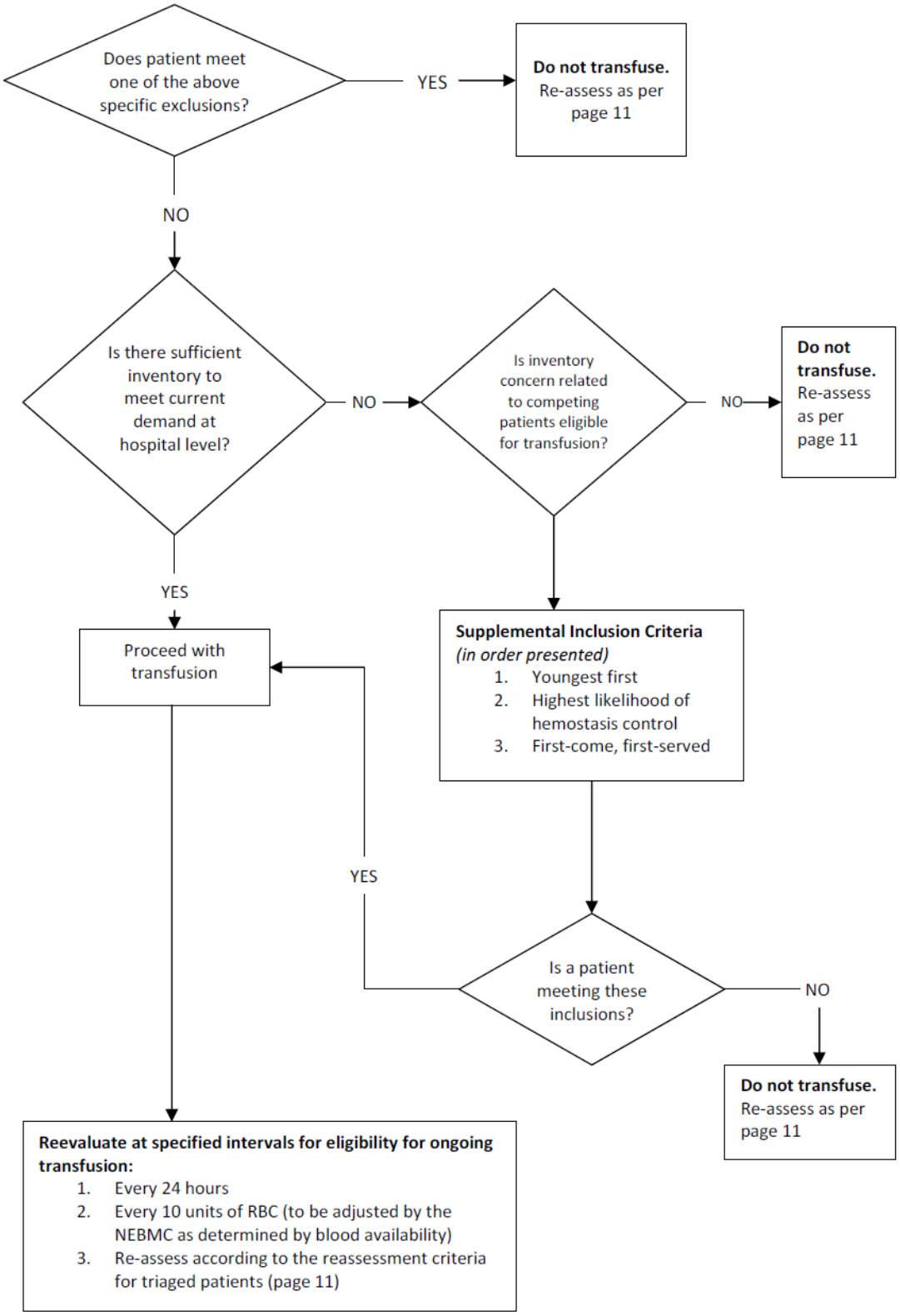


Figure 1 – page 2



Specific Exclusion Criteria for Massively Bleeding Patients:

Trauma

1. **During a red phase, do not administer transfusions to children or adults with non survivable brain injury.**
   Level of evidence: III
   Grade of recommendation: A
   Clinical Consideration: CT scanning should be done as soon as possible to confirm the diagnosis of a non survivable brain injury.

2. **During a red phase, do not administer transfusion to children or adults with a Glasgow Coma Scale =3 who have hypotension not attributable to reversible factors and who have fixed and dilated pupils.**
   Level of evidence: III
   Grade of recommendation: A

3. **During a red phase, do not transfuse patients after the declaration of brain death for the purpose of deceased organ donation.**
   Level of evidence: III
   Grade of recommendation: A

4. **During a red phase, do not administer transfusions to adults or children with penetrating cranial trauma and a Glasgow coma scale =3 that is not attributable to reversible factors.**
   Level of evidence: III
   Grade of recommendation: B

5. **During a red phase, do not administer transfusions to adults or children with penetrating cranial trauma, a Glasgow coma scale <8 that is not attributable to reversible factors, hypotension and severe thoracoabdominal trauma.**
   Level of evidence: III
   Grade of recommendation: B

6. **During a red phase, do not administer transfusions to adults or children with blunt trauma, and a Glasgow Coma Scale =3 that is not attributable to reversible factors.**
   Level of evidence: III
   Grade of recommendation: B

7. **During a red phase, do not administer transfusions to adults or children with blunt trauma who have lost vital signs pre-hospitalization.**
   Level of evidence: III
   Grade of recommendation: A

8. **During a red phase, do not administer transfusions to patients with transcranial gunshot injuries.**
   Level of evidence: III
   Grade of recommendation: A

9. **During a red phase, do not administer transfusions to patients >65 years with severe brain injury and profound shock and severe thoracic or abdominal trauma.**
   Level of evidence: III
   Grade of recommendation: B

10. **During a red phase, do not administer transfusions to patients >75 years with moderate brain injury, a Glasgow Coma scale of <12, who are in profound shock and who have thoracoabdominal injury.**
    Level of evidence: III
    Grade of recommendation: B

Ruptured Abdominal Aortic Aneurysm

1. **During a critical blood shortage, do not transfuse patients who have a cardiac arrest preoperatively.**
   Level of evidence: III
   Grade of recommendation: B

2. **During a critical blood shortage, do not transfuse patients with a systolic blood pressure less than 70mmHg who are unresponsive to fluid resuscitation and have lost consciousness.**
   Level of evidence: III
   Grade of recommendation: B

3. **During a critical blood shortage, do not transfuse patients with RAAA that do not meet criteria for emergent vascular repair.**
   Level of evidence: III
   Grade of recommendation: I

ECMO/VAD

1. **During a red phase, do not transfuse patients who require ECMO/VAD and who have multi-organ (> 1 organ) failure.**
   Level of evidence: III
   Grade of recommendation: B

2. **During a red phase, inform patients/families that patients receiving ECMO/VAD support who have multi-organ failure may not receive transfusion support if massively bleeding.**
   Level of evidence: III
   Grade of recommendation: B

Heart, Lung, Liver Transplantation

1. **Deceased Donor Organ Recovery - During a red phase, deceased donor organ recovery for transplantation should proceed, with the understanding that the deceased donor will not be transfused in the process of deceased donor stabilization.**
   Level of evidence: III

Grade of recommendation: B

2. **Deceased Donor Transplantation - During a red phase, deceased donor solid organ transplants may proceed with informed consent regarding increased risk from restriction of blood transfusion, and with the understanding (among patient and all involved physicians) that blood may not be available for transfusion.**
   Level of evidence: III
   Grade of recommendation: B

3. **Living Donor Transplantation – During a red phase, living donor transplantation should be deferred.**
   Level of evidence: III
   Grade of recommendation: B

Gastroenterology (refer to Section 8 of the expanded emergency framework for further information)

1. **During a red phase do not administer transfusions to patients with gastrointestinal bleeding and a Rockall score >8.**
   Level of evidence: III
   Grade of recommendation: B

2. **During a red phase do not administer transfusion to patients with liver cirrhosis and gastrointestinal (i.e. variceal) bleeding who have a Child Pugh score more than 10 (MELD score of more than 18) and who are not on the list for transplantation.**
   Level of evidence: III
   Grade of recommendation: B

3. **During a red phase, triage patients with gastrointestinal bleeding to centers with endoscopy to minimize the use of blood products.**
   Level of evidence: III
   Grade of recommendation: B

Obstetrics

1. **In a red phase, red cell transfusion should not be withheld from the bleeding obstetrical patient.**
   Level of evidence: II-2-III
   Grade of recommendation: B

Other massively bleeding situations not listed above

1. **In a red phase, for patients massively bleeding for reasons not listed above, do not transfuse patients for whom the triage team believes the mortality rate exceeds 80%**

Reassessment for Triaged Patients

1. Patients triaged to no blood components:

   Patients triaged to no transfusion care will be re-assessed at a minimum of every 24 hours. The triage team will review requests from the most responsible physician if an improvement in a patient's status would now qualify them to be triaged to active transfusion management. In addition, the triage team will assure that the patient and their family are given adequate access to psychological support and that adequate symptom management is given to minimize pain and distress.

2. Patients triaged to blood components:

   For patients triaged to active transfusion care, they will be re-assessed at a minimum of every 10 units of red blood cells (including pediatrics) or every 24 hours for patients receiving less than 10 units of blood or until cessation of hemorrhage(or more frequently – e.g. every 5 units - if deemed necessary by the NEBMC). At each assessment, the triage team will utilize the following variables to guide their decisions regarding the value of continued transfusions: SOFA score, total blood products used, need for ongoing transfusion support and ability to control bleeding with either surgery or other procedure (e.g. interventional radiology, endoscopy). Patients with a SOFA score >11, continued need for large amounts of blood components, and with no foreseeable ability to control blood loss will be triaged to palliative care.

Documentation for Transfusion Decisions

Transfusion decisions should be documented on a patient tracking tool. An example of a patient tracking tool is available in the appendix of this document.

Competing Patients Triaged to Active Transfusion Care

In the event of two or more patients requiring blood components at the same hospital for whom both qualify for active transfusion management by the triage team, the following principles (in order) are suggested to prioritize transfusion resources:

1. Administer blood to the youngest patients first i.e. pediatric patients first
2. Administer blood to patients who have the highest likelihood of hemostasis control
3. Administer blood according to the first-come, first-served principle.

In the event that two or more patients are competing for blood components at different hospitals and the blood still resides at the local blood centre, the same aforementioned principles will be applied jointly by the blood centre physician and the triage team leader from the hospitals involved.

Appendix A – Documentation Tools and Clinical Scoring

Triage Tracking Log – Emergency Disposition of Blood during Red Phase Blood Shortage

Tracking Number	Medical Record Number	Last Name	First Name	Location	Blood Group
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
21					
22					
23					
24					
25					
26					
27					
28					
29					
30					
31					
32					
33					
34					
35					
36					
37					
38					

Patient Triage Record' – Emergency Disposition of Blood during Red Phase Blood Shortage

<table>
<tr><td>Patient Tracking Number</td><td colspan="2">Hospital</td></tr>
<tr><td>Reason for Massive hemorrhage</td><td>Date of Triage</td><td>Time of Triage</td></tr>
<tr><td>Predicted to need >10 units in the next 24 hours
☐ Yes ☐ No(if no refer to standard tracking tool)

Has patient received product in the previous 24 h?
☐ Yes ☐ No
If yes, list products:</td><td>Age

Hemoglobin
Platelet
INR
PTT
Fibrinogen</td><td>Blood Group

pH
Lactate

Temp</td></tr>
<tr><td>Meets any exclusion criteria
☐ Yes ☐ No
If yes, which one(s)?</td><td>Product Required</td><td>Units of ABO compatible product available</td></tr>
<tr><td rowspan="5">Meets any specific exclusion criteria
☐ Yes ☐ No
If yes, which one(s)?</td><td>Date/Time of assessment</td><td>SOFA score</td></tr>
<tr><td></td><td></td></tr>
<tr><td></td><td></td></tr>
<tr><td></td><td></td></tr>
<tr><td></td><td></td></tr>
<tr><td rowspan="6">Decision made to administer blood?
☐ Yes ☐ No</td><td>Date/Time</td><td>Number of units & products transfused</td></tr>
<tr><td></td><td></td></tr>
<tr><td></td><td></td></tr>
<tr><td></td><td></td></tr>
<tr><td></td><td></td></tr>
<tr><td></td><td></td></tr>
<tr><td rowspan="5">Patient outcome at 24 hours</td><td>Date/Time</td><td>Re-assessment Decision</td></tr>
<tr><td></td><td></td></tr>
<tr><td></td><td></td></tr>
<tr><td></td><td></td></tr>
<tr><td></td><td></td></tr>
<tr><td>Comments by Triage Team</td><td colspan="2">Comments regarding patient and family concerns</td></tr>
<tr><td>Triage Documentation completed by</td><td colspan="2">Signature</td></tr>
<tr><td>Triage Officer Name</td><td colspan="2">Signature</td></tr>
<tr><td colspan="3">Follow-up</td></tr>
<tr><td>Patient Outcome at Discharge</td><td colspan="2">Patient Outcome at 6 months</td></tr>
</table>

Glasgow Coma Scale

Teasdale G, Jennett B. Assessment of coma and impaired consciousness. A practical scale.Lancet. 1974 Jul 13;2(7872):81-4.

The chart from the above reference has been modified to reflect a more recent version of the scale:

Eye opening	Spontaneous	4
	To speech	3
	To pain	2
	None	1
Best verbal response	Orientated	5
	Confused	4
	Inappropriate	3
	Incomprehensible	2
	None	1
Best motor response	Obeying	6
	Localising	5
	Withdraws	4
	Flexing	3
	Extending	2
	None	1

Rockall Score

As described by T A Rockall, R F A Logan, H B Devlin, T C Northfield, and the steering committee and members of the National Audit of Acute Upper Gastrointestinal Haemorrhage. Gut. 1996;38:316-321.

Rockall Score	**0**	**1**	**2**	**3**
Age	< 60 years	60 – 79 years	> = 80 years	
Shock	'No shock', systolic BP > = 100, pulse < 100	'Tachycardia', systolic BP > = 100, pulse > = 100	'Hypotension', Systolic BP < 100	
Comorbidity	No major comorbidity		Cardiac failure, ischaemic heart disease, any major comorbidity	Renal failure, liver failure, disseminated malignancy
Diagnosis	Mallory-Weiss tear, no lesion identified and no SRH	All other diagnoses	Malignancy of upper GI tract	
Major SRH	None of dark spot only		Blood in upper GI tract, adherent clot	

Child Pugh Score

Pugh RN, Murray-Lyon IM, Dawson JL, Pietroni MC, Williams R Transection of the oesophagus for bleeding oesophageal varices. Br J Surg. 1973 Aug;60(8):646-9.

Clinical and Biochemical Measurements	Points Scored for Increasing Abnormality		
	1	2	3
Encephalopathy (grade)	none	1 and 2	3 and 4
Ascites	Absent	Slight	Moderate
Bilirubin (mg per 100 ml)	1 - 2	2 - 3	> 3
Albumin (g per 100 ml)	3.5	2.8 – 3.5	< 2.8
Prothrombin time (sec. prolonged)	1 - 4	4 - 6	> 6
For primary biliary cirrhosis – Bilirubin (mg per 100 ml)	1 - 4	4 - 10	> 10

MELD Score

As per Kamath P.S, et al. A model to predict survival in patients with end-stage liver disease. Hepatology. 2001; 33(2): 464-470.

> Formula **:** $3.8*\log_e(\text{bilirubin[mg/dL]}) + 11.2*\log_e(\text{INR}) + 9.6*\log_e(\text{creatinine [mg/dL]}) + 6.4*(\text{etiology: 0 if cholestatic or alcoholic, 1 otherwise})$.

An online calculator is available: http://www.mayoclinic.org/meld/mayomodel6.html

SOFA Score

The SOFA score as described by Vincent JL, Moreno R, Takala J, Willatts S, De Mendonca A, Bruining H, et al. The SOFA (sepsis-related organ failure assessment) score to describe organ dysfunction/failure. on behalf of the working group on sepsis-related problems of the european society of intensive care medicine. Intensive Care Med. 1996 Jul;22(7):707-10.

SOFA Score	**0**	**1**	**2**	**3**	**4**
PaO2/FIO2 Ratio	>400	≤400	≤300	≤200 and mechanically vented	≤100 and mechanically vented
Platelet Count	>150	≤150	≤100	≤50	≤20
Bilirubin umol/L	<20	20-32	33-101	102-204	>204
Hypotension (ug/kg/min)	None	MAP<70	Dopamine ≤5 or dobutamine (any dose)	Dopamine >5 or epinephrine ≤0.1 or norepinephrine ≤0.1	Dopamine >15 or epinephrine >0.1 or norepinephrine >0.1
Glasgow Coma Scale	15	13-14	10-12	6-9	<6
Creatinine (umol/L)	<110	110-170	171-299	300-440 or <500 mL/day	>440 or <200 mL/day