Nova Scotia Provincial
Blood Contingency Plan

January 2017
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ACKNOWLEDGEMENTS

The following Provincial Contingency Plan for Blood Component/Blood Product Shortages in Nova Scotia was prepared in collaboration with the Provincial Working Group on Blood Component/Blood Product Contingency Planning. The Nova Scotia Provincial Blood Coordinating Program would like to acknowledge its appreciation for the tremendous and diligent work of past and current Provincial Working Group members, which provided invaluable contributions in the development of this Contingency Plan.

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EXECUTIVE SUMMARY

Blood components and blood products are a vital resource supporting health care in Canada. In a system of voluntary donation, these resources are often limited in quantity, and are susceptible to external threats such as labour disruptions, public health threats, disasters/emergency measures and extremes of weather. This Contingency Plan has been developed by the Nova Scotia Provincial Blood Coordinating Program in collaboration with Canadian Blood Services, the District Health Authorities and the IWK Health Centre.

This Contingency Plan is an evolving document, and will be amended as necessary. This Plan will require recommendation by the Nova Scotia Provincial Blood Coordinating Program, and will also require endorsement from the Department of Health and Wellness, Canadian Blood Services, the Nova Scotia Health Authority and the IWK Health Centre.

The purpose of this Contingency Plan is to maximize the effectiveness of a provincial response to a crisis that impacts the blood supply in Nova Scotia, and this Contingency Plan will do so by providing a framework to ensure a consistent, coordinated response within the province. This Contingency Plan is provincial in scope, and is intended to provide guidance to Nova Scotia’s Health Authority and the IWK Health Centre to enable the respective facilities to develop Blood Emergency Management Plans. This Contingency Plan delineates roles and responsibilities for all the relevant blood-system stakeholders and induces the activation of provincial networks that will respond to a crisis based on blood product/blood component inventory levels.

This Contingency Plan has been developed as a stand-alone plan and has also been developed to be operationally congruent with other provincial and federal/national emergency plans. In addition to a number of planning assumptions, the ethical aspects of this Plan have been developed based on the Nova Scotia Pandemic Plan’s Ethical Framework.

This Contingency Plan addresses five phases of inventory management, which are Green, Green Advisory, Amber, Red and Recovery, defined according to CBS inventory levels. However, this Contingency Plan may be invoked by the Blood Emergency Response Team (BERT) based on anticipated, real, or perceived threats to the provincial blood component/blood product supply. Fundamental activities during each of the four Phases include optimal utilization and inventory management.

Green Phase implies that normal blood component inventory levels exist and supply generally meets demand. This phase includes a broad range of inventory levels ranging from an ideal inventory to shortages that occur periodically and can be managed with existing CBS and hospital actions.

Green Advisory implies there may be brief situations where, while the overall inventory is in Green Phase, a particular blood type or component may be in limited supply and require CBS to issue an Advisory
Amber Phase implies that blood inventory levels are insufficient to continue with routine transfusion practices and the NSHA/IWK will be required to implement specific measures, as outlined in this document, in order to reduce blood usage.

Red Phase implies that blood inventory levels are insufficient to ensure that patients with non-elective indications for transfusion will receive the required transfusion(s).

Recovery Phase implies that blood inventories have begun to increase and are expected to be maintained at a level which would enable the return from Red to Amber and subsequently to Green Phase.

Upon full recovery, the Nova Scotia Provincial Blood Coordinating Program will conduct a retrospective review to assess lessons learned and revise this Plan as necessary. Upon full recovery, the NSHA/IWK Blood Emergency Management Groups will also conduct their own retrospective review to assess and revise their Blood Emergency Management Plans as necessary.
### DEFINITIONS / ACRONYMS

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>BEMP</td>
<td>Blood Emergency Management Plan</td>
</tr>
<tr>
<td>BEMG</td>
<td>Blood Emergency Management Group</td>
</tr>
<tr>
<td>BERT</td>
<td>Blood Emergency Response Team</td>
</tr>
<tr>
<td><strong>Blood Component</strong></td>
<td>Whole blood or a therapeutic component of blood intended for transfusion (e.g. red cells, granulocytes, platelets, plasma) that can be prepared using the equipment and techniques available in a blood centre. <strong>Note:</strong> Such equipment and techniques can include centrifugation, filtration, or freezing as per CSA Z902.</td>
</tr>
<tr>
<td><strong>Blood product</strong></td>
<td>Any therapeutic product derived from blood or plasma and produced by a manufacturing process that pools multiple units (usually more than 12). <strong>Note:</strong> Examples of blood products are human serum albumin, immunoglobulin preparations, and coagulation products (factors VIII and IX, fibrinogen, Anti-thrombin III, etc.) as per CSA Z902-15.</td>
</tr>
<tr>
<td>BTC</td>
<td>Blood Transfusion Committee</td>
</tr>
<tr>
<td>BTS</td>
<td>Blood Transfusion Service (may also be referred to as Blood Bank)</td>
</tr>
<tr>
<td>CBS</td>
<td>Canadian Blood Services</td>
</tr>
<tr>
<td>CBRH</td>
<td>Cape Breton Regional Hospital</td>
</tr>
<tr>
<td>NSHA</td>
<td>Nova Scotia Health Authority</td>
</tr>
<tr>
<td>DHW</td>
<td>Department of Health and Wellness</td>
</tr>
<tr>
<td><strong>Emergent</strong></td>
<td>An occurrence coming into view, existence or notice, often unexpectedly, with the potential to impact blood component inventories thus demands prompt action. e.g. pandemic flu, WNV, labour disruption.</td>
</tr>
<tr>
<td>aFFP</td>
<td>Apheresed Fresh Frozen Plasma</td>
</tr>
<tr>
<td>FP</td>
<td>Frozen Plasma</td>
</tr>
<tr>
<td><strong>H/REBMC</strong></td>
<td>Hospital/Regional Health Authority Emergency Blood Management Committee</td>
</tr>
<tr>
<td>IWK</td>
<td>Isaac Walton Killam Health Centre</td>
</tr>
</tbody>
</table>
| **Massively Bleeding Patient** | 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 unites of red blood cells in one hours (NAC)
<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
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<tbody>
<tr>
<td>NAC</td>
<td>National Advisory Committee on Blood and Blood Products</td>
</tr>
<tr>
<td>NEBMC</td>
<td>National Emergency Blood Management Committee</td>
</tr>
<tr>
<td>NSPBCP</td>
<td>Nova Scotia Provincial Blood Coordinating Program</td>
</tr>
<tr>
<td>Optimal Inventory</td>
<td>The level which provides adequate supplies of blood for routine and emergency situations and minimizes outdating. (Nova Scotia hospitals are using 5 Days on Hand)</td>
</tr>
<tr>
<td>PAC</td>
<td>Program Advisory Committee (of the NSPBCP)</td>
</tr>
<tr>
<td>PLTS</td>
<td>Platelets (includes single donor platelets, apheresed platelets and Buffy coat platelets)</td>
</tr>
<tr>
<td>P/T</td>
<td>Provincial/Territorial</td>
</tr>
<tr>
<td>P/TEBMC</td>
<td>Provincial/Territorial Emergency Blood Management Committee</td>
</tr>
<tr>
<td>QEII</td>
<td>Queen Elizabeth II Health Sciences Centre</td>
</tr>
<tr>
<td>Recall</td>
<td>The removal from further distribution, or use, of a product (blood component) that violates legislation administered by Health Canada (a regulatory requirement). <em>(NAC – Recommendations for the notification of recipients of blood component recall)</em></td>
</tr>
<tr>
<td>Triage Team</td>
<td>Healthcare professionals responsible for triaging patients in need of massive transfusion during a red phase blood shortage. Provides a structure that formally oversees the triage process be it provincial/regional or at the hospital level during a crisis. <em>(NAC – Emergency framework for rationing of blood for massively bleeding patients during a red phase of a blood shortage)</em></td>
</tr>
<tr>
<td>Unusual Recall</td>
<td>A recall due to an unanticipated event impacting a large or small number of blood components.</td>
</tr>
<tr>
<td>Urgent</td>
<td>Needing immediate action to contain the impact on blood component/blood product inventories</td>
</tr>
<tr>
<td>Withdrawal</td>
<td>The voluntary removal by the manufacturer (blood supplier) of a product (blood component) that does not violate legislation administered by Health Canada. <em>(NAC – Recommendations for the Notification of Recipients of a Blood Component Recall)</em></td>
</tr>
</tbody>
</table>
1.0 Introduction

1.1 Authority
The Blood Emergency Response Team (BERT) and Nova Scotia Health Authority (NSHA) /IWK representatives requested that the Nova Scotia Provincial Blood Coordinating Program (NSPBCP) develop a provincial blood component shortage contingency plan to provide a standardized framework to be followed by all facilities within Nova Scotia. This Contingency Plan has been developed by the NSPBCP in collaboration with Canadian Blood Services, the NSHA and the IWK Health Centre. This Contingency Plan is an evolving document, and will be amended as necessary to ensure its congruence with other related governmental planning documents, and with blood component standards and technology.

This Contingency Plan will require recommendation by the Nova Scotia Provincial Blood Coordinating Program, and endorsement by the Department of Health and Wellness, Canadian Blood Services, the Nova Scotia Health Authority and the IWK Health Centre.

1.2 Purpose
The purpose of this Contingency Plan is to maximize the effectiveness of a provincial response to a crisis that impacts the blood supply in Nova Scotia, and this Contingency Plan will do so by providing a framework to ensure a consistent, coordinated response within the province. This Contingency Plan provides tools to assist all levels of the public health care sector in appropriate decision-making. As a provincial framework, this Contingency Plan induces the activation of provincial networks that will respond to a crisis based on inventory levels and threats to this inventory.

1.3 Scope and Key Stakeholders
This Contingency Plan is provincial in scope and is intended to provide guidance in the event of activation of the Blood Emergency Response Team to the Nova Scotia Health Authority and the IWK Health Centre. This Contingency Plan also delineates roles and responsibilities for all the relevant blood-system stakeholders: the Nova Scotia Provincial Blood Coordinating Program and its Provincial Advisory Committee, the Perioperative Blood Management Program, the Blood Emergency Response Team (BERT), the Nova Scotia Department of Health, the NSHA and IWK Health Centre as well as Canadian Blood Services (CBS).

1.4 Audience
This Contingency Plan is primarily intended for all of the relevant blood-system stakeholders as indicated above. The executive summary is intended to provide a frame of reference so as to enable officials in public health and other government sectors that do not have a strong knowledge of the blood system to understand the structure, format and operational components of the Contingency Plan.
1.5 Document Structure

This document is structured to provide a practical framework. The Contingency Plan begins with an Executive Summary, followed by an Introduction and Background. The Planning Assumptions and Principles inherent in this Plan are discussed. The Overview presents the structure of the Contingency Plan, and the roles and responsibilities of stakeholders. The Operation of the Contingency Plan outlines the actions for activation of the Contingency Plan. Trigger thresholds and action items are also identified during each Phase of this Contingency Plan.
2.0 Background

Blood components are a vital resource supporting health care in Canada. In a system of voluntary donation, these resources are often limited in quantity. The potential for shortages of blood components due to such occurrences as delays in product release, public health threats, disasters/emergency measures and extremes of weather is a reality that must be proactively addressed through contingency planning.

Previous experience with blood inventory shortages demonstrates that merely restricting orders for blood components is not an effective or comprehensive approach to managing shortages in the blood supply. The development of a provincial contingency plan to ensure a consistent and coordinated response for the appropriate utilization of scarce blood components is critical to ensuring appropriate transfusion support for patients in Nova Scotia.

This Contingency Plan has been developed to function as a stand-alone plan in the event that the blood supply alone is impacted and also as a companion plan to the following plans: the Nova Scotia Provincial Pandemic Plan, the Nova Scotia All Hazards Plan, CBS’ Pandemic Influenza Preparedness Plan and The National Plan for the Management of Shortages of Labile Blood Components.

2.1 Initiation of The Nova Scotia Provincial Blood Contingency Plan

The Nova Scotia Provincial Blood Coordinating Program (NSPBCP) established the Blood Emergency Response Team (BERT) in 2004 as a mechanism to review emergent threats to the blood supply and to develop a response plan in order to minimize the impact to the health system. This team is comprised of members from Canadian Blood Services, the NSHA/IWK Health Centre and the Provincial Blood Coordinating Program.

Nova Scotia’s Blood Emergency Response Team (BERT) and the DHAs/IWK requested that the NSPBCP develop a provincial blood contingency plan to ensure a consistent and coordinated response within Nova Scotia. The NSPBCP convened a working group, conducted an ethics session and liaised with key contacts within the Nova Scotia Department of Health and Wellness (NSDHW) to ensure congruency with pandemic and Health Services Emergency Management plans. A final draft of the plan was available in February 2008. The NSPBCP presented the plan to the Senior Leadership Team (SLT) at the NSDHW and received endorsement to proceed with provincial consultations.

In January 2007, CBS approached the CBS P/T BLC with a request that a coordinated national plan be developed to address the allocation of available blood components to Canadian hospitals (and ultimately Canadian patients) served by CBS in times of extreme shortage. The CBS P/T BLC endorsed this request and asked the National Advisory Committee on Blood and Blood Products (NAC) to provide the leadership for the development of a National Plan for Management of Blood Shortages and a National Blood Shortages Working Group was established. The NSPBCP’s Clinical Advisor and the Program Manager are members of this national committee. Nova Scotia’s plan was used as a reference by the National Working Group.
The NSPBCP presented the draft plan (Version 36 dated 2008-Feb-08) to the DHA/IWK Vice Presidents of Medicine and attended DHA/IWK Blood Transfusion Committee meetings to discuss the contingency plan and obtain feedback. The feedback contained a common theme: the NSPBCP should develop various additional documents for implementation in the DHAs/IWK. The following documents were recommended: A triage plan, alternatives to blood in times of blood shortages, indications for transfusion, and patient education pamphlets for chronically transfused patients in times of blood shortages. Upon receipt of the final National Blood Shortages document in July 2009, the NSPBCP conducted a gap analysis to ensure congruency with the Nova Scotia plan. The Provincial Blood Contingency Plan Working Group was convened and subsequent revisions to the document were made.

In November 2012, the NAC released its Emergency Framework for Rationing of Blood for Massively Bleeding Patients during a Red Phase of a Blood Shortage. The Provincial Blood Contingency Plan was updated to include this framework as requested by stakeholders as well to include the recommendations from the blood shortage exercise performed January 2011.

The Provincial Blood Contingency Plan will continue to evolve as documents and tools are developed to support the plan and its’ users.
3.0 Ethics, Planning Principles and Assumptions

This Contingency Plan is based on a number of principles. Foremost, this Plan is based on the planning principle that shortages in blood inventories can be avoided or mitigated by appropriately reducing usage.

The Nova Scotia Department of Health and Wellness developed an ethical framework – Nova Scotia Health Services Pandemic Influenza Plan Ethical Considerations and Decision-Making Framework – to guide its pandemic planning process. Because the Nova Scotia Department of Health and Wellness is in the process of adopting this framework for all health emergency plans, this Contingency Plan is also based on the priority substantive values (criteria in decision-making) and the priority procedural values (process or procedural) contained in the Framework. The end goal of the Provincial Blood Contingency Plan is a consistent and coordinated response that ensures those patients with the greatest clinical need and likelihood of survival are priority recipients of blood components during a blood shortage. The inherent terminal values associated with the end goal are stewardship, evidence, and trust/fidelity. These terminal values shape both the procedural and the substantive values. In addition, this Contingency Plan has been developed so as to be compliant with CSA Z902 Blood and Blood Components, CSA Z15189 Medical Laboratories - Particular Requirements for Quality and Competence, and the American Association of Blood Banks’ Standards for Blood Banks and Transfusion Services.

The five priority procedural values of fairness, informed, open (transparent), accountable and responsive have been and will be upheld as this Contingency Plan is made available to all the relevant stakeholders (including the general public) for review and feedback.

The four key priority substantive values of equity, trust, solidarity and respect for human dignity are evident as this Contingency Plan provides a framework for the equitable distribution of scarce blood components that respects human dignity while fostering trust and solidarity between and amongst key stakeholders and the public.

This Contingency Plan utilizes CBS Dartmouth Centre’s inventory levels as a planning principle; the nature and extent of a blood supply shortage will be determined by CBS Dartmouth Centre’s inventory levels. CBS national inventories are comprised, in part of CBS’s provincial and territorial combined inventories of manufactured blood products (e.g., IVIG, Albumin) and are not reflected in phasing matrices. However, when shortages of manufactured blood products occur, the concepts and structure of this Contingency Plan will be followed. Shortages may only affect specific blood groups/components/products, or may affect all blood groups/components/products. Thus, the (potential) extent of the impact to inventories will determine the Contingency Plan phase initiated.
There are four key planning assumptions embedded in this Contingency Plan:

1. NSHA/IWK have established Blood Emergency Management Groups that will produce Blood Emergency Management Plans (BEMPs) that encompass all four phases contained in this Contingency Plan and a Triage Team that will provide a structure that formally oversees the triage process at the hospital level during crisis;

2. NSHA/IWK have developed All Hazards Plans and BEMPs will form a component of the All Hazards Plans;

3. NSHA/IWK are implementing actions to optimize appropriate transfusion through utilization activities in compliance with the CSA Z902 Blood and Blood Components Standards and provincial standards issued by the NSPBCP; and

4. That upon declaration of a Red Phase, all NSHA/IWK facilities will invoke their BEMPs simultaneously, and implement BERT recommendations (as communicated) thereby ensuring a timely and coordinated response.
4.0 Plan Structure - Overview

4.1 Phases
Notwithstanding the following Phases based on CBS Dartmouth’s inventory levels, BERT may invoke this Contingency Plan based on anticipated, real, or perceived threats to the provincial blood components supply. In the event that an emergent issue or event poses a serious threat to the provincial blood components supply, Red Phase may be initiated as a pre-emptive measure.

This Contingency Plan is composed of the following four phases, which are defined according to CBS Dartmouth inventory levels. Each phase is designed to be independent of the next, as threats or potential threats will have varying impacts on blood components inventories. It is conceivable to invoke a Red Phase directly from Green Phase dependent on the real or perceived impact to blood components inventories.

4.1.1 Green Phase implies that normal blood component inventory levels exist and supply generally meets demand. This phase includes a broad range of inventory levels ranging from an ideal inventory to temporary shortages that occur periodically and can be managed with existing Canadian Blood Services/hospital actions.

**Green Phase Advisory** There could be brief situations where, while the overall inventory is in Green Phase, a particular blood type or component may be in limited supply and require CBS to issue an Advisory. Most of these situations will be brief, and CBS will communicate temporary inventory adjustments to hospitals through “business-as-usual” channels. Should the situation persist, prior to going to a public media appeal for donors, or to discussing the potential of an Amber phase, the CBS Chief Supply Chain Officer- CSCO will consult with the NEBMC Chair to convene the NEBMC (within 24 - 48 hrs) to determine if there are any changes to hospital inventory management practice which could assist with and/or improve the situation internally. If the situation cannot be improved upon internally, a mass public/media appeals may be undertaken to avert a blood shortage.

4.1.2 Amber Phase implies that blood inventory levels are insufficient to continue with routine transfusion practice and NSHA/IWK will be required to implement specific measures to reduce blood usage.

4.1.3 Red Phase implies that blood inventory levels are insufficient to ensure that patients with non-elective indications for transfusion will receive the required transfusion(s).

4.1.4 Recovery Phase implies that blood component inventories have begun to increase and are expected to be maintained at a level which would enable the return from Red to Amber and subsequently to Green Phase.
National Inventory levels used to define phases

Approximate inventory levels that could lead to the declaration of Amber or Red Phase if sustained are shown in the following tables. The numbers below are accurate as of October 7, 2015. Updates to these numbers are provided at: http://www.nacblood.ca/resources/shortages-plan/index.html

Red Blood Cell Inventory

<table>
<thead>
<tr>
<th>RBC Inventory Level</th>
<th>CBS Hours On Hand</th>
<th>CBS # Units on Hand</th>
</tr>
</thead>
<tbody>
<tr>
<td>Green Phase</td>
<td>&gt;72 hours</td>
<td>O pos: &gt;2,975</td>
</tr>
<tr>
<td></td>
<td>3 days</td>
<td>O neg: &gt;926</td>
</tr>
<tr>
<td></td>
<td></td>
<td>A pos: &gt;2,293</td>
</tr>
<tr>
<td></td>
<td></td>
<td>A neg: &gt;543</td>
</tr>
<tr>
<td></td>
<td></td>
<td>B pos: &gt;655</td>
</tr>
<tr>
<td></td>
<td></td>
<td>B neg: &gt;153</td>
</tr>
<tr>
<td></td>
<td></td>
<td>AB pos: &gt;152</td>
</tr>
<tr>
<td></td>
<td></td>
<td>AB neg: &gt;44</td>
</tr>
<tr>
<td>Amber Phase</td>
<td>48 - 72 hours</td>
<td>O pos: 1,983 - 2,975</td>
</tr>
<tr>
<td>(serious)</td>
<td>2-3 days</td>
<td>O neg: 618 - 926</td>
</tr>
<tr>
<td></td>
<td></td>
<td>A pos: 1,529 - 2,293</td>
</tr>
<tr>
<td></td>
<td></td>
<td>A neg: 362-543</td>
</tr>
<tr>
<td></td>
<td></td>
<td>B pos: 436-655</td>
</tr>
<tr>
<td></td>
<td></td>
<td>B neg: 102-153</td>
</tr>
<tr>
<td></td>
<td></td>
<td>AB pos: 102-152</td>
</tr>
<tr>
<td></td>
<td></td>
<td>AB neg: 29-44</td>
</tr>
<tr>
<td>Red Phase (critical)</td>
<td>&lt;48 hours</td>
<td>O pos: &lt;1,983</td>
</tr>
<tr>
<td></td>
<td>&lt;2 days</td>
<td>O neg: &lt;618</td>
</tr>
<tr>
<td></td>
<td></td>
<td>A pos: &lt;1,529</td>
</tr>
<tr>
<td></td>
<td></td>
<td>A neg: &lt;362</td>
</tr>
<tr>
<td></td>
<td></td>
<td>B pos: &lt;436</td>
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<tr>
<td></td>
<td></td>
<td>B neg: &lt;102</td>
</tr>
<tr>
<td></td>
<td></td>
<td>AB pos: &lt;102</td>
</tr>
<tr>
<td></td>
<td></td>
<td>AB neg: &lt;29</td>
</tr>
</tbody>
</table>

Platelet Inventory

<table>
<thead>
<tr>
<th>Platelet Inventory Level*</th>
<th>% of National Requirement</th>
<th>CBS # of Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Green Phase (minimal decrease to optimal)</td>
<td>80 - 100% of daily national requirement</td>
<td>&gt;259</td>
</tr>
<tr>
<td>Amber Phase (serious)</td>
<td>25 - 79% of daily national requirement, recovery NOT expected within 12-24 hours</td>
<td>81-259</td>
</tr>
<tr>
<td>Red Phase (critical)</td>
<td>&lt;25% of daily national requirement, recovery NOT expected within 12-24 hours</td>
<td>&lt;81</td>
</tr>
</tbody>
</table>

* As platelets only have a shelf life of 5 days and CBS routinely does not have more than a 1.5 day inventory on hand at any time, platelet inventory levels are expressed as a percentage of the daily national requirement rather than “days on hand”.
**Frozen Plasma Inventory**

<table>
<thead>
<tr>
<th>Frozen Plasma Inventory Level (Groups O, A and B only)</th>
<th>CBS Days On Hand</th>
<th>CBS # of Units on Hand</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Green Phase</strong> (minimal decrease to optimal)</td>
<td>&gt;7 days</td>
<td>&gt;2,099 units</td>
</tr>
<tr>
<td><strong>Amber Phase</strong> (serious)</td>
<td>3 - 7 days</td>
<td>899 - 2,099 units</td>
</tr>
<tr>
<td><strong>Red Phase</strong> (critical)</td>
<td>&lt;3 days</td>
<td>&lt;899 units</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Group AB Frozen Plasma Inventory Level</th>
<th>CBS Days On Hand</th>
<th>CBS # of Units on Hand</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Green Phase</strong> (minimal decrease to optimal)</td>
<td>&gt;14 days</td>
<td>&gt;546 units</td>
</tr>
<tr>
<td><strong>Amber Phase</strong> (serious)</td>
<td>6 - 14 days</td>
<td>234 - 546 units</td>
</tr>
<tr>
<td><strong>Red Phase</strong> (critical)</td>
<td>&lt;6 days</td>
<td>&lt;234 units</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Cryoprecipitate Inventory Level</th>
<th>CBS Days On Hand</th>
<th>CBS # of Units on Hand</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Green Phase</strong> (minimal decrease to optimal)</td>
<td>&gt;14 days</td>
<td>&gt;2,610 units</td>
</tr>
<tr>
<td><strong>Amber Phase</strong> (serious)</td>
<td>6 - 14 days</td>
<td>1,118 - 2,610 units</td>
</tr>
<tr>
<td><strong>Red Phase</strong> (critical)</td>
<td>&lt;6 days</td>
<td>&lt;1,074 units</td>
</tr>
</tbody>
</table>

CBS inventory levels represent only part of the total inventory within the blood system, as a large part (and likely the majority) of the total inventory at any one time is already in storage in the hospital blood banks. The information above reflects the “days on hand” inventory cut-offs for CBS which should be reflected in the hospital ordering practices for the same phase. The national TOTAL blood component inventories (blood supplier and hospital combined) are derived from hospitals reporting their inventory levels by blood group and component type in near to real time using the CBS Inventory Level webpage within the Blood Component and Product Disposition System. As work proceeds with CBS, the hospitals and the NAC BSWG Inventory Sub-Group such that total blood inventory levels can be readily obtained, inventory criteria for ordering and phase declaration is being adjusted.
4.2 **Key Stakeholder Roles and Responsibilities**

This section outlines the roles and responsibilities of the following parties as they relate to blood components/blood products only, and does not detail broader responsibilities from a public health perspective.

4.2.1 **Department of Health and Wellness**

The Nova Scotia Department of Health and Wellness (DHW) holds overall responsibility for the performance of the health system, while NSHA/IWK is responsible for the delivery of health service. The NSPBCP will communicate BERT’s recommendations to the Risk Mitigation: Primary & Acute Care Branch of the DHW who will advise the Health Emergency Management Centre and will facilitate obtaining the appropriate approvals.

4.2.2 **Canadian Blood Services (CBS)**

CBS, as the blood operator, is responsible for the recruitment of donors, collections, testing, production and distribution of blood component/blood products. CBS manages the national blood inventory (except for Quebec, in which Hema-Quebec is the provider) and has detailed its’ operational framework to deal with blood shortages in their national plan; The National Plan for the Management of Shortages of Labile Blood Components, developed in collaboration with the National Advisory Council (NAC) for blood and blood products, CBS describes it’s communication processes and Business Continuity Plan within the document.

With respect to the National Plan, CBS has the ultimate responsibility for declaring various phases based on shortages and recovery from shortages as well as determining inventory distribution. However, these activities would occur following consultation with the NEBMC (see Appendix B) and in consideration of its advice.

CBS follows its’ internal processes to communicate issues with or affecting inventory levels.

4.2.3 **Nova Scotia Provincial Blood Coordinating Program (NSPBCP)**

The responsibility for the maintenance of this Contingency Plan rests with the Nova Scotia Provincial Blood Coordinating Program. This Contingency Plan and all subsequent versions will be available on the NSPBCP’s website: [http://novascotia.ca/dhw/nspbcp/](http://novascotia.ca/dhw/nspbcp/)

The NSPBCP’s key objectives are to maximize the safe and appropriate management of blood components/blood products. The NSPBCP engages in the following initiatives and activities to meet its objectives:

- To establish and maintain a program to optimize the use of blood components and their alternatives
- To establish and maintain a surveillance program for adverse events related to transfusion therapy
• To ensure that appropriate standards for blood transfusion therapy are being implemented and maintained at Nova Scotia health care facilities
• To monitor hospital inventory levels during shortages
• Provide the secretariat function to BERT, including:
  ➢ The dissemination of BERT’s response plan and recommendations to the DHW for approval, and subsequently to NSHA/IWK
• Provide communication and coordination functions to the NSHA/IWK, including the dissemination of NSPBCP tools, PBMP advice and communications from BEMGs to BERT

4.2.4 Blood Emergency Management Committees

4.2.4.1 The National Emergency Blood Management Committee

The National Emergency Blood Management Committee (NEBMC) ensures the implementation of a national Plan. The membership and terms of reference of the NEBMC were developed by the National Advisory Council - Blood Shortage Working Group (NAC-BSWG) taking into consideration the need for all regions to share information and have input into decision making, while acknowledging the challenge of convening a large committee in a timely manner.

Their mandate and membership is described in the NEBMC Terms of Reference, derived from The National Plan for the Management of Shortages of Labile Blood Components 2015-10-07, Section 4.1.

4.2.4.2 The Blood Emergency Response Team (BERT)

BERT is the equivalent to what is described in the National Plan as the Provincial/Territorial Emergency Blood Management Committee (P/TEMBC).

It is the responsibility of the Ministries of Health of each province or territory to establish a Provincial (or Territorial) Emergency Blood Management Committee (P/TEBMC) and its terms of reference.

BERT is a sub-committee of the NSPBCP’s Program Advisory Committee with the following key objectives:
• Review urgent and emergent impacts to the blood supply in Nova Scotia;
• Develop a response plan to mitigate the impacts to the health system, including recommendations to NSHA/IWK; and
• Advise the DHW on issues related to the blood supply.

The Terms of Reference for BERT can be located in Appendix A.
4.2.4.3 The Blood Emergency Management Group (BEMG)

BEMG is equivalent to what is described in the National Plan as Hospital/RHA Emergency Blood Management Committee (H/REMBC).

Each Zone of the NSHA/IWK Health Centre has a responsibility to establish a Blood Emergency Management Group (BEMG). The generic terms of reference and recommended membership, as per The National Plan for the Management of Shortages of Labile Blood Components 2015-10-07, are located in Appendix C.

4.2.5 Nova Scotia Health Authority/IWK Health Centre (NSHA/IWK)

The Nova Scotia Health Authority and the IWK Health Centre are required to establish a Blood Emergency Management Group (BEMG) with a mandate to develop, implement and maintain a Blood Emergency Management Plan (BEMP) encompassing all four phases of this Contingency Plan.

During the Green Phase, facilities establish a Blood Transfusion Committee (BTC) if one does not currently exist. Facility BEMPs may designate management responsibilities to BTCs during Green and Amber Phases, as deemed appropriate by the BEMG. The BEMP will define which staff members will participate in blood component inventory shortage management and how a reduction in usage will be achieved. The purpose of a BEMP is to delineate lines of responsibility, decision making processes, and effective lines of communication to enable the BEMG to respond appropriately during a shortage.

The NSHA and the IWK Health Centre are to ensure that a group exists to provide a structure that formally oversees the triage process during crisis.

4.2.6 Perioperative Blood Management Program (PBMP)

The PBMP, located at the QEII Health Sciences Centre is a referral program for Central Zone and its mandate is to:

- Enhance patient care and patient satisfaction through education and peri-operative blood conservation/management techniques
- Provide a process whereby patients are informed and blood management/conservation techniques are utilized and decrease the demand on the blood supply.
5.0 Communications during the Contingency Plan

The operation of this Contingency Plan is a responsibility shared between the NSPBCP, BERT, CBS, the NSHA/IWK, and the DHW. The cornerstone of this Contingency Plan is built on a series of sequential operational procedures, as determined by the roles and responsibilities of key stakeholders and the extent of the shortage. These sequential operational procedures include:

1) Identification and Communication of the blood issue;
2) Assessment of the issue and development of the response plan;
3) Communication of the response plan;
4) Implementation of the response plan; and
5) Recovery from the issue.

5.1 Identification and Communication of the Blood Issue

Identification of an issue may occur at a national, provincial or local (facility specific) level, resulting in activation of the plan. National activation may be the result of a provincial event and provincial activation may be the result of a local event. Any event that impacts inventory should be reported to CBS Dartmouth who assesses overall inventory impact.

There are three potential scenarios that would trigger the activation of this Contingency Plan:

i. **Local**: A minor, temporary shortage associated with normal fluctuations in blood component/blood product inventories; CBS Dartmouth communicates this to the NSHA/IWK Lead Contacts and the NSPBCP.

ii. **Provincial**: A real, perceived or anticipated moderate or severe threat; such as severe weather, major disaster, public health emergency or recall/withdrawal, that could have implications to the blood supply and is first identified by a Health Ministry or a stakeholder other than CBS, is communicated to the Chair of BERT who requests the chair of NAC to convene the NEMBC.

iii. **National**: The possibility of a significant blood component shortage is identified within CBS, a provincial Health ministry or other stakeholder including large scale recalls/withdrawals within CBS.

5.2 Assessment of the Blood Issue and Development of the Response Plan

i. **Local**: NSHA/IWK (facility specific event) will assess and identify appropriate inventory management initiatives, CBS/QEII/CBRH/IWK or another NSHA facility is informed of fluctuations.

ii. **Provincial**: The Chair of BERT will determine whether to convene BERT, based on the degree of threat or reduction of blood inventory levels. Once BERT convenes, the team will develop a response plan that will be communicated to the NSHA/IWK by the NSPCBP, secretariat of BERT.
iii. National: The chair of NAC is contacted by CBS or a provincial Ministry via the Lead Province regarding the possibility of a significant blood component shortage. During the NEMBC teleconference a response plan will be developed. The P/T Representative and NAC member of the NEMBC are also members of Nova Scotia’s BERT which provides the communication link between the national and provincial committees.

5.3 Communication of the Response Plan
i. Local: NSHA/IWK communicate response plan internally.
ii. Provincial: As the secretariat to BERT, the NSPBCP will communicate BERT’s response plan to the NSHA/IWK in Nova Scotia.
iii. National: Nova Scotia’s NAC representative is also the Chair of BERT. Following the national meeting the Chair of BERT will convene BERT in a timely manner. The decisions made during the NEMBC meeting will be communicated to the Provincial committee. As the secretariat to BERT, the NSPBCP will communicate BERT’s response plan to the NSHA/IWK in Nova Scotia. This response plan may include recommendations for filling hospital orders; handling of blood components such as splitting units and/or extending expiry dates, etc.

5.4 Implementation of the Response Plan
i. Local: NSHA/IWK implement response plan.
ii. Provincial: BEMGs will receive BERT recommendations and implement the response plan.
iii. National: The P/TEMBCs will receive NEBMC’s recommendations and support implementation.

5.5 Recovery from the Blood Issue
i. Local: NSHA/IWK assesses, communicate and implement responses until CBS notifies of a complete recovery.
ii. Provincial: BERT assesses, communicates and implements responses until CBS notifies of a complete recovery.
iii. National: NEMBC assesses, communicates and implements responses until CBS notifies of a complete recovery.
Nova Scotia Blood Contingency Plan Chart

The following is a schematic representation of the sequential operational procedures outlined in Section 5.1 above:

Identification & Communication
- CBS Dartmouth communicates minor shortage to Lead Contacts of NSHA Zones/IWK

Assessment & Development of Response Plan
- NSHA Zones/IWK to assess and develop inventory management response plan

Communication of Response Plan
- NSHA Zones/IWK communicate response plan internally

Implementation of Response Plan
- NSHA Zones/IWK reduce utilization and/or inventory levels

NSHA Zones/IWK to assess and develop inventory management response plan

CBS Dartmouth communicates Amber shortage to NSHA/IWK

NSHA Zones/IWK assesses and develop inventory management response plan

CBS Dartmouth communicates Amber shortage to BERT Chair

NSHA Zones/IWK communicate response plan internally

BERT Chair assesses need to convene

NSPBCP advise DHW of BERT recommendations to Zone lead contacts

CBS Dartmouth communicates return to Green Phase when shortage concluded

NSHA Zones/IWK reduce utilization and/or inventory levels

CBS Dartmouth or other entity communicates Red shortage/threat to BERT Chair

NSHA Zones/IWK implement BERT recommendations, reduce utilization and/or inventory levels

BERT convenes, develops response plan, will meet until Phase is concluded

NSPBCP advises DHW of BERT recommendations to Zone lead contacts

CBS Dartmouth communicated Red shortage to NSHA/IWK

NSHA Zones/IWK activate BEMPs, implements BERT recommendations

CBS Dartmouth communicates return to Green Phase when shortage concluded

BERT does NOT convene

CBS Dartmouth communicates return to Green Phase when shortage concluded

BERT convenes, develops response plan, will meet until Phase is concluded

BSR convenes, develops response plan, will meet until Phase is concluded

BERT may determine move to Red Phase

CBS Dartmouth communicates return to Green Phase when shortage concluded

CBS continues to monitor inventory levels and increase

NSPBCP advises DHW of BERT recommendations

CBS Dartmouth or other entity communicates Red shortage/threat to BERT Chair
5.6 **Green Phase**

Green Phase implies that normal blood component inventory levels exist and supply generally meets demand. This phase includes a broad range of inventory levels ranging from an ideal inventory to temporary shortages that occur periodically and can be managed with existing Canadian Blood Services/hospital actions.

<table>
<thead>
<tr>
<th>CBS Dartmouth Inventories: Normal circumstances where blood component/product inventories meet demand. No threat or perceived threat to blood component/product inventories.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Red Blood Cells:</strong> Greater than 3 day supply (72 hours)**</td>
</tr>
<tr>
<td>O POS</td>
</tr>
<tr>
<td>≥ 240 units</td>
</tr>
<tr>
<td><strong>For local inventory fluctuations of Group O and A below 3 day inventory supply; if Dartmouth expects recovery to normal levels by the end of day (through end labelling of work in progress or imports) information on expected recovery times will be included in the comment section of the daily inventory notice. If recovery to normal levels is not anticipated by end of day then an inventory advisory will be issued to the hospitals. For fluctuations that affect the total national inventory, advisories will be issued as per instructions from National office to all distribution sites.</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>PLTs: 24-30 doses (80-100% of daily NS/PEI/NB requirement)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>FP/aFFP:</strong> Greater than 7 day supply for O, A and B and greater than 14 day supply for AB</td>
</tr>
<tr>
<td>O</td>
</tr>
<tr>
<td>≥ 86 units</td>
</tr>
</tbody>
</table>

**Communications**
NSPBCP:
- Place the Contingency Plan and other provincial guidelines on website for easy access.
- Support NSHA/IWK with education sessions, as appropriate throughout province.

NSHA/IWK:
- Educate/train organization personnel on BEMP operations initially and institute regular updates.
  - Include as part of health care professional orientation.

**Activities**
CBS Dartmouth:
- Effective management of both provincial and national blood component inventories.

NSPBCP:
- Develop provincial guidelines i.e. blood component utilization management, transport.
- Define optimal blood inventory levels and minimum blood inventory levels. Optimal blood inventory levels equal 5.0 days on hand and minimum blood inventory levels are equal to 3.0 days on hand.
- Maintain and update massive transfusion guidelines and algorithms.
- Maintain and update provincial contingency plan, as necessary.
- Organize simulation exercises to aide in compliance.

PBMP:
- Function as a resource to NSPBCP to optimize blood component utilization through Perioperative blood conservation/management techniques.
NSHA/IWK:

- Develop, implement and maintain a BEMP for the organization including communication pathways and the Blood Contingency Toolkit.
- Implement NSPBCP guidelines and agreed transfusion protocols/triggers for all transfusions.
- Formulate and include transfusion guidelines in the health care professional orientation.
- Document total inventory levels in the CBS hospital Disposition Reporting System.
- Implement blood component utilization management mechanisms.
- Assess and review current utilization patterns for elective surgeries performed within the NSHA/IWK.
- Initiate as appropriate to services, maximum surgical blood ordering schedules for elective surgeries including annual revision when necessary (or more frequently if indicated).
- Establish mechanisms to enable:
  - 24-hour or 12-hour reservation periods for cross-matched blood components
  - Advance notification of any waiting lists potentially impacting blood inventories (e.g. operating room wait lists, chronic transfusion patients waiting for transfusion)

Green phase advisory may see requests in reduction of inventory from optimal levels to minimum levels while actions are taken to increase inventory levels.
5.7 **Amber Phase**

Amber Phase implies that blood inventory levels are insufficient to continue with routine transfusion practice and hospitals/DHAs will be required to implement specific measures to reduce blood usage.

**Amber Phase:**

<table>
<thead>
<tr>
<th>CBS Inventories</th>
<th>moderate, extended, temporary shortage associated with normal fluctuations of inventories. Moderate threat or perceived threat.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Red Blood Cells:</strong></td>
<td>2-3 day supply (48-72 hours)**</td>
</tr>
<tr>
<td>O POS</td>
<td>A POS</td>
</tr>
<tr>
<td>160 - 240 units</td>
<td>120 - 180 units</td>
</tr>
</tbody>
</table>

**For local inventory fluctuations of Group O and A between 2 to 3 day inventory supply; if Dartmouth expects recovery to normal levels by the end of day (through end labelling of work in progress or imports) information on expected recovery times will be included in the comment section of the daily inventory notice. If recovery to normal levels is not anticipated by end of day then an inventory advisory will be issued to the hospitals. For fluctuations that affect the total national inventory, advisories will be issued as per instructions from National office to all distribution sites.**

**PLTS:**

5 to 24 doses
25 to 79% of daily NS/PEI/NB requirement, recovery expected within 12 hours

**FP/affFP:**

3 to 7 day supply for O, A and B and 6-14 day supply for AB

<table>
<thead>
<tr>
<th>O</th>
<th>A</th>
<th>B</th>
<th>AB</th>
</tr>
</thead>
<tbody>
<tr>
<td>37 - 86 units</td>
<td>28 - 65 units</td>
<td>4 - 8 units</td>
<td>22 - 50 units</td>
</tr>
</tbody>
</table>

**Communications**

**CBS Dartmouth:**

- Notifies chair of BERT/NSPBCP as well as the NSHA/IWK indicating affected blood component, current inventories, anticipated period of recovery, and potential for an extension of recovery period requiring a move to Red Phase.

**Chair of BERT:**

- Assesses situation to:
  - Determine degree of threat or likelihood of requirement for a move to Red Phase.
  - Identify possible recommendations to the NSHA/IWK and advice to the DHW.
  - Notify Chair of NAC if local.
- If a Red Phase is determined likely, notifies BERT membership and initiates full BERT meeting to determine appropriate recommendations.
- Special circumstances may require systemic recommendations resulting in:
  - Convening of BERT.
  - Development of recommendations for NSHA/IWK and advice to the DHW.

**If BERT convenes, simultaneously**

**NSPBCP:**

- Forwards BERT recommendations to DHW for endorsement.
- Notify NSHA/IWK, EHS and the Health and Wellness Duty Officer after hours of BERT recommendations to be endorsed by Deputy Minister.

**NSHA/IWK:**

- Notify Hematology Specialists, Bone Marrow Transplant, Liver Transplant, Surgeons /Anaesthesiologists and any other applicable disciplines within their facilities of Amber Phase shortage indicating affected blood component/blood product and anticipated period of recovery.
- Notify Triage Team of amber phase to prepare for Red Phase triaging of massively bleeding patients.
**NSHA/IWK Activities:**

- Medical Director assesses situation and develops response plan based on the degree of real or perceived threat, including:
  - Reviews BERT recommendations; and
  - Convenes BEMG as appropriate.
- Assess current inventories.
- Document total inventory levels in the CBS hospital Disposition Reporting System.
- Allow inventories to fall to minimum levels before making requests from CBS.
- If required, redistribute blood components/blood products between facilities facilitated by the BTS’ involved.
- Implement systemic recommendations when issued by BERT.

**Depending on the blood component involved and current inventories at the NSHA/IWK, the following may be considered:**

**RBCs:**

- Cut MSBOs to 50% of normal reservation amount or group and screen with cross match on demand. Communication to surgeons/anaesthetists essential.
- Reservation period for cross matched blood reduced to 12 hours, as appropriate to the extent of the shortage.
- Reduce transfusion triggers on routine transfusions, as appropriate. Determine on a case-by-case basis.
- Review all transfusion requests and determine transfusion requirement on a case-by-case basis.
- Require Medical Director’s approval of all transfusions outside of criteria.
  - Delay transfusions as appropriate through discussion with the Medical Director and the treating physician to determine clinical need and patient management.

**PLTS:**

- Delay elective transfusions as appropriate through discussion with the Medical Director and the treating physician.
- Require Medical Director’s authorization of all transfusions to prioritize according to clinical need.
- Initiate emergency issue only, if required.

**FP/aFFP**

- If approaching 3 day supply available within the facility, release only on approval of the Medical Director.

*During any non-Green Phase, requests for CMV negative, irradiated products and ABO specific platelets may not be honoured when filling orders.*
5.8 Red Phase

Red Phase implies that blood inventory levels are insufficient to ensure that patients with non-elective indications for transfusion will receive the required transfusion(s).

### Red Phase:

**CBS Inventories:** Severe local shortage or threat or perceived threat.

**Red Blood Cells:**

Less than 2 day supply (48 hours)**

<table>
<thead>
<tr>
<th>O POS</th>
<th>A POS</th>
<th>O NEG</th>
<th>A NEG</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 160 units</td>
<td>&lt; 120 units</td>
<td>&lt; 64 units</td>
<td>&lt; 35 units</td>
</tr>
</tbody>
</table>

**Local advisory** will be issued or advisories will be issued as per instructions from National office to all distribution sites.

**PLTS:**

Less than 5 doses

Less than 25% of daily NS/PEI/NB requirement, recovery expected within 12 hours

**FFP/aFFP:**

Less than 3 days’ supply of O, A and B and less than 6 days’ supply for AB

<table>
<thead>
<tr>
<th>O</th>
<th>A</th>
<th>B</th>
<th>AB</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 37 units</td>
<td>&lt; 28 units</td>
<td>&lt; 4 units</td>
<td>&lt; 22 units</td>
</tr>
</tbody>
</table>

**CBS Activities:**

- Initiate appropriate mechanisms to recoup inventories.

**Communications**

**CBS Dartmouth:**

- Notifies chair of BERT/NSPBPC as well as the NSHA/IWK indicating shortage cause, affected blood component/blood product, current inventories and anticipated period of recovery.

**BERT:**

- Convenes to assess the situation and develop a response plan, including recommendations to NSHA/IWK, EHS and the Health and Wellness Duty Officer after hours and advice to DHW.

**NSPBPC:**

- Forwards recommendations to NSHA/IWK, EHS and the Health and Wellness Duty Officer after hours and advice to DHW for endorsement, as required.

**NSHA/IWK:**

- Medical Director to convene the BEMG.

**BEMG:**

- Convened to assess the specifics of the red phase, review BERT recommendations and determine a plan for implementation on an ongoing basis throughout the entirety of the shortage.
- Dispenses appropriate information and updates throughout the organization on an ongoing basis throughout the shortage.

**BERT Recommendations**

**Should inventories levels become critical the following recommendations may be communicated:**

- Reductions in minimum inventory levels.
- Delay of elective surgeries requiring blood component support.
- Delay in the initiation of treatment of chemotherapy and bone marrow transplant.
- Delay of liver transplantation.
- Reductions in transfusion triggers.
- Approval of the use of split (aliquotted) apheresed platelets and/or buffy coat platelets.
- Extension of expiry dates for RBCs, platelets and/or FFP/aFFP.
- Expanded use of erythropoietin, as appropriate.
- Utilization of antifibrinolytic agents, as appropriate.
**NSHA/IWK Activities:**

**Initiate BEMG.**

**Initiate BERT recommendations as applicable to NSHA/IWK services.**

- Assess current inventories. It may be necessary to move all blood inventories to the lead facility within the Zone to control accessibility.
- Closely monitor blood component inventories.
- Works with Triage Team in rationing of blood for massively bleeding patients.
- If required, redistribute blood components/blood products between facilities. For all blood components; notify Haematology Specialists, Bone Marrow Transplant, Liver Transplant, Surgeons/Anaesthesiologists and any other applicable disciplines of the shortage.
- Initiate BEMP Request for Transfusion form.
- Initiate Medical Director’s authorization for all transfusions in consultation with attending physician to prioritize according to clinical need and likelihood of survival on a case-by-case basis.
- Document total inventory levels in the CBS hospital Disposition Reporting System.
- Reduce transfusion triggers as advised.
- Initiate Medical Director’s consult prior to performing emergency surgery to ensure blood component inventory levels are sustainable.
- Use intra-operative cell salvage as available.

*During any non-Green Phase, requests for CMV negative, irradiated products and ABO specific platelets may not be honoured when filling orders.*
Algorithm for the Triage Team (page 1)
Rationing of Blood for Massively Bleeding Patients during Red Phase

Patient needing or predicted to need massive transfusion

NO ➜ Follow guidance from NEBMC and National Blood Shortage Plan

YES ➜

General Exclusion Criteria:
A. Severe burns of patient with any 2 of the following:
   i. Age >60yrs
   ii. >60% of total body surface area affected
   iii. Inhalation injury requiring mechanical ventilation
B. Cardiac arrest
C. Advanced, progressive baseline cognitive impairment
D. Advanced, progressive untreatable neuromuscular disease
E. Metastatic malignant disease with expected survival less than 6 months
F. Advanced and irreversible immunocompromise
G. Severe and irreversible acute neurologic event or condition
H. End-stage organ failure meeting the following criteria:
   i. Heart — NYHA class III or IV heart failure
   ii. Lungs — COPD with FEV1 < 25% predicted, baseline PaO2 < 55mmHg, or secondary pulmonary hypertension; Cystic fibrosis with post-bronchodilator FEV1 < 30% or baseline PaO2 < 55mmHg; Pulmonary fibrosis with VC or TLC < 60% predicted, baseline PaO2 < 55mmHg, or secondary pulmonary hypertension; primary pulmonary hypertension with NYHA class III or IV heart failure, right atrial pressure > 10mmHg, or mean pulmonary arterial pressure > 50mmHg

Does patient meet one of the above general exclusions?

YES ➜ Do not transfuse. Re-assess as per section 15.6

NO ➜

Specific Exclusion Criteria based on clinical factors specific to patient populations (see section 15.3):
- Trauma
- Ruptured Abdominal Aortic Aneurysm
- ECMO/VAD
- Heart/Lung Liver Transplantation
- Gastroenterology (GI Bleed)
- Obstetrical Bleed
- Other

Go to page 2
Does patient meet one of the above specific exclusions?  

YES  

Do not transfuse.  
Re-assess as per section 15.6

NO

Is there sufficient inventory to meet current demand at hospital level?  

NO

Is inventory concern related to competing patients eligible for transfusion?  

NO

Do not transfuse.  
Re-assess as per section 15.6

YES

Supplemental inclusion criteria (in order presented)  
1. Youngest first  
2. Highest likelihood of hemostasis control  
3. First-come, first-served

Proceed with transfusion

YES

Is a patient meeting these inclusions?  

NO

Do not transfuse.  
Re-assess as per section 15.6

YES

Reevaluate at specified intervals for eligibility for ongoing transfusion:  
1. Every 24 hours  
2. Every 10 units of RBC (to be adjusted by the NEBMC as determined by blood availability)  
3. Re-assess according to the reassessment criteria for triaged patients (section 15.6)
5.9 Recovery Phase

Recovery Phase implies that blood component inventories have begun to increase and are expected to be maintained at a level which would enable the return from Red to Amber and subsequently to Green Phase.

<table>
<thead>
<tr>
<th>Recovery Phase:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sequential return to Green phase inventory levels.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Communications</th>
</tr>
</thead>
<tbody>
<tr>
<td>As established for Red, Amber and Green phases as each phase is reached.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CBS Dartmouth:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Notifies BERT chair/NSPBCP, and NSHA/IWK of change in phase and stage, including affected blood component, current inventories and anticipated period of recovery to next phase. Notification simultaneous with notification of BERT recommendations, if applicable.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CBS Activities:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initiate appropriate mechanisms to recoup inventories.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>NSHA/IWK Activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>BEMG</td>
</tr>
<tr>
<td>Develop action plan for graduated recovery and return to full services:</td>
</tr>
<tr>
<td>➢ Review NSHA/IWK and provincial inventories to determine anticipated recovery period within the NSHA/IWK.</td>
</tr>
<tr>
<td>➢ Review historical blood utilization patterns for elective surgeries to manage fragile inventories.</td>
</tr>
<tr>
<td>➢ Review chronic transfusion, OR deferral/cancellation lists and current OR waiting lists to determine surgery reintegration plan.</td>
</tr>
<tr>
<td>➢ Do not compress elective surgery back logs during recovery period, as this may result in a secondary inventory shortage.</td>
</tr>
<tr>
<td>➢ Delay surgeries most likely to require blood component support until inventories have stabilized and are maintaining Green Phase status.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Inventory Management:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assess current inventory levels, with graduated re-establishment of inventory levels.</td>
</tr>
<tr>
<td>Require Medical Director’s authorization of all transfusions until CBS inventories have stabilized and are maintaining Green Phase status.</td>
</tr>
<tr>
<td>Accommodate patients requiring CMV negative and irradiated blood components, if possible.</td>
</tr>
</tbody>
</table>

* During any non-Green Phase, requests for CMV negative products and ABO specific platelets may not be honoured when filling orders.

Recovery from a blood component/blood product shortage is entirely dependent upon CBS’ ability to recoup and maintain inventories. The Recovery Phase is initiated by CBS Dartmouth, based on inventory levels previously identified within each Phase. The Recovery Phase will follow a sequential progression as inventories are replenished and stabilized.

NSHA/IWK will implement their respective BEMPs as per current inventory levels to facilitate the recovery process, and to avoid exerting pressure on potentially unstable inventories.

Upon full recovery, the NSPBCP will conduct a retrospective review of this plan to evaluate the functionality, determine necessary revisions and make appropriate updates. This will be done in collaboration with CBS, the NSHA and the IWK, and will take any
BERT recommendations into consideration. As a component to the evaluation process, the NSPBCP will prepare a report for submission to the DHW.

Upon full recovery, the NSHA/IWK BEMG will also conduct a retrospective review of their BEMP to evaluate the functionality, determine necessary revisions and make appropriate updates. This will be done in collaboration with their BTC/BTS, and will take any BERT recommendations into consideration. As a component of the evaluation process, NSHA/IWK will prepare a report for submission to NSHA/IWK CEOs.
6.0 Decision making

6.1 Supportive Teams

It is recommended, as per the National Plan as well as the Emergency Framework for Rationing of Blood for Massively Bleeding Patients During a Red Phase of a Blood Shortage, if disaster triage should be utilized, a multidisciplinary triage committee should be set up in each institution to assist with decision-making re: blood rationing on a case by case basis. A committee will ensure that all departments/services are treated fairly and that the decision-making process is transparent. The following forms included in this contingency plan will support process documentation:

- Blood Component screening log, Appendix D
- Surgery Cancellation Form, Appendix E
- Request Form during shortages, Appendix F
- Transfusion Log, Appendix G
- Triage Tracking Log, Appendix H
- Patient Triage Record, Appendix I

The above forms can serve as a record to review the decision making processes thus allowing a retrospective review of the process for adequacy and efficacy.

6.2 Supportive Documents

It is recommended, as per the National Plan, uniform guidelines of transfusion practice are developed and adhered to. Such guidelines will reduce the potential for each physician to have to design and defend individual strategies for individual cases and will ensure consistency in practice and standardized decision making. The NSPBCP plans to develop the following supporting documents, which have been identified by stakeholders as being important to the success of the Plan:

- Indications for Transfusion - in green phase and during blood shortages
- Alternatives to transfusion during shortages

During the development of the National Plan, NAC recognized the ethical dilemma placed on physicians/hospitals that will be asked to make difficult decisions in the allocation of inventory during shortages and will address the requirement. The NAC-BSWG decided to establish two additional sub-committees, the Communication Sub-committee and a Sub-committee to develop guidelines for discontinuing blood transfusion for patients with potentially massive requirements but in whom there is very remote chance of benefit. The NAC has released the Emergency Framework for Rationing of Blood for Massively Bleeding Patients During a Red Phase of a Blood Shortage and the Provincial Plan has been updated to reflect the advice provided in said document. As the national plan continues to evolve with the addition of such guidelines, the Provincial plan will be reviewed to ensure congruency of the plans is maintained.
6.3 Transfusion decision making guidelines for Green, Amber and Red phase based on the National Plan for the Management of Shortages of Labile Blood Components Table 1 and 2 below

Table 1: Guideline for the use of RBC transfusions in children and adults in shortage situations:

<table>
<thead>
<tr>
<th><strong>Green Phase</strong></th>
<th><strong>Amber Phase</strong></th>
<th><strong>Red Phase</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Major Hemorrhage</strong></td>
<td><strong>Major Hemorrhage</strong></td>
<td><strong>Major Hemorrhage</strong></td>
</tr>
<tr>
<td>Follow your hospital/RHA guidelines</td>
<td>Follow your hospital/RHA guidelines</td>
<td>Follow your hospital/RHA guidelines Follow triage/rationing allocation framework if instructed by NEBMC¹</td>
</tr>
<tr>
<td><strong>Surgery/Obstetrics</strong></td>
<td><strong>Surgery/Obstetrics</strong></td>
<td><strong>Surgery/Obstetrics</strong></td>
</tr>
<tr>
<td>Follow your hospital/RHA guidelines</td>
<td>Urgent² and emergency² surgery in consultation with H/RBEMC. Peri/post partum hemorrhage. For all situations, the minimal number of units to stabilize patient should be used.</td>
<td>Emergency situations in consultation with H/RBEMC Follow triage/rationing allocation framework if instructed by NEBMC¹</td>
</tr>
<tr>
<td><strong>Non-Surgical Anemias⁴</strong></td>
<td><strong>Non-Surgical Anemias⁴</strong></td>
<td><strong>Non-Surgical Anemias⁴</strong></td>
</tr>
<tr>
<td>Follow your hospital/RHA guidelines</td>
<td>All requests for RBC transfusion in patients with a Hb level &gt; 70 g/L must be reviewed by designated medical personnel. For patients with hypoproliferative anemias, single unit transfusion should be provided if significant symptoms associated with anemia but reassessment of severity of symptoms after each unit is required.</td>
<td>All requests for RBC transfusion in patients with a Hb level &gt; 60 g/L must be reviewed by designated medical personnel. For patients with hypoproliferative anemias, single unit transfusion should be provided if significant symptoms associated with anemia but reassessment of severity of symptoms after each unit is required.</td>
</tr>
</tbody>
</table>
1. These guidelines are available on:
   http://www.nacblood.ca/resources/shortages-plan/index.html
2. Urgent surgery – patient likely to have major morbidity if surgery not performed within the next one to 28 days
3. Emergency surgery – patient likely to die (have major morbidity) with 24 hours without surgery
4. Includes anemia following trauma, surgery and delivery

Notes:
- Given the relatively small volumes/numbers of units required, transfusions for neonates (i.e. patients less that 4 months of age) and intrauterine transfusions would be given according to usual guidelines (i.e. would not be restricted even in times of shortage). However measures to share units among neonates or between neonates and larger patients should be used to the extent possible.
- In Red or Amber phases, the hospital/RHA blood bank director, in consultation with the patient’s physician, may consider the use of a blood component which has passed its Health Canada approved storage period. In such cases, the justification for the use of an outdated product must be documented by the responsible physician in the patient’s chart and every effort must be made to obtain specific patient consent.
6.4 **Table 2: Guideline for the use of platelet transfusions in children and adults in shortage situations**

<table>
<thead>
<tr>
<th>Green Phase</th>
<th>Amber Phase</th>
<th>Red Phase</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Major Hemorrhage</strong></td>
<td><strong>Major Hemorrhage</strong></td>
<td><strong>Major Hemorrhage</strong></td>
</tr>
<tr>
<td>Immune thrombocytopenia and life- or limb-threatening bleeding maintain PC &gt; 10 x 10^9/L.</td>
<td>For head trauma or CNS bleeding maintain a PC &gt; 80 x 10^9/L.</td>
<td>Same as Amber phase</td>
</tr>
<tr>
<td>For head trauma or CNS bleeding maintain a PC &gt; 100 x 10^9/L.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other significant bleeding, or acute promyelocytic leukemia at acute presentation, maintain a PC &gt; 50 x 10^9/L.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Invasive procedures/surgery</strong></td>
<td><strong>Invasive procedures/surgery</strong></td>
<td><strong>Invasive procedures/surgery</strong></td>
</tr>
<tr>
<td>For non-surgical invasive procedures maintain a PC &gt; 20 x 10^9/L (central venous catheter insertion, paracentesis, thoracocentesis)</td>
<td>Urgent and emergency surgery in consultation with H/RBEMC</td>
<td>Emergency surgery in consultation with H/RBEMC</td>
</tr>
<tr>
<td>For lumbar maintain a PC &gt; 50 x 10^9/L</td>
<td>In presence of active bleeding or surgical procedure maintain a PC &gt; 50 x 10^9/L or if CNS trauma/surgery a PC &gt; 80 x 10^9/L</td>
<td>All requests for platelet transfusion must be reviewed by designated medical personnel</td>
</tr>
<tr>
<td>For CNS surgery maintain a PC &gt; 100 x 10^9/L</td>
<td>For non-surgical invasive procedures (other than bone marrow aspiration or biopsy) maintain a PC &gt; 10 x 10^9/L with image guidance.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>For lumbar puncture, maintain a PC &gt; 20 x 10^9/L</td>
<td></td>
</tr>
<tr>
<td><strong>Bone marrow failure/ hematopoietic stem cell transplantation/chemotherapy</strong></td>
<td><strong>Bone marrow failure/ hematopoietic stem cell transplantation/chemotherapy</strong></td>
<td><strong>Bone marrow failure/ hematopoietic stem cell transplantation/chemotherapy</strong></td>
</tr>
<tr>
<td>Adhere to a maximum threshold PC of 10 x 10^9/L for prophylactic platelet transfusions.</td>
<td>Adhere to a maximum threshold PC of 10 X 10^9/L for prophylactic platelet transfusions; consider lowering this threshold for routine prophylactic transfusions to 5 x 10^9/L. Transfer patients undergoing autologous stem cell transplant only if symptoms of bleeding. All requests for a platelet transfusion in non-bleeding patients with a PC &gt; 10 x 10^9/L must be reviewed by designated medical personnel. Split PC doses and use half doses in non-bleeding patients if necessary.</td>
<td>Eliminate all prophylactic transfusions.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>All requests for platelet transfusions in non-bleeding patients must be reviewed by designated medical personnel</td>
</tr>
</tbody>
</table>

**Notes**
- PC = Platelet Count
- Given the relatively small volumes/numbers of units required, transfusions for neonates (i.e. patients less that 4 - months of age) and intrauterine transfusions would be given according to usual guidelines (i.e. would not be - restricted even in times of shortage). However measures to share units among neonates or between neonates and larger patients should be used to the extent possible
• Follow the same guidelines for cancelling/performing surgery as described in Table 1
• Split doses of platelets (apheresis or buffy coat) should be considered if available. Health Canada advises that splitting doses of platelets is considered aliquoting and is not a processing activity which requires registration. Sample aliquoting procedures are available on the NAC website.
• Lower PC thresholds for platelet transfusions for surgical bleeding or special procedures (such as ECMO) should be used.
• In Red or Amber phases, the hospital/RHA blood bank director, in consultation with the patient’s physician, may consider the use of a blood component which has passed its Health Canada approved storage period. In such cases the justification for the use of an outdated product must be documented by the responsible physician in the patient’s chart, and every effort must be made to obtain, specific patient consent.
Appendix A
Blood Emergency Response Team (BERT)

Terms of Reference

1.0 Mandate:
BERT reviews urgent and emergent impacts to the blood supply in Nova Scotia and develops a response plan in order to minimize the impact to the health system.

1.1 Key objectives:
- BERT reviews all available current information collected and determines what further information is required
- Completes analysis of information
- Initiates control measures based on findings
- Liaises with the relevant working groups on key messages to be communicated related to the blood supply

2.0 Membership:
The team functions as a subcommittee of the Nova Scotia Provincial Blood Coordinating Program (NSPBCP) Advisory Council. In the event of an emergent situation, the core BERT team will convene at the discretion of the Chair.

The Core team members include:
- Provincial/Territorial Blood Representative for NS
- National Advisory Committee on Blood and Blood Products Representative for NS
- Clinical Advisor, NSPBCP
- Program Manager, NSPBCP
- Laboratory Standards Coordinator, NSPBCP
- Central Zone Laboratory Medical Director, Blood Transfusion Service Adult Tertiary Care
- IWK Laboratory Medical Director, Blood Transfusion Service
- Laboratory Medical Director, Blood Transfusion Service Rural
- Director Product & Hospital Services, Canadian Blood Services (CBS), Halifax
- Hospital Liaison Specialist, CBS, NS /NL
- Medical Director, CBS, Halifax

If the emergent situation includes PEI, CBS Hospital Liaison Specialist NB/ PEI will be included.

If the situation warrants, the expanded BERT team members will be assembled.
The Expanded team members should include:

- Medical Director, CBS, National
- DHA 1-9 & IWK CEO
- DHA 1-9 & IWK Designates
  - VP
  - Laboratory Medical Director, Blood Transfusion Service
  - Lab Manager
  - Quality Specialist
  - Nursing
- Representative, Perioperative Blood Conservation Program
- Blood Recipient representative
- Other individuals as designated by the group

2.1 The NSPBCP will serve as the Secretariat. Activities include:

- Maintain contact list of members, arrange meetings/teleconferences
- Circulate the agenda (as available) and relevant information to all team members
- Record and distribute minutes of the meeting
- Distribute communications on behalf of the team

3.0 Chair
The Chair will be the Clinical Advisor of the NSPBCP.

4.0 Quorum:
Decisions are made by those present.

5.0 Meetings:
BERT shall meet on an ad hoc basis by the call of any member, upon approval from the Chair.

6.0 Responsibility:
BERT advises the Department of Health and Wellness and Department of Health Promotion and Protection on issues related to the blood supply.
Appendix B

National Emergency Blood Management Committee

Terms of Reference

1.0 Mandate
The National Emergency Blood Management Committee (NEBMC) will develop recommendations and provide advice to the Provincial/Territorial (P/T) Ministries of Health, hospitals/RHA and Canadian Blood Services (CBS) to support a consistent and coordinated response to critical blood shortages in Canada.

To this end, the NEBMC will:

- provide advice to CBS with respect to determining the appropriateness of declaring an Amber or Red phase situation, and subsequent recovery from these situations
- provide recommendations on the distribution of blood components in Amber and Red phases
- provide recommendations as to whether or not to implement triage and rationing guidelines for massively bleeding patients in a Red phase
- provide recommendations on previously unforeseen circumstances related to critical blood shortages
- provide recommendations concerning the communication of the shortages to key stakeholders
- ensure the necessary communication between the NEBMC and the Provincial/Territorial Emergency Blood Management Committee (P/TEBMC) occurs
- task the Blood Shortage Working group to review and report upon the implementation of the Plan and subsequent outcomes after each simulation exercise and live activation
- ensure ongoing refinement and improvements to the Plan

2.0 Membership
The Chair of the NEBMC will be the current chair of the National Advisory Committee for Blood and Blood Products (NAC). The Vice-Chair of NAC shall act as chair in the absence of the NEBMC/NAC Chair.

The membership of the NEBMC will include the following:

- CBS officials as determined by CBS and including the following
  - Chief Supply Chain Officer (CSCO)
  - Chief Medical & Scientific Officer
  - Director, Supply Chain Operations Planning
  - Regional Director, Supply Chain Operations
  - Director, Medical Utilization
  - Medical Officer(s)
  - Director, Government Relations
➢ Director, Communications
• all NAC for Blood and Blood Products members
• all P/T Blood Representatives
• Québec Ministry représentative (Ex-Officio)
• Hema-Québec représentative (Ex-Officio)
• Health Canada BGTD representative (Ex-Officio)
• two blood transfusion recipient representatives, chosen jointly by CBS and NAC; one
  • should be an actual blood transfusion recipient (present or past) and the other should be a
  • representative of an appropriate patient society that receives blood components

Every member of the NEBMC is responsible for naming a designate in the event that he/she is unavailable. The term of any member will be determined by the body that appointed them.

The NEBMC may invite additional experts to meetings on an ad hoc basis to provide expertise on the subject matter being discussed (e.g. Public Health Agency of Canada in the event of a blood shortage secondary to an infectious risk, Regional representatives from CBS supply chain).

3.0 Meetings/Quorum
NEBMC will hold regular meetings, emergency simulation meetings and meetings convened at the time of potential shortages or shortages.

Note: Potential Shortages could be brief situations where, while the overall inventory is in Green Phase, a particular blood type or component may be in limited supply and require CBS to issue a Green Advisory. Most of these situations will be brief, and CBS will communicate temporary inventory adjustments to hospitals through “business-as-usual” channels. Should the situation persist, prior to going to a public media appeal for donors, or to discussing the potential of an Amber phase, the CBS CSCO will consult with the NEBMC Chair to convene the NEBMC (within 24 - 48 hrs) to determine if there are any changes to hospital inventory management practice can assist with and/or improve the situation internally.

Regular meetings and emergency simulation meetings will be extremely important to ensure that the committee can effectively function in times of potential shortages or shortages and will be convened at the call of the Chair of the NEBMC, twice per year.

The first of these 2 meetings would be used for reviewing the Plan to maintain currency and the second would be used for a blood shortage exercise with the purposes of increasing NEBMC comfort in handling such events. The meetings
should be scheduled two years out by CBS acting as the secretariat to the NEBMC.

There will be no requirement for quorum and decisions of the NEBMC will be made by consensus. Consensus is defined as 80% (or greater) agreement of the NEBMC members present. In the event consensus is reached, the CBS CSCO will take the NEBMC recommendation as his or her primary consideration in rendering decisions related to matters identified by the NEBMC mandate. In the event that consensus cannot be reached, the CBS CSCO will make the decisions using knowledge of current and future CBS inventories and considering the advice received from the NEBMC.

4.0 Communications and Support

Secretariat
A Secretariat, provided by CBS, shall support the work of the NEBMC. The Secretariat shall be responsible for:

- maintaining an up-to-date contact list of members and their designates
- arranging meetings/teleconferences at the direction of the Chair, including planned and unplanned simulation meetings
- reporting all proceedings and recommendations of the NEBMC to all members of the NEBMC and their designates
- distribution of relevant information and reports from P/TEBMC, CBS or other relevant sources to all NEBMC members and their designates

NAC Members
In their NEBMC role, NAC members will serve as medical/technical advisory representatives for their respective provinces to the NEBMC. In conjunction with their P/T representative, they will facilitate dissemination and implementation of NEBMC recommendations to their P/TEBMC and Hospital/RHA Emergency Blood Management Committee (H/REBMC).

P/T Representatives
In their NEBMC role, P/T representatives will facilitate the dissemination and implementation of NEBMC recommendations within their respective ministries of health and to their P/TEBMC.

Provincial/Territorial Emergency Blood Management Committees
It is the responsibility of the Ministries of Health of each province or territory to establish a P/TEBMC and its terms of reference, which should include the following responsibilities:

- develop a response plan to minimize the P/T impact of blood shortages
- work in accordance with the guidelines outlined in this Plan
- ensure that the recommendations of the NEBMC and resulting national decisions are appropriately communicated within its jurisdiction
- solicit feedback on implementation of the Plan from the H/REBMC
• provide the conduit for communications/feedback between the NEBMC and H/REBMCs
• establish a process to monitor adherence to the Plan in times of blood shortages
• establish recommendations to manage non-adherence to the Plan in times of blood shortages

Thus, each P/TEBMC will work collaboratively as required with the NEBMC and its jurisdiction’s H/REBMCs.

Provinces or territories may wish to consider having a core or an executive P/TEBMC and then an expanded membership depending upon the extent of the crisis.

Core team members must include:
• P/T Blood Representative
• Provincial NAC member(s)

Core team members would also usually include:
• Chief Medical Officer of Health
• Medical Director(s) Provincial Blood Program (if applicable)
• Program Manager Provincial Blood Program (if applicable)
• Representatives of tertiary care centre blood transfusion services
• Representatives of rural or remote sites
• Regional Medical Officers(s), CBS
• Regional Director(s), CBS
• Regional Hospital Liaison Specialist(s), CBS

In the event the situation warrants, the core team members could be expanded to include:
• District/Regional Health Authorities and/or tertiary care centre CEOs
• District/Regional Health Authorities and/or tertiary care centre designates for:
  ➢ Transfusion Service Medical Directors
  ➢ Laboratory Managers
  ➢ Risk Managers
  ➢ Medical Ethicist
  ➢ Transfusion Safety Officers
  ➢ Quality Specialists
  ➢ Nursing administrators
  ➢ Executive management representatives
  ➢ Physician user group representatives
  ➢ Chairs of transfusion committees
  ➢ Communication Specialists
• Blood recipient representative(s)
• Other individuals as designated by the group
Hospital/RHA Emergency Blood Management Committee
Each hospital or Regional Health Authority (RHA) has a responsibility to establish a Hospital/RHA Emergency Blood Management Committee (H/REBMC) whose mandate is to develop a Blood Shortages Management Plan (Plan) in accordance with the guidelines outlined in this Plan and to ensure that these plans are appropriately communicated and adhered to in times of blood shortages. H/REBMCs should also serve as the communication conduit to the P/TEBMC. In small provinces/territories it is possible that the P/TEBMC and H/REBMC would be one single body.

H/REBMC membership will vary from facility to facility; the following outlines potential membership:
- Representative of hospital/RHA senior or executive management
- Medical Director, Blood Transfusion Service
- Head, Department of Internal Medicine (or in larger centres could be Heads of Critical Care Medicine and Haematology/Oncology)
- Head, Department of Surgery
- Head, Department of Anesthesiology
- Head, Emergency Department
- Head, Obstetrics/Gynecology Department
- Chair of the Blood Transfusion Committee
- Director of Nursing
- Transfusion Service Laboratory Manager
- Transfusion Safety Officer
- Hospital/RHA Risk Manager
- Director, Communications/Public Affairs
- Other members as deemed appropriate by the Hospital/RHA Blood Transfusion Committee.

5.0 Evaluation
The NAC’s Blood Shortage Working Group will review the implementation and outcomes of the Plan after each simulation exercise and live activation for ongoing refinement and modification of the Plan, and shall report these findings to all members of the NEBMC.
Appendix C
Blood Emergency Management Group (BEMG)

Terms of Reference

1.0 Mandate
The BEMG is to develop a Blood Emergency Management Plan (BEMP) in accordance with the guidelines outlined in the Provincial Blood Contingency Plan and to ensure that these plans are appropriately communicated and adhered to in times of blood shortages.

During a blood shortage the BEMG has executive authority and each facility should have a designated Lead Contact person available 24 hours/day, 7 days/week to receive and disseminate communications. It is critical the Blood Transfusion Services Medical Director is informed immediately of Amber or Red Phase declarations.

1.1 Key Objectives
- Operationalizes BERT’s recommendations in the respective Zones
  - Communication
  - Actions
  - Develop and maintain BEMPs

2.0 Membership
BEMG membership will vary from facility to facility; the following outlines potential membership:
- Representative of senior or executive management/Chief Executive Officer (CEO)
- Medical Director, Blood Transfusion Service
- Clinical Director of Internal Medicine (in large centers it could be Director of Critical Care Medicine and Hematology/Oncology)
- Clinical Director of Surgery
- Clinical Director of Anesthesiology
- Clinical Director, Emergency Department
- Clinical Director of Acute Medicine
- Clinical Director, Obstetrics/Gynecology Department
- Chair of the Blood Transfusion Committee
- Director of Nursing
- Blood Transfusion Service Laboratory Manager
- Transfusion Safety Officer/Nurse
- Facility/Zone Risk Manager
- Director, Communications/Public Affairs
- Director of Operations
- Other members as deemed appropriate by the Facility/Blood Transfusion Committee
3.0 **Chair**
The chair will be the Medical Director Laboratory Services/Blood Transfusion Service or designate.

4.0 **Quorum**
Decisions are made by those present.

5.0 **Meetings**
BEMG shall meet on an ad hoc basis in response to BERT, CBS or a local event.

6.0 **Responsibility**
BEMG communicates to internal customers on issues related to the blood supply; ensuring processes are in place and evolve as necessary to fulfill their mandate and enable the key objectives outlined in these Terms of Reference.
Blood Emergency Management Plan

(enter Zone)

(enter facilities)
TABLE OF CONTENTS
1.0 INTRODUCTION

1.1 SCOPE
This document describes the Blood Emergency Management Plan (BEMP) used by [facility(ies)/zone] when anticipated, real or perceived threats to provincial blood component/product inventories occur. The plan defines policy and objectives as well as management’s commitment to a consistent, coordinated provincial response thus maximizing the effectiveness of the Nova Scotia Provincial Blood Contingency Plan.

This document also describes processes and procedures for management of crises affecting internal function of the NSHA/facilities or external disasters requiring NSHA/facilities support involving blood components/products. (optional)

The plan is based on the current version of the following guidelines and standards:
- Nova Scotia Provincial Blood Contingency Plan
- C.S.A. Z902 Blood and blood components
- A.A.B.B. Standards for Blood Banks and Transfusion Services
- C.S.T.M. Standards for Hospital Transfusion Services

1.2 DISTRIBUTION
The plan is distributed to [location of all manuals].

1.3 REVISIONS
The plan is reviewed and revisions made on a biennial basis to ensure reflection of current best practices and continuous improvement. Documentation of revisions is located [location].

2.0 GLOSSARY
The following are terms and descriptions utilized within this plan:

Blood product
Any therapeutic product derived from human blood or plasma, and produced by a manufacturing process that pools multiple units (usually more than 12).

Note: Examples of blood products are human serum albumin, immunoglobulin preparations, and coagulation products (factors VIII and IX, fibrinogen, Anti-Thrombin III, etc.)
Blood component  A therapeutic component of blood intended for transfusion (e.g. red cells, granulocytes, platelets, plasma) that can be prepared using the equipment and techniques available in a blood centre. **Note:** Such equipment and techniques can include centrifugation, filtration, or freezing

BEMP  Blood emergency management plan

BEMG  Blood emergency management group

BERT  Blood emergency response team

BTC  Blood transfusion committee

BTS  Blood transfusion service (may also be referred to as Blood Bank)

CBS  Canadian Blood Services

CBRH  Cape Breton Regional Hospital

NSHA  Nova Scotia Health Authority

DHW  Department of Health and Wellness

Emergent  An occurrence coming into view, existence or notice, often unexpectedly, with the potential to impact blood component/product inventories thus is demanding prompt action. E.g. pandemic flu, WNV, labour disruption

aFFP  Apheresed fresh frozen plasma

FP  Frozen plasma

IMSC  Inventory Management Sub Committee

IWK  IWK Health Centre

NSPBCP  Nova Scotia Provincial Blood Coordinating Program

PAC  Program advisory committee (of the NSPBCP)

PLTS  Platelets (includes apheresed platelets and buffy coat platelets)

QEII  Queen Elizabeth II Health Sciences Centre

Urgent  Needing immediate action to contain the impact on blood component/product inventories
3.0 GENERAL INFORMATION

3.1 PURPOSE
The purpose of this emergency plan is to provide clear, concise and consistent direction to health care professionals when emergent threats to blood component/product inventories have been identified ensuring a coordinated provincial response.

3.2 PLANNING PRINCIPLES
This emergency plan is based on the following principles:
- Shortages of blood components/products can be contained and managed by appropriately reducing utilization and inventory levels.
- Patients with the greatest clinical need and likelihood of survival are priority recipients of blood components/products during a shortage.
- Ethical consideration meeting both procedural (process and procedure) and substantive (decision-making) values of the provincial ethics framework is an inherent component.
- CBS inventory levels or potential threats to these levels provide the basis for determining the phasing and initiation of the Provincial Contingency Plan; and in turn the initiation of this plan.
- Upon declaration of an Amber or Red Phase, the NSHA and IWK will invoke this plan and implement BERT recommendations (as communicated) thereby ensuring a timely and coordinated response.

3.3 ORGANIZATION IDENTITY
The following facilities are active members of this emergency plan:

<table>
<thead>
<tr>
<th>Facility Name</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enter facility(ies) name</td>
<td>Enter facility(ies) location</td>
</tr>
</tbody>
</table>

4.0 ROLES AND RESPONSIBILITIES
This plan is built on a series of sequential operational procedures including:
1) Identification and communication of the blood issues;
2) Assessment of the issue and development of the response plan;
3) Communication of the response plan;
4) Implementation of the response plan, and
5) Recovery from the issue
4.1 Blood Emergency Management Group
The BEMG has executive authority and includes the following members:

<table>
<thead>
<tr>
<th>Member</th>
<th>Title</th>
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</tbody>
</table>

The BEMG is responsible to:
- Develop, implement and maintain the **BEMP**.
- Ensure appropriate lines of communication are developed, initiated and maintained
- Once initiated and throughout the course of a shortage; assess CBS communications and BERT recommendations, develop a province-wide response plan and implement the response plan.
- Provide support and input for case-by-case decision-making (as required)
- Upon recovery from a shortage, conduct a retrospective review of this **BEMP**’s functionality to determine issues and appropriate revisions. A final report will be submitted to the CEO.

4.2 Lead Contact
The lead contact (available 24 hours/day, 7 days/week) is responsible to receive and disseminate communications from both CBS and BERT for this emergency plan and is:

<table>
<thead>
<tr>
<th>Contact</th>
<th>Contact information</th>
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<tbody>
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</tbody>
</table>

Alternate:

4.3 Medical Director (BTS/Laboratory) or Designate
The Medical Director (BTS/Laboratory)/designate is responsible for the following:
- All medical and technical policies and procedures that affect laboratory personnel and test performance.
- Responsible for, or consulted in, the development of policies that relate to the care and safety of recipients.
- Responsible for the appropriate use of resources in the transfusion service and compliance with standards.
• Liaison with requesting physicians to facilitate case-by-case decision-making through:
  ➢ availability of alternatives
  ➢ delays or reduction in blood component/product provision (as appropriate)
  ➢ course of treatment changes (if required)
• Provide input and support in the development, initiation, and maintenance of this plan.
• Provide expertise and recommendations when developing Zone response plans according to BERT/CBS recommendations.
• Initiate appropriate strategies within the BTS to contain utilization of affected blood components/products as required and according to CBS/BERT recommendations.

4.4 Blood Transfusion Service (BTS)
The BTS is responsible for the following:
• Assess, monitor and maintain blood component/product inventories.
• Provide historical and on-going utilization and inventory levels to the Medical Director/BEMG and/or CBS as required.
• Identify a BTS staff member/designate as a coordinator to:
  ➢ Initiate and communicate Medical Director (BTS/Laboratory)/BEMG response plan, as directed.
  ➢ Initiate facility-to-facility transport as appropriate.
  ➢ Liaise with Medical Director (BTS/Laboratory)/designate to update on utilization and inventory levels throughout the shortage
• Obtain blood components/products from CBS when available and/or other facilities when required.
• Obtain approval from the Medical Director (BTS/ Laboratory)/designate prior to dispense of blood components/products as appropriate.

4.5 Blood Transfusion Committee (BTC)
The BTC is responsible for the following:
• Assess NSPBCP guidelines and standards of practice for appropriateness and facilitate implementation within the Zones.
• Help define blood transfusion policies as appropriate to local clinical activities.
• Ensure regular evaluations of blood transfusion practices are conducted and provide input into making appropriate changes as necessary.
• Review available alternatives to allogeneic blood transfusion and make appropriate recommendations on their use.
• Assess and determine utilization management mechanisms appropriate to local clinical activities.
BLOOD EMERGENCY MANAGEMENT PLAN
(insert NSHA Zone / IWK name)
FACILITY NAME(S)

- Review and assess historical transfusion and utilization patterns to determine appropriate recommendations for zone response plans.
- To provide expertise and support case-by-case decision-making processes as required.
- Provide feedback on functionality of this plan to BEMG upon resolution of the shortage.

4.6 Health Care Professionals Involved in the Transfusion Process (Physicians, nurses, etc.)
All health care professionals involved in the transfusion process are responsible to:
- Adhere to BERT recommendations and accompanying zone response plans as indicated.
- Ensure communications are distributed appropriately throughout their clinical areas.
- Be available for consultation with the Medical Director/designate to discuss recipient indications for transfusion and determine appropriate course of treatment.
- Provide feedback, as requested to BEMG/Medical Director upon resolution of the shortage indicating efficacy and effectiveness of the plan’s functionality.
- Participate in BEMP education sessions and be aware of roles and responsibilities within the plan.

5.0 Identification of Potential Threat or Actual Shortage
A potential threat or actual shortage of blood components/products will be identified in one of two ways:
1) CBS identifies an issue potentially or actually impacting the inventories of blood components/products. This issue may impact regional and/or national inventories and as such would be assessed to determine the appropriate phasing to be initiated.
2) Another entity (DHW/Public Health, Health Canada) identifies an issue potentially or actually impacting the inventories of blood components/products. This issue would be communicated directly to the BERT, who would communicate and collaborate with CBS-Dartmouth to determine appropriate interventions and/or phasing to be implemented, if required.
6.0 COMMUNICATION
Effective communication throughout the facilities within this zone ensures a coordinated provincial response to potential threats and actual shortages affecting blood component/product inventories in Nova Scotia.

6.1 Initial communication

6.1.1 Green Phase
Normal fluctuations in CBS-Dartmouth’s inventories may result in minor, temporary shortages (24 - 48 hours recovery dependent on the blood component/product involved). These shortages will have the most impact on the QEII, CBRH and the IWK as these facilities:
1) Store platelets and the largest inventories of RBC’s.
2) Are, provincially, the high-end users of blood components/products
3) Given 1) and 2) above, these sites will have the greatest immediate impact on utilization to assist with mitigating inventory shortages.

Minor, temporary shortages associated with FFP/aFFP inventories will result in communication to the QEII as this facility is the only site performing plasmapheresis and liver transplants in Nova Scotia.

CBS-Dartmouth will communicate directly with the lead contact at the QEII &/or CBRH &/or IWK as appropriate throughout the extent of the temporary shortage.

6.1.2 Amber Phase
Moderate threat or perceived threat to CBS-Dartmouth blood component/product inventories resulting in shortage recoveries between 48-72 hours dependent on the blood component/product involved. CBS-Dartmouth will communicate initially and throughout the extent of the shortage accordingly:
1) Chair of BERT
   Situation is assessed to determine likelihood of move to Red Phase or need for systematic recommendations.
2) If BERT is initiated to determine appropriate recommendations:
   a. NSPBCP obtains endorsement from DHW for recommendations.
b. NSPBCP and CBS-Dartmouth simultaneously notify the lead contact at the NSHA/IWK of phasing, affected blood components/products, current inventories, and anticipated period of recovery and BERT recommendations.

If BERT is NOT initiated:

a. CBS-Dartmouth notifies the lead contact at the NSHA/IWK of phasing, affected blood components/products, current inventories and anticipated period of recovery.

6.1.3 Red Phase
Severe local threat or perceived threat to CBS-Dartmouth blood component/product inventories
OR
Severe shortage or imminent threat to the national blood component/product inventories as a result of reduced donations (>30%) due to factors such as pandemic influenza, or catastrophic loss at CBS resulting in shortage recoveries >48 - >72 hours dependent on the blood component/product involved. CBS-Dartmouth will communicate initially and throughout the extent of the shortage accordingly:

1) Chair of BERT.
2) BERT is initiated to determine appropriate recommendations.
   a. NSPBCP obtains endorsement from DHW for recommendations.
   b. NSPBCP and CBS-Dartmouth simultaneously notify the lead contact at the Zones/IWK of phasing, affected blood components/products, current inventories and anticipated period of recovery and BERT recommendations.

6.1.4 Unusual Circumstances:
BERT may be initiated in response to anticipated real or perceived threats to the provincial blood component/product supplies which may require an immediate provincial response to mitigate the impact. In these unusual circumstances, BERT will determine appropriate provincial recommendations and the following will occur:

a. NSPBCP obtains endorsement from DHW for recommendations.

b. NSPBCP and CBS-Dartmouth simultaneously notify the lead contact at the NSHA/IWK of phasing, affected blood components/products, current inventories, and anticipated period of recovery and BERT recommendations.
6.2 NSHA Zones/facility(ies) communication

6.2.1 Lead Contact or alternate
Communication regarding a blood shortage from CBS-Dartmouth & recommendations from BERT (NSPBCP) (if appropriate) will be forwarded to the lead contact by fax. The lead contact will immediately forward the communication on to the Medical Director (BTS/Laboratory)/designate.

<table>
<thead>
<tr>
<th>Time of Day</th>
<th>Contact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal working hours (0700-1700 hour)</td>
<td></td>
</tr>
<tr>
<td>Evening hours (1700-2300 hours)</td>
<td></td>
</tr>
<tr>
<td>Night hours (2300-0700 hours)</td>
<td></td>
</tr>
</tbody>
</table>

6.2.2 Medical Director (BTS/Laboratory)/designate
The Medical Director (BTS/Laboratory)/designate will assess the communications from CBS-Dartmouth and BERT to determine impact on local clinical needs and activities.

6.2.2.1 Green Phase
The Medical Director (BTS/Laboratory)/designate will determine appropriate response and strategies for the NSHA Zone/facilities or IWK to implement. Communications will be forwarded to appropriate clinical areas impacted by the minor fluctuation in inventories indicating the response and strategies to be implemented.

6.2.2.2 Amber Phase
The Medical Director (BTS/Laboratory)/designate will determine if the BEMG is required to be initiated to develop an appropriate response and strategies for the NSHA Zone/facilities or IWK to implement. Communications will be forwarded to appropriate clinical areas impacted by the shortage indicating the response and strategies to be implemented.

6.2.2.3 Red Phase
The Medical Director (BTS/Laboratory)/designate will initiate the BEMG as soon as possible to develop an appropriate response and strategies for the NSHA Zone/facilities or IWK to implement. Initial pre-emptive strategies may be initiated by the BTS upon direction from the Medical Director/designate to help mitigate the
shortage until such time as a BEMG action plan has been developed. Ongoing communications will be forwarded to the appropriate clinical areas impacted by the shortage indicating the response and strategies to be implemented throughout the extent of the shortage in response to ongoing CBS-Dartmouth communications and BERT (NSPBCP) recommendations.

6.2.3 Blood Emergency Management Group (BEMG)

The BEMG will assess CBS-Dartmouth communications, BERT (NSPBCP) recommendations and impact to NSHA Zone / IWK blood component/product inventories and services. A response plan will be developed and communication directives for clinical areas will be determined by the BEMG. The chair of the BEMG will forward the communication directives to (insert appropriate position responsible for communicating recommendations) for distribution.

6.2.4 Distribution of Communications

6.2.4.1 The Medical Director (BTS/Laboratory)/designate communicates appropriate policies, processes and procedures to be implemented in the BTSs throughout the NSHA Zone / IWK according to the response plan developed by the BEMG.

6.2.4.2 The BTS staff member/designate responsible to coordinate BTS activities implements the policies, processes and procedures throughout the NSHA Zone / IWK and ensures BTS staff are aware and updated on any changes to current policies, processes and procedures throughout the extent of the shortage.

6.2.4.3 The (insert appropriate position responsible for communicating recommendations) forwards the communication directives from the response plan to the key contacts throughout the NSHA Zone / IWK who are responsible to distribute the information throughout their clinical areas.

The following table indicates the key contacts and contact information for all phases of this plan:

---

EFFECTIVE DATE/DOCUMENT NUMBER/VERSION
<table>
<thead>
<tr>
<th>Phase</th>
<th>Key Contact</th>
<th>Contact Information</th>
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</thead>
<tbody>
<tr>
<td>Green</td>
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<tr>
<td>Amber</td>
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<tr>
<td>Red</td>
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</tbody>
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**EFFECTIVE DATE/DOCUMENT NUMBER/VERSION**
## Appendix E  Component Screening Log

**Phase:**
- ☐ Amber
- ☐ Red

**Facility:**

**Date:** 20 / / at 0800 hr to 20 / / at 0800 hr

<table>
<thead>
<tr>
<th>Time</th>
<th>MRN#</th>
<th>Last Name</th>
<th>Product &amp; # Requested</th>
<th>Ordering Physician Requesting</th>
<th>Clinical Indication</th>
<th>Products Available</th>
<th>Decision</th>
<th>Physician reviewing</th>
</tr>
</thead>
<tbody>
<tr>
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<td></td>
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<td>☐ Red Cells, # ___</td>
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<td>☐ Platelets, # _____</td>
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<td>☐ Plasma, # _____</td>
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</table>

2009-11-09 Adapted from National Plan for Management of Shortages of Labile Blood Components

Nova Scotia Provincial Blood Contingency Plan
December 2016
### Appendix F  Surgery Cancellation Report

FACILITY ________________________________

**Surgery Cancellation Report for Use During a Blood Shortage**

<table>
<thead>
<tr>
<th>Surgery Type</th>
<th>Number of Procedures Cancelled</th>
<th>Number of Procedures Deferred</th>
<th>Adverse Patient Outcome (describe and occurrences)</th>
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</table>

2009-11-09 Adapted from National Plan for Management of Shortages of Labile Blood Components

Nova Scotia Provincial Blood Contingency Plan
December 2016
Appendix G  Requests for Blood Components During a Blood Shortage

Facility________________________________________________________

Date: __________________________________________________________

Time: __________________________________________________________

Facility Name: _________________________________________________

Patient Name: _________________________________________________

Patient MRN#: ________________________________________________

Ordering Physician: _____________________________________________

Screening Physician Name: _______________________________________

Component Requested: __________________________________________

Reason for Request: _____________________________________________

Component Availability: _______Amber Phase ________Red Phase

Pre transfusion Laboratory Data:
   Hgb: _____
   Plt: _____
   INR: ______

Comment on Release or Non-Release of Blood Component(s) and Outcomes:
________________________________________________________________
________________________________________________________________
________________________________________________________________
________________________________________________________________

Ordering Physician notified:
_______________________________________________________________

Follow up date and time:
________________________________________________________________

2009-11-09 Adapted from National Plan for Management of Shortages of Labile Blood Components

Nova Scotia Provincial Blood Contingency Plan
December 2016
## Transfusion Log for Use During a Blood Shortage

<table>
<thead>
<tr>
<th>Clinical Indication</th>
<th>Procedure Deferred</th>
<th>Relevant Laboratory Results</th>
<th>Length of Transfusion Delay Due to Blood Shortage</th>
<th>Adverse Patient Outcomes (describe any occurrences)</th>
</tr>
</thead>
<tbody>
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</table>

2009-11-09 Adapted from National Plan for Management of Shortages of Labile Blood Components
## Appendix I

### Triage Tracking Log

Emergency Disposition of Blood during Red Phase Blood Shortage

<table>
<thead>
<tr>
<th>Tracking Number</th>
<th>Medical Record Number</th>
<th>Last Name</th>
<th>First Name</th>
<th>Location</th>
<th>Blood Group</th>
</tr>
</thead>
<tbody>
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</tbody>
</table>
# Appendix J

## Patient Triage Record

### Emergency Disposition of Blood during Red Phase Blood Shortage

<table>
<thead>
<tr>
<th>Patient Tracking Number</th>
<th>Hospital</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reason for Massive Hemorrhage</td>
<td>Date of Triage</td>
</tr>
<tr>
<td>Predicted to need &gt;10 units in next 24 hours</td>
<td>Age</td>
</tr>
<tr>
<td>[ ] Yes [ ] No (if no refer to standard tracking tool)</td>
<td>Hemoglobin</td>
</tr>
<tr>
<td>Has patient received product in previous 24 h?</td>
<td>Platelet</td>
</tr>
<tr>
<td>[ ] Yes [ ] No</td>
<td>INR</td>
</tr>
<tr>
<td>If yes, list products:</td>
<td>PTT</td>
</tr>
<tr>
<td></td>
<td>Fibrinogen</td>
</tr>
<tr>
<td>Meets any exclusion criteria</td>
<td>Product Required</td>
</tr>
<tr>
<td>[ ] Yes [ ] No</td>
<td></td>
</tr>
<tr>
<td>If yes, which one(s)?</td>
<td></td>
</tr>
<tr>
<td>Meets any specific exclusion criteria</td>
<td>Dare/Time of assessment</td>
</tr>
<tr>
<td>[ ] Yes [ ] No</td>
<td></td>
</tr>
<tr>
<td>If yes, which one(s)?</td>
<td></td>
</tr>
<tr>
<td>Decision made to administer blood?</td>
<td>Date/Time</td>
</tr>
<tr>
<td>[ ] Yes [ ] No</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Patient outcome at 24 hours</td>
<td>Date/Time</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Comments by Triage Team</td>
<td>Comments regarding patient and family concerns</td>
</tr>
<tr>
<td>Triage Documentation completed by</td>
<td>Signature</td>
</tr>
<tr>
<td>Triage Officer Name</td>
<td>Signature</td>
</tr>
<tr>
<td>Follow-up</td>
<td></td>
</tr>
<tr>
<td>Patient Outcome at Discharge</td>
<td>Patient Outcome at 6 months</td>
</tr>
</tbody>
</table>

2012-04-14 Adapted from Emergency Framework for Rationing of Blood for Massively Bleeding Patients During a Red Phase Blood Shortage

Nova Scotia Provincial Blood Contingency Plan

December 2016
This document has been developed to support enacting the Nova Scotia Provincial Blood Contingency Plan. As described in the Plan, the blood supply is a national commodity and the potential scenarios that could compromise the national blood inventory are almost unlimited. Both the Provincial and National plans categorize Blood shortages by phases: **Green; Amber, Red and Recovery** all of which are defined by Canadian Blood Services (CBS) - inventory levels. During times of shortage the Blood Transfusion Service department will be required to make difficult decisions on how to ration the supply. Decisions during such times are guided by both individual hospital Blood Emergency Management Groups (BEMGs) which provide executive authority over their Blood Emergency Management Plans (BEMPs) and / or by recommendations put forth by the Provincial Blood Emergency Response Team (BERT). Documentation of such decisions and transparency of actions satisfy the *Nova Scotia Health Services Pandemic Influenza Plan*; dated April 2007.

This document is divided into sections according to phases of the Plan. Documents common to various phases are located at the back of the toolkit. The toolkit is expected to:

- Standardize documentation of an event
- List contact information
- List associated documents/ SOPs
- Provide templates for:
  - Phase checklists
  - communication cascades
  - communication memos
  - contact information
  - event log
  - transfusion logs: request / decision making
  - inventory reporting
  - event review
- Evolve as indicated

This toolkit, although designed to support the management of a blood shortage and / or imminent threat; may be used by facilities to document events unique to their BTS. The document is designed to provide transparency of activities throughout an entire shortage and is to be maintained by the BTS as evidence of their decision making processes.
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<table>
<thead>
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<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>BEMP</td>
<td>Blood Emergency Management Plan</td>
</tr>
<tr>
<td>BEMG</td>
<td>Blood Emergency Management Group</td>
</tr>
<tr>
<td>BERT</td>
<td>Blood Emergency Response Team</td>
</tr>
<tr>
<td>BTC</td>
<td>Blood Transfusion Committee</td>
</tr>
<tr>
<td>BTS</td>
<td>Blood Transfusion Service (may also be referred to as Blood Bank)</td>
</tr>
<tr>
<td>CBS</td>
<td>Canadian Blood Services</td>
</tr>
<tr>
<td>CBRH</td>
<td>Cape Breton Regional Hospital</td>
</tr>
<tr>
<td>DHW</td>
<td>Department of Health and Wellness</td>
</tr>
<tr>
<td>aFFP</td>
<td>Apheresed Fresh Frozen Plasma</td>
</tr>
<tr>
<td>FP</td>
<td>Frozen Plasma</td>
</tr>
<tr>
<td>H/REMBC</td>
<td>Hospital / Regional Health Authority Emergency Blood Management Committee</td>
</tr>
<tr>
<td>IMSC</td>
<td>Inventory Management Sub Committee</td>
</tr>
<tr>
<td>IWK</td>
<td>Isaac Walton Killam Health Centre</td>
</tr>
<tr>
<td>MSBOS</td>
<td>Maximum Surgical Blood Ordering Schedule</td>
</tr>
<tr>
<td>NAC</td>
<td>National Advisory Council</td>
</tr>
<tr>
<td>National Plan</td>
<td>National Plan for the Management of Shortages of Labile Blood Components (developed by the NAC and CBS)</td>
</tr>
<tr>
<td>NEMBC</td>
<td>National Emergency Blood Management Committee</td>
</tr>
<tr>
<td>NSPBCP</td>
<td>Nova Scotia Provincial Blood Coordinating Program</td>
</tr>
<tr>
<td>PAC</td>
<td>Program Advisory Committee (of the NSPBCP)</td>
</tr>
<tr>
<td>PLTS</td>
<td>Platelets (includes single donor platelets, apheresed platelets and Buffy coat platelets)</td>
</tr>
<tr>
<td>P/T</td>
<td>Provincial/Territorial</td>
</tr>
<tr>
<td>P/TEBMC</td>
<td>Provincial/Territorial Emergency Blood Management Committee</td>
</tr>
<tr>
<td>TMAG</td>
<td>Transfusion Medicine Advisory Group</td>
</tr>
</tbody>
</table>
A Summary of Phases and Associated Inventory Levels

The Phases of the Plan

**GREEN**
- Blood Component product inventories meet demands
- Minor (normal) fluctuations in inventories managed through CBSs local/national inventories

**GREEN Advisory**
- Brief situations where inventory levels are low with respect to a particular blood component while overall inventory is in Green Phase

**Amber**
- Moderate, extended temporary shortages
- Recovery of inventories by CBS in a relatively short period of time utilizing local/national inventories

**Red**
- Severe, prolonged shortage or imminent severe threat.
- Recovery of inventories by CBS in a relatively short period of time utilizing local/national inventories

**RED**
- Severe shortage or imminent threat to national inventories as a result of reduction in donations (greater than 30%)

Phasing is determinant on:
- CBS’s blood component/product inventories available and/or
- Emergent issue or event posing a serious threat to the provincial blood component/product inventories.

Inventory detailed as Days on Hand based on the National Plan 2015-10-07

**Red Cell Inventory:**

<table>
<thead>
<tr>
<th>RBC Inventory Level</th>
<th>CBS Hours On Hand</th>
<th>CBS # Units on Hand</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Green</strong> Phase (minimal decrease to optimal)</td>
<td>&gt;72 hours 3 days</td>
<td>O pos: &gt;2,975 O neg: &gt;926</td>
</tr>
<tr>
<td></td>
<td></td>
<td>A pos: &gt;2,293 A neg: &gt;543</td>
</tr>
<tr>
<td></td>
<td></td>
<td>B pos: &gt;655 B neg: &gt;153</td>
</tr>
<tr>
<td></td>
<td></td>
<td>AB pos: &gt;152 AB neg: &gt;44</td>
</tr>
<tr>
<td><strong>Amber</strong> Phase (serious)</td>
<td>48 – 72 hours 2-3 days</td>
<td>O pos: 1,983 - 2,975 O neg: 618 - 926</td>
</tr>
<tr>
<td></td>
<td></td>
<td>A pos: 1,529 - 2,293 A neg: 362-543</td>
</tr>
<tr>
<td></td>
<td></td>
<td>B pos: 436 - 655 B neg: 102 - 153</td>
</tr>
<tr>
<td></td>
<td></td>
<td>AB pos: 102 - 152 AB neg: 29 - 44</td>
</tr>
<tr>
<td><strong>Red</strong> Phase (critical)</td>
<td>&lt; 48 hours &lt;2 days</td>
<td>O pos: &lt;1,983 O neg: &lt;618</td>
</tr>
<tr>
<td></td>
<td></td>
<td>A pos: &lt;1,529 A neg: &lt;362</td>
</tr>
<tr>
<td></td>
<td></td>
<td>B pos: &lt;436 B neg: &lt;102</td>
</tr>
<tr>
<td></td>
<td></td>
<td>AB pos: &lt;102 AB neg: &lt;29</td>
</tr>
</tbody>
</table>
Platelet Inventory:

<table>
<thead>
<tr>
<th>Platelet Inventory Level*</th>
<th>% of National Requirement</th>
<th>CBS # of Units</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Green Phase (minimal decrease to optimal)</strong></td>
<td>80 - 100% of daily national requirement</td>
<td>&gt;259</td>
</tr>
<tr>
<td><strong>Amber Phase (serious)</strong></td>
<td>25 - 79% of daily national requirement, recovery NOT expected within 12-24 hours</td>
<td>81 - 259</td>
</tr>
<tr>
<td><strong>Red Phase (critical)</strong></td>
<td>&lt;25% of daily national requirement, recovery NOT expected within 12 - 24 hours</td>
<td>&lt;81</td>
</tr>
</tbody>
</table>

*As platelets only have a shelf life of 5 days and CBS routinely does not have more than a 1.5 day inventory on hand at any time, platelet inventory levels are expressed as a percentage of the daily national requirement rather than “days on hand”.

Frozen Plasma Inventory:

<table>
<thead>
<tr>
<th>Frozen Plasma Inventory Level (Groups O, A and B only)</th>
<th>CBS Days On Hand</th>
<th>CBS # of Units on Hand</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Green Phase (minimal decrease to optimal)</strong></td>
<td>&gt; 7 days</td>
<td>&gt;2,099 units</td>
</tr>
<tr>
<td><strong>Amber Phase (serious)</strong></td>
<td>3 - 7 days</td>
<td>899 - 2,099 units</td>
</tr>
<tr>
<td><strong>Red Phase (critical)</strong></td>
<td>&lt;3 days</td>
<td>&lt;899 units</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Group AB Frozen Plasma Inventory Level</th>
<th>CBS Days On Hand</th>
<th>CBS # of Units on Hand</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Green Phase (minimal decrease to optimal)</strong></td>
<td>&gt;14 days</td>
<td>&gt;546 units</td>
</tr>
<tr>
<td><strong>Amber Phase (serious)</strong></td>
<td>6 - 14 days</td>
<td>234 - 546 units</td>
</tr>
<tr>
<td><strong>Red Phase (critical)</strong></td>
<td>&lt;6 days</td>
<td>&lt;234 units</td>
</tr>
</tbody>
</table>

Cryoprecipitate Inventory:

<table>
<thead>
<tr>
<th>Cryoprecipitate Inventory Level</th>
<th>CBS Days on Hand</th>
<th>CBS # Units on Hand</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Green Phase (minimal decrease to optimal)</strong></td>
<td>&gt;14 days</td>
<td>&gt;2,610</td>
</tr>
<tr>
<td><strong>Amber Phase (serious)</strong></td>
<td>6 - 14 days</td>
<td>1,118 - 2,610 units</td>
</tr>
<tr>
<td><strong>Red Phase (critical)</strong></td>
<td>&lt;6 days</td>
<td>&lt;1,074 units</td>
</tr>
</tbody>
</table>

CBS inventory levels represent only part of the total inventory within the blood system, as a large part (and likely the majority) of the total inventory at any one time is already in storage in the hospital blood banks. The information above reflects the “days on hand” inventory cut-offs for CBS which should be reflected in the hospital ordering practices for the same phase. The national TOTAL blood component inventories (blood supplier and hospital combined) are derived from hospitals reporting their inventory levels by blood group and component type in near to real time using the CBS Inventory Level webpage within the Blood Component and Product Disposition System. As work proceeds with CBS, the hospitals and the NAC BSWG Inventory Sub-Group such that total blood inventory levels can be reliably obtained, inventory criteria for ordering and phase declaration is being adjusted.
Table 1: Guideline for the use of RBC transfusions in children and adults in shortage situations

<table>
<thead>
<tr>
<th>Green Phase</th>
<th>Amber Phase</th>
<th>Red Phase</th>
</tr>
</thead>
<tbody>
<tr>
<td>Major Hemorrhage</td>
<td>Follow your hospital/RHA guidelines</td>
<td>Follow your hospital/RHA guidelines</td>
</tr>
<tr>
<td>Follow your hospital/RHA guidelines</td>
<td>Follow your hospital/RHA guidelines</td>
<td>Follow your hospital/RHA guidelines</td>
</tr>
<tr>
<td>Surgery/Obstetrics</td>
<td>Urgent (^2) and emergency (^3) surgery in consultation with H/REBC. Peri/post partum hemorrhage. For all situations, the minimal number of units to stabilize patient should be used.</td>
<td>Emergency situations in consultation with H/REBC. Follow triage/rationing allocation framework if instructed by NEBM (^1)</td>
</tr>
<tr>
<td>Non-Surgical Anemias (^4)</td>
<td>All requests for RBC transfusion in patients with a H(b) level &gt; 70 g/L must be reviewed by designated medical personnel. For patients with hypoproliferative anemia, single unit transfusion should be provided if significant symptoms associated with anemia but reassessment of severity of symptoms after each unit is required.</td>
<td>All requests for RBC transfusion in patients with a H(b) level &gt; 60 g/L must be reviewed by designated medical personnel. For patients with hypoproliferative anemia, single unit transfusion should be provided if significant symptoms associated with anemia but reassessment of severity of symptoms after each unit is required.</td>
</tr>
</tbody>
</table>

\(^1\) These guidelines are available on http://www.nacblood.ca/resources/shortages-plan/index.html
\(^2\) Urgent surgery – patient likely to have major morbidity if surgery not performed within the next one to 28 days
\(^3\) Emergency surgery – patient likely to die (have major morbidity) with 24 hours without surgery
\(^4\) Includes anemia following trauma, surgery and delivery

Notes

- Given the relatively small volumes/numbers of units required, transfusions for neonates (i.e. patients less that 4 months of age) and intrauterine transfusions would be given according to usual guidelines (i.e. would not be restricted even in times of shortage). However measures to share units among neonates or between neonates and larger patients should be used to the extent possible.
In Red or Amber phases, the hospital/RHA blood bank director, in consultation with the patient’s physician, may consider the use of a blood component which has passed its Health Canada approved storage period. In such cases the justification for the use of an out-dated product must be documented by the responsible physician in the patient’s chart, and every effort must be made to obtain, specific patient consent.

*Table 2: Guideline for the use of platelet transfusions in children and adults in shortage situations

<table>
<thead>
<tr>
<th>Green Phase</th>
<th>Amber Phase</th>
<th>Red Phase</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Major Hemorrhage</strong></td>
<td><strong>Major Hemorrhage</strong></td>
<td><strong>Major Hemorrhage</strong></td>
</tr>
<tr>
<td>Immun thrombocytopenia and life- or limb-threatening bleeding maintain PC &gt;10 x 10^9/L. For head trauma or CNS bleeding maintain a PC &gt;100 x 10^9/L. Other significant bleeding, or acute promyeloctytic leukemia at acute presentation, maintain a PC &gt;50 x 10^9/L.</td>
<td>For head trauma or CNS bleeding maintain a PC &gt;80 x 10^9/L.</td>
<td>Same as Amber phase</td>
</tr>
<tr>
<td><strong>Invasive procedures/surgery</strong></td>
<td><strong>Invasive procedures/surgery</strong></td>
<td><strong>Invasive procedures/surgery</strong></td>
</tr>
<tr>
<td>For non-surgical invasive procedures maintain a PC &gt;20 x 10^9/L (central venous catheter insertion, paracentesis, thoracentesis) For lumbar maintain a PC &gt;50 x 10^9/L. For CNS surgery maintain a PC &gt;100 x 10^9/L.</td>
<td>Urgent and emergency surgery in consultation with H/RBEMC In presence of active bleeding or surgical procedure maintain a PC &gt;50 x 10^9/L or if CNS trauma/surgery a PC &gt;80 x 10^9/L. For non-surgical invasive procedures (other than bone marrow aspiration or biopsy) maintain a PC &gt;10 x 10^9/L with image guidance. For lumbar puncture, maintain a PC &gt;20 x 10^9/L.</td>
<td>Emergency surgery in consultation with H/RBEMC All requests for platelet transfusion must be reviewed by designated medical personnel</td>
</tr>
<tr>
<td><strong>Bone marrow failure/ hematopoietic stem cell transplantation/ chemotherapy</strong></td>
<td><strong>Bone marrow failure/ hematopoietic stem cell transplantation/ chemotherapy</strong></td>
<td><strong>Bone marrow failure/ hematopoietic stem cell transplantation/ chemotherapy</strong></td>
</tr>
<tr>
<td>Adhere to a maximum threshold PC of 10 x 10^9/L for prophylactic platelet transfusions.</td>
<td>Adhere to a maximum threshold PC of 10 X 10^9/L for prophylactic platelet transfusions; consider lowering this threshold for routine prophylactic transfusions to 5 x 10^9/L. Transfuse patients undergoing autologous stem cell transplant only if symptoms of bleeding. All requests for a platelet transfusion in non-bleeding patients with a PC &gt;10 x 10^9/L must be reviewed by designated medical personnel. Split PC doses and use half doses in non-bleeding patients if necessary.</td>
<td>Eliminate all prophylactic transfusions. All requests for platelet transfusions in non-bleeding patients must be reviewed by designated medical personnel</td>
</tr>
</tbody>
</table>
Notes

- PC = Platelet Count
- Given the relatively small volumes/numbers of units required, transfusions for neonates (i.e. patients less than 4 - months of age) and intrauterine transfusions would be given according to usual guidelines (i.e. would not be - restricted even in times of shortage). However measures to share units among neonates or between neonates and larger patients should be used to the extent possible
- Follow the same guidelines for cancelling/performing surgery as described in Table 1
- Split doses of platelets (apheresis or buffy coat) should be considered if available. Health Canada advises that splitting doses of platelets is considered aliquoting and is not a processing activity which requires registration. Sample aliquoting procedures are available on the NAC website.
- Lower PC thresholds for platelet transfusions for surgical bleeding or special procedures (such as ECMO) should be used.

In Red or Amber phases, the hospital/RHA blood bank director, in consultation with the patient’s physician, may consider the use of a blood component which has passed its Health Canada approved storage period. In such cases the justification for the use of an outdated product must be documented by the responsible physician in the patient’s chart, and every effort must be made to obtain, specific patient consent.
This Section is to be used to reflect Green Phase Activities

*Please refer to hospital BEMP and the Nova Scotia Provincial Blood Contingency Plan for more detailed instructions.*

**Green Phase**

Green phase implies normal blood component inventory levels exist and supply generally meets demand. This phase includes a broad range of inventory levels ranging from an ideal inventory to temporary shortages that occur periodically and can be managed with existing CBS/hospital actions.
## Actions during the Green Phase

<table>
<thead>
<tr>
<th>Items</th>
<th>Zone/IWK Actions during <strong>Green Phase</strong></th>
<th>Reference Document</th>
</tr>
</thead>
<tbody>
<tr>
<td>example</td>
<td>Review of daily inventory levels email from CBS</td>
<td>SOP123.Review of Daily Records.</td>
</tr>
<tr>
<td>1.</td>
<td>Develop, implement and maintain a BEMP for the organization include communication pathways</td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>Implement NSPBCP guidelines and agreed transfusion protocols / triggers for all transfusions.</td>
<td>Indications for Transfusion Guideline under development</td>
</tr>
<tr>
<td>3.</td>
<td>Include transfusion guidelines, step 2, in health care professional orientation.</td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td>Define minimum and maximum blood inventory levels, review annually.</td>
<td>List SOP</td>
</tr>
<tr>
<td>5.</td>
<td>Implement/ review blood component/ product utilization management strategies.</td>
<td></td>
</tr>
<tr>
<td>6.</td>
<td>Assess and review current utilization patterns for elective surgeries performed within the Zone.</td>
<td></td>
</tr>
<tr>
<td>7.</td>
<td>Initiate as appropriate to services, Maximum Surgical Blood Ordering Schedules, review annually and intermittently when indicated.</td>
<td></td>
</tr>
<tr>
<td>8.</td>
<td>Facilitate blood transport mechanisms as per NSPBCP transport guidelines and Redistribution Agreement.</td>
<td>Pkging/transport Redistribution SOP</td>
</tr>
</tbody>
</table>
| 9. | Establish mechanisms to enable:  
  - Reduced reservation periods for cross-matched blood components  
  - Advance notification of any waiting lists potentially impacting blood inventories (e.g. operating room wait lists, chronic transfusion patients waiting for transfusion).  
  - Physical and electronic quarantine of expired blood components past their expiry date, include an informed consent step.  
  - All hospitals in the health authority are aware of and compliant with the health authority/hospital plan  
  - Integration of the plan with local and hospital all hazards plans  
  - Training on the contents of the plan and the communication strategy related to blood contingencies  
  - Participation in periodic mock drills to practice and test the plan | List SOPs |
| 10. | Develop, facility specific templates to support communication  
  - Patient Notification  
  - Amber Phase Alert  
  - Red Phase Alert  
  - Recovery Phase Alert | See document section |
This Section is to be used to support an Amber Phase Notification

Templates located at the common tab, apply to this section as they are indicated for all CBS phase alerts.

Please refer to hospital BEMP and the Nova Scotia Provincial Blood Contingency Plan for more detailed instructions.

Amber Phase
Implies blood inventory levels insufficient to continue with routine Transfusion practice and hospitals/Zones will be required to implement specific measures to reduce blood usage.
 Amber Phase Transfusion Medicine Service Condensed Checklist

- BERT may or may not convene during an Amber Phase Alert -

☐ Notify the BTS Medical Director or designate of the Phase Alert Notification

  - Discuss whether additional communications and/or actions are required as per BEMP (see strategy chart pg. 12)

  By: __________________________ on________________________ at______________ hrs

☐ Notify the BTS Medical Director or designate of BERT’s

  - Decision to convene or not to convene
  - Recommendations as available

  By: __________________________ on________________________ at______________ hrs

  - Be prepared to report hospital blood inventory levels via the CBS Hospital Disposition System

  By: __________________________ on________________________ at______________ hrs

☐ Allow inventory to reach minimum levels before placing routine blood orders with CBS

☐ Recognize that routine blood orders with CBS may be filled at reduced levels

☐ Notify CBS of any local situation that could further affect the blood supply, e.g. multiple trauma, difficult surgical case, equipment failure

  By: __________________________ on________________________ at______________ hrs

☐ Be prepared to redistribute affected blood components/products to avoid outdating and/or as directed by BERT.

  - Redistribution SOP_________________________________________
  - Packing and Transport SOP___________________________________

☐ Refer all requests for the affected component(s)/product(s) that do not fulfill predetermined acceptance criteria to the BTS Medical Director or designate prior to issuing.

  By: __________________________ on________________________ at______________ hrs
# Strategies for Inventory Management during an Amber Phase

<table>
<thead>
<tr>
<th>Affected Component / Strategies</th>
<th>SOP###</th>
<th>Approval Signature(s)</th>
<th>Implementation Date/Time</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>RBC’s</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1) Cut MSBOs to 50% of normal reservations amount or group and screen with cross match on demand.</td>
<td>1.</td>
<td>1.</td>
<td>1.</td>
</tr>
<tr>
<td>a) Communication to surgeons/anesthetists essential</td>
<td>a).Memo_________</td>
<td>a)</td>
<td>a)</td>
</tr>
<tr>
<td>2. Reservation period for cross matched blood reduced 12 hours, as appropriate to the extent of the shortage</td>
<td>2.</td>
<td>2.</td>
<td>2.</td>
</tr>
<tr>
<td>3. Reduce transfusion triggers on routine transfusions, as appropriate. Determine on a case-by-case basis.</td>
<td>3.</td>
<td>3.</td>
<td>3.</td>
</tr>
<tr>
<td>a).Memo___________</td>
<td>a)</td>
<td>a)</td>
<td>a).</td>
</tr>
<tr>
<td>4. Review all transfusion requests and determine transfusion requirement on a case-by-case basis.</td>
<td>4.</td>
<td>4.</td>
<td>4.</td>
</tr>
<tr>
<td>a).Memo___________</td>
<td>a)</td>
<td>a)</td>
<td>a)</td>
</tr>
<tr>
<td>5. Require Medical Director approval of all transfusions outside of criteria</td>
<td>5.</td>
<td>5.</td>
<td>5.</td>
</tr>
<tr>
<td>● Delay transfusions as appropriate through discussion with the Medical Director and the treating physician to determine clinical need and patient management</td>
<td>a).Memo___________</td>
<td>a)</td>
<td>a)</td>
</tr>
<tr>
<td><strong>Platelets</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Delay elective transfusions as appropriate through discussion with the Medical Director and the treating physician.</td>
<td>6.</td>
<td>6.</td>
<td>6.</td>
</tr>
<tr>
<td>a).Memo___________</td>
<td>a)</td>
<td>a)</td>
<td>a)</td>
</tr>
<tr>
<td>7. Require Medical Director Authorization of all transfusions to prioritize according to clinical need.</td>
<td>7.</td>
<td>7.</td>
<td>7.</td>
</tr>
<tr>
<td>a).Memo___________</td>
<td>a)</td>
<td>a)</td>
<td>a)</td>
</tr>
<tr>
<td>8. Initiate emergency issue only, if required.</td>
<td>8.</td>
<td>8.</td>
<td>8.</td>
</tr>
<tr>
<td>a).Memo___________</td>
<td>a)</td>
<td>a)</td>
<td>a)</td>
</tr>
<tr>
<td><strong>Plasma (FP/FFP)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. If less than (&lt;) 2 day supply available within the facility, release only on approval of the Medical Director.</td>
<td>9.</td>
<td>9.</td>
<td>9.</td>
</tr>
<tr>
<td>a).Memo___________</td>
<td>a)</td>
<td>a)</td>
<td>a)</td>
</tr>
</tbody>
</table>

PBMP?
Memo

To: [Enter name of Chiefs of Surgery, Anaesthesia, Critical Care, Trauma, Emergency, Hematology, Medicine, Directors of Laboratories, Nursing and Risk Management, Chairpersons of Transfusion Committee, Emergency Blood Management Committee]

From: [Enter name of BTS Medical Director or Designate]

Cc: [Enter name of BTS Manager / Chief Technologist/Charge Technologist]

Date: [Enter date and Time]

Re: Notification of Blood Shortage – *Amber Phase*

Blood Transfusion Services (BTS) has received notification from Canadian Blood Services (CBS) that they are currently experiencing a shortage of [Enter name of blood component / product here]. The shortage is the result of [Enter the reason for the shortage here]. As a result, blood inventory levels may be reduced in order to conserve inventory for critical cases. During the shortage you may experience delays with orders as the BTS triages requests for [Enter name of blood component / product here]; we thank you in advance for your patience and support. Additional communication will be shared with you as it is available, please review this notification with staff in your area. The following may occur due to the shortage:

- BTS processes will be modified during a shortage – see page2
- CBS may reduce order fill rate
- NSPBCP will advise on the provincial Blood Emergency Response Team’s (BERT’s) recommendations, as available
  - BERT may or may not convene in Amber phase, as per Contingency Plan.

Note: This shortage is expected to remain for [Enter the expected time frame for shortage]. Until you receive further notification, you will be asked to follow the hospital procedure for Emergency Management of Blood – Amber Phase. Should you experience a need for support in managing patients requiring blood during this period, please contact the Transfusion Service at [Enter the contact number].
Notification of BTS Strategies  
~ Amber Phase

In response to the present blood shortage, the BTS has adopted the following modifications to practice [check all that applies]. BTS actions will evolve as directed by BERT and CBS.

_____ Medical procedures and elective surgical procedures requiring the affected Component(s) will be reviewed on a case by case basis.

_____ MSBOs will be reduced to 50% of normal reservations

_____ Group and screen with cross match on demand.

_____ The reservation period for cross matched blood is reduced from (X hrs to X-12) hours.  
(Enter hrs as appropriate to facility and the extent of the shortage.)

_____ Transfusion triggers on routine transfusions may be reduced; as appropriate; to be determined on a case-by-case basis.

_____ All transfusion requests will be reviewed, transfusion decisions will be determined on a case-by-case basis.

_____ Medical Director Approval is required for transfusions outside of criteria.

_____ Transfusion delays may occur when appropriate, as determined by the Medical Director and the treating physician, based on clinical need and patient management.

_____ Patient Notification Memo’s are available for deferred transfusions

_____ BERT’s recommendation is:  
_______ attached or _________ to follow.

_____ Other


Exceptions: Use of the affected component(s) may be prioritized according to patient need. Transfusions for neonates (patients <4 months old) and intrauterine transfusions can be given according to the usual guidelines.

Date____________________________ Time_______ hrs Signature________________________
This Section is to be used to support a RED Phase Notification

Templates located at the common tab, apply to this section as they are indicated for all CBS phase alerts.

Please refer to hospital BEMP and the Nova Scotia Provincial Blood Contingency Plan for more detailed instructions.

RED Phase

Red Phase implies that blood inventory levels are insufficient to ensure that patients with non-elective indications for transfusion will receive the required transfusion(s).
RED Phase Transfusion Medicine Service Condensed Checklist
-BERT convenes and advises during RED phase alerts-

☐ Immediately notify the BTS Medical Director or designate of the Phase Alert Notification
☐ Notify the BTS Medical Director or designate of BERT’s recommendations
  • Above should be done simultaneously when possible.
  By: ____________________________ on _____________________ at ______________ hrs

☐ The BTS Medical Director or designate convenes the BEMG (Meeting log page 28)
☐ The BEMG, on an on-going basis throughout the shortage :
  • Assesses the specifics of the Red Phase
  • Reviews BERT’s recommendations and determines a plan for implementation
  • Communicates information throughout the organization and provides updates

☐ Issue the internal hospital memo “Notification of Blood Component Shortage – Red Phase” to the listed departments
  • For all blood components assure Hematology Specialists, Bone Marrow Transplant, Liver Transplant, Surgeons/Anaesthesiologists and any other applicable disciplines of the shortage.
  Use memo page 18.

☐ Assess current inventories. It may be necessary to move all blood inventories to the lead facility within the Zone to control accessibility, as applicable.
☐ Monitor blood component inventories and participate in IMSC teleconferences when initiated.
  • Report hospital blood inventory levels to CBS
  Report Zone/ hospital blood inventory levels via the Canadian Blood Services Hospital Disposition System
  By: ____________________________ on _____________________ at ______________ hrs

☐ Do not issue blood to stock fridges, such as operating room or trauma room.
☐ Notify CBS of any local situation that could further affect the blood supply, e.g. multiple trauma, difficult surgical case, equipment failure
☐ Refer all requests for the affected component to the BTS Medical Director or designate prior to issuing product
☐ Be prepared to redistribute affected blood components/products to avoid outdating and/or as directed by BERT. Redistribution SOP_____________________________________

☐ Initiate Medical Director Authorization for all transfusions in consultation with attending physician to prioritize according to clinical need and likelihood of survival on a case-by-case basis
☐ Reduce transfusion triggers as advised. Determine on a case-by-case basis.
☐ Initiate BTS Medical Director Consult prior to performing emergency surgery to ensure blood component inventory levels are sustainable.
<table>
<thead>
<tr>
<th>Strategies for Inventory Management during a RED Phase</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>RBC’s-</strong>&lt;br&gt;As per BERT’s recommendation</td>
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<tr>
<td></td>
</tr>
<tr>
<td>1. Reductions in minimum inventory levels</td>
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<td>2. Delay of elective surgeries requiring blood component support</td>
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<tr>
<td>3. Delay in the initiation of treatment of chemotherapy and bone marrow transplant.</td>
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<tr>
<td>4. Delay of liver transplantation.</td>
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<tr>
<td>5. Reductions in transfusion triggers</td>
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<td></td>
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<tr>
<td>7. Expanded use of erythropoietin, as appropriate.</td>
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<tr>
<td><strong>Platelets</strong>&lt;br&gt;As per BERT’s recommendation</td>
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<tr>
<td>9. Utilization of antifibrinolytic agents, as appropriate</td>
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<tr>
<td></td>
</tr>
<tr>
<td><strong>Plasma (FP/FFP)</strong>&lt;br&gt;As per BERT’s recommendation</td>
</tr>
<tr>
<td>10. Extension of expiry dates for FP/ aFFP</td>
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<td></td>
</tr>
</tbody>
</table>

BERT may consult and enact Perioperative Blood Management Program (PBMP) strategies to assist with recovery.
Urgent Notification Of Blood Component/Blood Product Shortage
Red Phase

Memo

To: [Enter name of Chiefs of Surgery, Anesthesia, Critical Care, Trauma, Emergency, Hematology, Medicine, Directors of Laboratories, Nursing and Risk Management, Chairpersons of Transfusion Committee, Emergency Blood Management Committee, CEO, Public affairs / Communications]

From: [Enter name of BTS Medical Director or Designate]

Cc: [Enter name of BTS Manager/ Chief Technologist/Charge Technologist]

Date: [Enter date and Time]

Re: RED Phase Alert ~ Critical [RBC] Shortage

Blood Transfusion Services (BTS) has received notification from Canadian Blood Services (CBS) that they are currently experiencing a severe shortage of [Enter name of blood component / product here]. The shortage is the result of [Enter the reason for the shortage here]. This shortage is anticipated to last for a prolonged period of time. As a result, blood inventory conservation efforts are necessary to conserve inventory for critical and life-threatening cases; denial and/or reduction of some requests may occur. Transfusion requests will be reviewed on a case by case basis. The provincial Blood Emergency Response Team (BERT) convenes during a Red Phase and provides recommendations to support inventory management throughout the shortage to the NSHA/IWK. Additional communication(S) from BERT and/or CBS will be shared with you as available, please review this notification with staff in your area.

- NSPBCP will advise on BERT’s recommendations, as soon as they are available.
- BTS processes will be modified during a shortage ~ see page2
- CBS will reduce order fill rate for affected product

Note: You will be asked to strictly follow the hospital procedure for Emergency Management of Blood – Red Phase. Communication will be ongoing with Canadian Blood Services and BERT. Once CBS inventories regain stability, you will receive further notification indicating when normal blood ordering practice may be resumed. Should you experience need for support in managing patients requiring blood during this period, please contact the Transfusion Service at [Enter the contact number desired].
Notification of BTS Strategies for Transfusion Management ~ RED

In response to the present blood shortage, the BTS has adopted the following modifications to practice [check all that applies]. BTS actions will evolve as directed by BERT and CBS.

- Medical procedures and elective surgical procedures requiring the affected Component(s) will be reviewed on a case by case basis.
- MSBOs will be reduced to 50% of normal reservations
- Group and screen only with cross match on demand.
- The reservation period for cross matched blood is reduced from (X hrs to X - 24) hours. *(Enter hrs as appropriate to facility and the extent of the shortage.)*
- Transfusion triggers on routine transfusions to be reduced; as appropriate; to be determined on a case-by-case basis.
- All transfusion requests will be reviewed, transfusion decisions will be determined on a case-by-case basis.
- Patient Notification Memo’s are available for deferred transfusions.
- Medical Director Approval is required for transfusions outside of criteria.
- Transfusion delays may occur, when determined appropriate by the Medical Director and the treating physician, based on clinical need and patient management.
- BERT’s recommendation is: _______ attached or _______ to follow.

Other __________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________

*Exceptions: Use of the affected component(s) may be prioritized according to patient need. Transfusions for neonates (patients <4 months old) and intrauterine transfusions can be given according to the usual guidelines.*

Date__________________________ Time________hrs   Signature____________________________
This Section is to be used to Support a Recovery Phase Notification

Templates located at the common tab, apply to this section as they are indicated for all CBS phase alerts.

Please refer to hospital BEMP and the Nova Scotia Provincial Blood Contingency Plan for more detailed instructions.

<table>
<thead>
<tr>
<th>Recovery Phase</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recovery Phase implies that blood component inventories have begun to increase and are expected to be maintained at a level which would enable the return from Red to Amber and subsequently to Green Phase</td>
</tr>
</tbody>
</table>
Recovery Phase
Transfusion Medicine Service Condensed Checklist

☐ Immediately notify the BTS Medical Director or designate of the Phase Alert Notification

By: ____________________________ on __________________ at ____________ hrs

☐ The BTS Medical Director or designate convenes the BEMG (Meeting log page 28)

☐ The BEMG develop action plan for graduated recovery and return to full services:
  - Review NSHA/IWK and provincial inventories to determine anticipated recovery period within the NSHA/IWK.
  - Review historical blood utilization patterns for elective surgeries to manage fragile inventories.
  - Review chronic transfusion, OR deferral/cancellation lists and current OR waiting lists to determine surgery reintegration plan.
    ➢ Do not compress elective surgery back logs during recovery period, as this may result in a secondary inventory shortage.
  - Delay surgeries most likely to require blood component support until inventories have stabilized and are maintaining Green Phase status.

☐ Issue the internal hospital memo “Notification Regarding Blood Component/Blood Product Shortage Situation” See Memo page 23.

☐ Continue to assess current inventories.

☐ Continue to Require Medical Director authorization of all transfusions until CBS inventories have stabilized and are maintaining Green Phase status

☐ Accommodate patients requiring CMV negative and irradiated blood components, if possible.

☐ Other____________________________________________________________________________________
  ______________________________________________________________________________________
  ______________________________________________________________________________________
  ______________________________________________________________________________________
  ______________________________________________________________________________________

By: ____________________________ on __________________ at ____________ hrs
Memo

To: [Enter name of Chiefs of Surgery, Anaesthesia, Critical Care, Trauma, Emergency, Hematology, Medicine, Directors of Laboratories, Nursing and Risk Management, Chairpersons of Transfusion Committee, Emergency Blood Management Committee]

From: [Enter name of BTS Medical Director or Designate]

Cc: [Enter name of BTS Manager/Chief Technologist/Charge Technologist]

Date: [Enter date and Time]

Re: Notification of Blood Shortage – *Recovery Phase*

Blood Transfusion Services (BTS) has received notification from Canadian Blood Services (CBS) that inventory levels for [Enter name of blood component / product here] have steadily improved over the last week and have now reached a stable level. As a result, critical blood product conservation strategies may be lessened. Inventory levels on site are expected to improve over the next few days back up to optimal levels.

- Elective transfusions and elective surgical procedures deferred as a result of the blood inventory shortage may begin to be recalled in a controlled and gradual way in order to reduce the possibility of de-stabilizing the recovery of blood inventory levels.

Note: We would like to take this opportunity to thank you for your support and collaboration during this difficult period. By working together, it was possible to use available blood inventory effectively to ensure the patients in most critical need received required products.

Should you experience the need for support in managing patients requiring blood during this recovery period or if you have any questions/comments regarding this recent shortage and how it was managed, please contact the Manager of Transfusion Services at [Enter the contact number desired].
This SECTION contains Common TEMPLATES, applicable to ALL phase alerts (Amber, Red and Recovery), used to support Documentation During a Blood Shortage Event

Please refer to hospital BEMP and the Nova Scotia Provincial Blood Contingency Plan for more detailed instructions.
Communication

**Event Log**: A log sheet designed to document internal / external notification(s)/ communication(s) sent / received during an event; it is also able to serve as an event summary and provide time frames. Maintain copies of notifications / communications that you list on the log and number them in such a way they are easily linked (1-10), to the event log. It is important to document method and time, on the log to assist with process evaluation.

**Lead Facility Communication Chart**: The lead facility within a zone assists with event messaging to all facilities within the zone. This chart provides a standardized template to document communication within the zone.

**Critical Communication Contact Information**: You may choose to list information on this sheet or refer to BEMP.

**BEMG Meeting Log**: A log sheet designed to document BEMG meeting dates and members in attendance.

**Patient Notification Memo**: This memo is created to provide a communication mechanism to patients whose treatment is delayed or affected by the shortage.

Forms

**Surgical Request Screening Log**: Use to document decision making for surgical transfusion cases delayed/ cancelled during the shortage. Upon notification of Recovery phase and / or as advised by BERT, this form can also be used for rescheduling / prioritizing patients that were delayed or cancelled.

**Summary of Surgical Request Screening Log**: Using the above document create a summary of surgery delays / cancellations associated with the blood shortage. Surgery cancellation should be associated / traceable to a BERT recommendation. This form provides a manner to assess the impact on service related to the blood shortage.

**Non-Surgical Request Screening Log**: Use to document decision making for transfusion requests other than surgical; during the shortage. Upon notification of Recovery phase and / or as advised by BERT, this form can also be used for rescheduling / prioritizing patients that were delayed or cancelled.

**Summary of Non-Surgical Request Screening Log**: Using the above document create a summary of transfusion delays / cancellations associated with the blood shortage. This form provides a manner to assess the impact on service related to the blood shortage.

**Requests for Blood Components during a Blood Shortage**: This form may be used to replace or supplement transfusion requests during a shortage. Should your facility choose to maintain its’ current request practice during a shortage, it is advisable to supplement current practice with a mechanism to document decision making, such as above screening logs.
### Event Log

Document Receipt and Sending of Notification(s) / Communication(s)

* *(When a Phase Alert is received, document the details and go to the corresponding phase section of this toolkit.)*

<table>
<thead>
<tr>
<th>Date: dd/mm/yy</th>
<th>External from: a) CBS b) NSPBCP c) Other</th>
<th>Method: a) Fax b) e-Mail c) Other</th>
<th>Time in hrs</th>
<th>Phase Alert* a) Amber b) Red c) Recovery d) BERT e) Other</th>
<th>Affected Product and Group(s) a) RBC b) PLTS c) FFP d) Other</th>
<th>Event Description (i.e. Pandemic / storm)</th>
<th>Receipt verification required?</th>
<th>Yes / No</th>
<th>Done by initials</th>
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<tbody>
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<td>10.</td>
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</tbody>
</table>

**Observations / Comments:**

____________________________________________________________________________________
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____________________________________________________________________________________
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____________________________________________________________________________________
____________________________________________________________________________________
### Lead Facility Communication Chart

Created by: _____________________ on _____________________
Reviewed By: _____________________ on _____________________

### Critical Communication Contact Information

<table>
<thead>
<tr>
<th>List Facility(ies) in Zone_______</th>
<th>Contact Person(s) Numbers /email</th>
<th>Informed of</th>
<th>By: Initials Date/ Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>[Enter Lead Facility]</td>
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<td></td>
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<tr>
<td>#1</td>
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<tr>
<td>#8</td>
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</tr>
</tbody>
</table>
Use the following grid as a guide to organize and store emergency contact numbers:

<table>
<thead>
<tr>
<th>Organization Name</th>
<th>Contact Persons</th>
<th>Contact Numbers</th>
<th>Verified Current By/Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;enter name of your health authority/hospital/facility&gt;</td>
<td></td>
<td>Land Line:</td>
<td></td>
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<td></td>
<td></td>
<td>Cell Phone:</td>
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<td>Email:</td>
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<td>Text Message:</td>
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<tr>
<td></td>
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<td>Satellite Phone:</td>
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<tr>
<td>Local Emergency Services:</td>
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<tr>
<td>Police</td>
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<td>Fire</td>
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<td>Ambulance</td>
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<tr>
<td>Taxi(s)</td>
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<tr>
<td>Facility Security</td>
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<tr>
<td>Shuttle /Courier</td>
<td></td>
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<tr>
<td>Hospital Emergency Management Team</td>
<td>Lead:</td>
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<td>Quality and Risk</td>
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<td>Canadian Blood Services</td>
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<td>NSPBCP</td>
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<tr>
<td>Pharmacy</td>
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</table>
# BEMG Meeting Log Sheet

**Facility**

<table>
<thead>
<tr>
<th><strong>BEMG Meeting Attendees</strong></th>
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</thead>
<tbody>
<tr>
<td><strong>BEMG Chair:</strong></td>
<td><strong>Week of:</strong></td>
<td><strong>Date(s):</strong></td>
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<td><strong>Designate:</strong></td>
<td><strong>Indicate Phase of Inventory</strong></td>
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<td><strong>Recovery = ]</strong></td>
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<tr>
<td><strong>BEMG Member/Position</strong></td>
<td><strong>Signature</strong></td>
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<tr>
<td><strong>Other Attendees/Designates</strong></td>
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</tbody>
</table>
Memo

To: {Enter name of patient}
   {Enter name of Ordering Physician}
   {Enter name of Charge Nurse}

From: {Enter name of BTS Medical Director or Designate}

Cc: {Enter name of BTS Chief Technologist/Charge Technologist, Risk Management}

Date: {Enter date}
Time: {Enter time}

Re: Blood Shortage – {Enter component name and group}

Blood Transfusion Services received notification from Canadian Blood Services (CBS) that they are currently experiencing a severe shortage of {enter name of blood component here}. The shortage is the result of {enter the reason for the shortage here}. Hospital Transfusion Medicine Services in NS have been required to reduce their inventory levels of {enter name of blood component here} and to prioritize use according to patient need, with urgent and life-threatening cases having first priority.

As a result your scheduled {enter one of the following, as applicable: blood transfusion / surgery} will be postponed based on current blood inventory levels.

This shortage {include following clause if applicable: is being experienced across the country and} is expected to continue for {enter the expected time frame of shortage, or say: a prolonged period}. Once blood inventory levels have improved, you will receive further notice regarding your rescheduled {enter one of the following, as applicable: transfusion / surgery}.

If you would like more information, please contact the Transfusion Medicine Service at {enter the contact number}.

We regret this deferral and thank you for your understanding and patience during this difficult situation.
## Form: Surgical Request Screening Log for Shortages

### Facility: North Pole

<table>
<thead>
<tr>
<th>Phase:</th>
<th>Amber</th>
<th>Red</th>
<th>Recovery</th>
</tr>
</thead>
<tbody>
<tr>
<td>Start Date:</td>
<td>2010 / Dec / 03 at 1100 hrs</td>
<td>20 / / at 1100 hrs</td>
<td>2010 / Dec / 07 at 1100 hrs</td>
</tr>
<tr>
<td>End Date:</td>
<td>2010 / Dec / 07 at 1100 hrs</td>
<td>20 / / at 1200 hrs</td>
<td>2010 / Dec / 09 at 1200 hrs</td>
</tr>
</tbody>
</table>

**Notification from BERT to cancel/delay surgery received:**
- 2010 / Dec / 03 at 1200 hrs
- 20 / / at __________ hrs

**Notification(s):** See Event log # 3

**Notification from BERT to enable surgery received:**
- 2010 / Dec / 07 at 1200 hrs
- 20 / / at __________ hrs

**Notification(s):** See Event log # 6

### Patient Identifier(s) MRN/HCN/Acc#
- Name: Last, First
- Blood Group: __________

### Physician/Surgeon Procedure

<table>
<thead>
<tr>
<th>Original: Dec 3 1159</th>
<th>Revised: Dec 8 1200</th>
</tr>
</thead>
</table>

### Date / Time

<table>
<thead>
<tr>
<th>Dr. Kilt</th>
<th>Total hip</th>
</tr>
</thead>
<tbody>
<tr>
<td>120 hrs</td>
<td>120 hrs</td>
</tr>
</tbody>
</table>

### Relevant Laboratory Results

<table>
<thead>
<tr>
<th>Original:</th>
<th>Revised:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hgb=12</td>
<td>Hgb=12</td>
</tr>
</tbody>
</table>

### Transfusion Request: RBCs, PLT, Plasma, Other

<table>
<thead>
<tr>
<th>Inventory Levels</th>
<th>Decision/Physician</th>
<th>Adverse Outcome</th>
<th>NOTES</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 units of RBC</td>
<td>Delay Dr. Bill</td>
<td>CBS ↓ 25%</td>
<td>No recovery identified</td>
</tr>
<tr>
<td>12 units (3 days)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Relevant Laboratory Results

<table>
<thead>
<tr>
<th>Relevant Laboratory Results</th>
<th>Inventory Levels</th>
<th>Decision/Physician</th>
<th>Adverse Outcome</th>
<th>NOTES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hgb=12</td>
<td>4 units of RBC</td>
<td>Yes Dr. Bill</td>
<td>Recovery 48 hrs unlikely to bleed Christmas is coming!</td>
<td></td>
</tr>
<tr>
<td></td>
<td>20 units (5 days)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Example

- Original:
- Revised:

---

Adapted (modified) from N.S. Provincial Blood Contingency plan April 2010.
## Form: Summary of Surgical Request Decisions during Blood Shortages

<table>
<thead>
<tr>
<th>Facility:</th>
<th></th>
</tr>
</thead>
</table>

### Phase: **Amber**  
**Red**  
**Recovery**  

### Associated Notification/ Communication(s)

<table>
<thead>
<tr>
<th>Start Date:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>20 / /</td>
<td>20 / /</td>
</tr>
<tr>
<td>at ______ hrs</td>
<td>at ______ hrs</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>End Date:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>20 / /</td>
<td>20 / /</td>
</tr>
<tr>
<td>at ______ hrs</td>
<td>at ______ hrs</td>
</tr>
</tbody>
</table>

### Type of Surgery

<table>
<thead>
<tr>
<th>Number of Procedures</th>
<th>Number of Units</th>
<th>Average delay (hrs) (Total hrs / # procedures)</th>
<th>Percent of Adverse Patient Outcomes (# of events / # of procedures)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cancelled</td>
<td>Deferred</td>
<td>RBC</td>
<td>PLT</td>
</tr>
</tbody>
</table>

Adapted (modified) from Nova Scotia Provincial Blood Contingency Plan.
### Form: Non-Surgical Request Screening Log for Shortages

<table>
<thead>
<tr>
<th>Patient Identifier(s)</th>
<th>Physician/ Diagnosis / Indication</th>
<th>Date / Time</th>
<th>Relevant Laboratory Results</th>
<th>Transfusion Request:</th>
<th>Inventory Levels</th>
<th>Decision/ Physician</th>
<th>Adverse Outcome</th>
<th>NOTES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elf, Sleepy AB</td>
<td>Diplastic anemia</td>
<td>Original: Dec 3 1159</td>
<td>n/a</td>
<td>Hgb 80</td>
<td>2RBC</td>
<td>5 units 7 days</td>
<td>Yes Dr. Snow</td>
<td>n/a</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Revised:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Elf, Chilly O neg</td>
<td>Lymphoma</td>
<td>Original: Dec 3 1159</td>
<td>96 hrs</td>
<td>Hgb 80</td>
<td>2 units RBC</td>
<td>12 units 2.7 days</td>
<td>no</td>
<td>Asymptomatic and no known recovery phase</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Revised: Dec 7 1200</td>
<td></td>
<td>Hgb 70</td>
<td>2 units RBC</td>
<td>18 units 4 days</td>
<td>yes</td>
<td>Symptomatic SOB Recovery 48hrs</td>
</tr>
</tbody>
</table>

**Example**
### Summary of Non-Surgical Decisions during Blood Shortages

<table>
<thead>
<tr>
<th>Phase</th>
<th>Amber</th>
<th>Red</th>
<th>Recovery</th>
<th>Facility ______________________________</th>
</tr>
</thead>
<tbody>
<tr>
<td>Associated Notification/ Communication(s)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Start Date:</td>
<td>20 / /</td>
<td>20 / /</td>
<td>20 / /</td>
<td></td>
</tr>
<tr>
<td></td>
<td>at _____ hrs</td>
<td>at _____ hrs</td>
<td>at _____ hrs</td>
<td></td>
</tr>
<tr>
<td>End Date:</td>
<td>20 / /</td>
<td>20 / /</td>
<td>20 / /</td>
<td></td>
</tr>
<tr>
<td></td>
<td>at _____ hrs</td>
<td>at _____ hrs</td>
<td>at _____ hrs</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Diagnosis / Indication / Type/Location</th>
<th>Number of Procedures</th>
<th>Number of Units</th>
<th>Average delay (hrs)</th>
<th>Adverse Patient Outcome (describe any occurrences)</th>
</tr>
</thead>
<tbody>
<tr>
<td>i.e. Oncology / RDU / OBGYN</td>
<td>Cancelled</td>
<td>Deferred</td>
<td>RBC</td>
<td>PLT</td>
</tr>
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</tbody>
</table>

2010-11-12 Adapted (and Revised) from Nova Scotia Provincial Blood Contingency Plan.
Requests for Blood Components during a Blood Shortage

REQUESTS FOR BLOOD COMPONENTS DURING A BLOOD SHORTAGE

Date: _________________________________

Time: _________________________________

Facility Name: _________________________________

Patient Name: _________________________________

Patient MRN#: _________________________________

Ordering Physician: _________________________________

Screening Physician Name: _________________________________

Component Requested: _________________________________

Reason for Request: _________________________________

Component Availability: _______Amber Phase _______Red Phase

Clinical Presentation:

Pre transfusion Laboratory Data:
  Hgb: _____
  Plt: _____
  INR: _____

Comment on Release or Nonrelease of Blood Component(s) and Outcomes:
  ________________________________________________________________
  ________________________________________________________________
  ________________________________________________________________
  ________________________________________________________________

Ordering Physician notified: _________________________________

Follow up date and time: _________________________________
Memo

To: {Enter name of patient}
    {Enter name of Ordering Physician}
    {Enter name of Charge Nurse}

From: {Enter name of BTS Medical Director or Designate}

Cc: {Enter name of BTS Chief Technologist/Charge Technologist, Risk Management}

Date: {Enter date}

Time: {Enter time}

Re: Blood Shortage – {Enter component name and group}

Blood Transfusion Services received notification from Canadian Blood Services (CBS) that they are currently experiencing a severe shortage of {enter name of blood component here}. The shortage is the result of {enter the reason for the shortage here}. Hospital Transfusion Medicine Services in NS have been required to reduce their inventory levels of {enter name of blood component here} and to prioritize use according to patient need, with urgent and life-threatening cases having first priority.

As a result your scheduled {enter one of the following, as applicable: blood transfusion / surgery} will be postponed based on current blood inventory levels.

This shortage {include following clause if applicable: is being experienced across the country and} is expected to continue for {enter the expected time frame of shortage, or say: a prolonged period}. Once blood inventory levels have improved, you will receive further notice regarding your rescheduled {enter one of the following, as applicable: transfusion / surgery}.

If you would like more information, please contact the Transfusion Medicine Service at {enter the contact number}.

We regret this deferral and thank you for your understanding and patience during this difficult situation.
References:

British Columbia Provincial Blood Contingency Plan December 21, 2009

British Columbia: The Hospital Emergency Blood Management Plan Template for the Transfusion Medicine Service October 30, 2009


National Plan for the Management of Shortages of Labile Blood Components, September 28, 2009

Nova Scotia Provincial Blood Contingency Plan, March 2010

Ontario Contingency Plan for Management of Blood Shortages, 2008-01-28

APPENDIX M

Emergency framework for rationing of blood for massively bleeding patients during a red phase of a blood shortage

Working group on emergency disposition of blood during a red phase blood shortage
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Section 11..........................................................................................................................................................................Legal Implications
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Appendix E – Documentation Tools
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Appendix G – Identification and Selection of Studies
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Section 1 - Purpose

When the original version (dated 2009-09-28) of the *National Plan for the Management of Shortages of Labile Blood Components* was sent out for external consultation, it was criticized because it did not include a plan for patients requiring massive transfusion. Many examples cited were the lack of preparedness for Hurricane Katrina and although best intentions on behalf of the decision makers present, many inappropriate decisions were made. This document is the first attempt to address this deficiency in the National Blood Shortages Plan. This document was prepared by a multidisciplinary group with a broad range of expertise (See Appendix C). This document was developed to guide healthcare professionals in triaging patients in need of massive transfusion during a red phase blood shortage, where demand for blood greatly exceeds supply, and where all other measures to increase the supply of blood have been exhausted. The definition of a red phase for red blood cells is that there is less than 48 hours worth of red blood cell (RBC) units available in Canada and there is no foreseeable ability to avert the shortage by increasing collections or by reducing elective surgical procedures further. This document is intended to guide all transfusion rationing decisions made in the red phase in Canada for patients predicted to need massive transfusion due to 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). This tool applies to all decisions regarding all blood components (red blood cells, frozen plasma, and platelets), although it is expected that red blood cells will likely be the product in greatest scarcity, since in massively bleeding patients there are no available alternatives to red blood cells. The triage tool is designed to assist with standardizing care across all jurisdictions to allow for fair and just distribution of blood during a red phase.

Section 2 - Background

A) Blood Inventory Management in Canada 2004-2010

The availability of blood for transfusion has not been limited by supply and patients receive transfusion as deemed necessary by their physicians. Transfusions are administered knowingly to brain dead patients while awaiting decisions to be made regarding eligibility for organ donation. A core concern with the management of patients requiring massive transfusion in a blood shortage is that a single patient with a very poor chance of survival could potentially consume 10 or more units of blood that could be alternatively diverted to save other patients with a much better chance of survival.

Between April 2004 and March 2009, Canadian Blood Services averaged 17,372 RBC units in inventory across the country, with the target of 5 days or more on hand (>15,425 units on hand). During this time period, there was 1 day when inventory dipped below 10,000 units, 10 days below 11,000 units, and 38 days below 12,000 units. Hence, only 2.5% of the time (out of a total of 1500 days measured) did the inventory level drop below 12,000 units in Canada (<4 days on hand). On all but one occasion Canadian Blood Services was able to reverse the decline in inventory by increasing collection of blood. On one occasion, it was also necessary to issue a public appeal to donors in the face of double the usual growth in demand. In addition, Canadian
Blood Services pro-actively ramps up collection activities to build inventories prior to anticipated blood shortages, such as was done in preparation for the H1N1 pandemic influenza outbreak in 2009. Since the development of the *National Plan for the Management of Shortages of Labile Blood Components*, there has never been an amber or red phase declared (personal communication, Mr. David Howe, Canadian Blood Services).

In the Province of Quebec, since 2004, Hema-Quebec has maintained approximately 5700 RBC units in inventory, corresponding to an inventory of 8 days. This allows Hema-Quebec to meet the needs of the 98 hospitals throughout the Province. From April 2004 to March 2009, the daily inventory fell below the optimal target of 8 days for a total of 13 days: 2 days below 3600 RBC units (less than 5 days), 2 days below 3900 RBC units (less than 5.5 days) and 9 days below 4600 RBC units (less than 6.5 days). All these events occurred in 2004 and 2005. The inventory was maintained at its optimal level continuously for all blood groups from 2006 to 2009. However, Hema-Quebec is monitoring the demand for O negative RBC units which has increased from 10.8% in 2004 to 12.6% in 2011. Hema-Quebec has developed a recruitment process adapted to the level of inventory to prevent it from falling below its optimal target. (Personal communication, Mrs Sylvie Thibault, Hema-Quebec).

It has been predicted that as the proportion of the population over age 65 years increases over the next 4 decades, that our blood supply could become seriously compromised due to insufficient donors. Between 2010 and 2050, the per capita use of blood is expected to rise from current levels of 31 per 1000 to 65 per 1000 population.(1) In addition, in the same time period, the blood dependency ratio is expected to increase from 0.60 to 0.95 (the number of age non-eligible donors each age eligible donor will have to support, in addition to their own needs).

B) Effectiveness of screening during an acute blood shortage

There is very little known on the effectiveness of screening orders for transfusion and cancelling surgery during a blood shortage. No work as yet has been done on rationing of blood components to massively bleeding patients. Galloway et al (2) reported on the yield that would be achieved with the implementation of an emergency blood contingency plan during a blood shortage. They simulated the impact of enacting the National UK Blood Shortage Plan over a 21 day period with a table top exercise. They estimated after retrospectively reviewing 661 elective surgeries that they would have cancelled a mere 22 operations, of which only 7 required blood. In addition, 22 non-surgical anemia patients would have been managed without transfusion and 34 bone marrow failure patients could have had their transfusions delayed by 2 to 7 days during a short-term shortage. Overall, the savings were minimal compared to a total of 251 patients transfused during their 21-day audit period.

C) Examples of non-transfusion triage protocols

Most of the literature on resource rationing frameworks during scarcity comes from the critical care and public health spheres addressing response to pandemics. Christian et al. reported in the Canadian Medical Association Journal in 2006 the Ontario triage protocol for critical care
during an influenza pandemic (3). This triage tool was developed by a multidisciplinary team (critical care, infectious diseases, military medicine, disaster medicine, and triage management) after an extensive literature review and broad consultation process. The key parts of this triage protocol include a colour-coded triage tool, inclusion criteria, and exclusion criteria. The authors chose the SOFA score because it assesses daily organ dysfunction, uses simple physiologic and laboratory parameters, is easy to calculate and has been widely validated (see Table 1) (4) The SOFA score cut-off (>11 points) was set for a predicted mortality rate of 80%. Their exclusion criteria includes, but is not limited to, severe trauma and burns, advanced disease states, cardiac arrest, end-stage organ failure and elective palliative surgery. (5) Christian et al (3) had not included age as an exclusion criterion however, the authors received strong and consistent feedback from stakeholders and during expert consultation that an age criteria should be included in the exclusion criteria. An age criterion of 85 years was chosen.

Similar exclusion criteria were used by Devereaux et al in a triage tool for allocation in mass critical care in 2008 (6) and the Utah Department of Public Health triage tool. (7) Devereaux also added the following additional exclusion criteria: SOFA score >15, SOFA >5 for more than 5 days with a flat or rising trend, >6 organ failures, and advanced or irreversible neurological event or condition (6). The triage tool categorizes patients into 4 colours (blue, red, yellow and green). Patients with a poor chance of survival were designated ‘blue’ and critical care resources are not to be allocated to these patients. Patients with the highest chance of survival were designated ‘red’ and critical care resources were prioritized to these patients. Patients designated ‘yellow’ were next on the priority list, followed by ‘green’ patients who are to be deferred or reassessed as needed. These investigators also required prioritization reassessment at 48 and 120 hours.

Devereaux et al detailed the results of a Task Force for Mass Critical Care Summit Meeting that occurred in January of 2007. (6) They also utilized inclusion and exclusion criteria as detailed above. Patients meeting these criteria were subjected to daily reassessments of the inclusion and exclusion criteria. Patients were prioritized by SOFA score. They listed four reasons why resources may be re-allocated, even for patients meeting the inclusion/exclusion criteria, given the available resources at the time of triage, including: 1. Patients with the highest SOFA scores or a SOFA score that is rising or flat; 2. A high degree of patient acuity with poor chance of survival and a likely long duration of critical care resources; 3. A moderate degree of acuity but a prolonged duration of critical care resource needed; 4. Severe underlying chronic illness in conjunction with any of the above factors leads a decision maker to feel the prognosis is poor, and/or the patient’s duration of critical care will be prolonged. Their document also included key recommendations, including but not limited to: 1. All hospitals must operate uniformly and cooperate in order to successfully implement a triage process; 2. Patients not eligible for critical care will continue to receive supportive/palliative medical care; 3. The task force suggests that a triage officer and support team implement and coordinate the distribution of scarce resources; 4. Providers should be legally protected for providing care during allocation of scarce resources when following accepted protocols.
The Utah Department of Public Health triage tool for hospital and ICU triage for adults and children is very similar to the above two triage protocols. It utilizes exclusion criteria and the modified-SOFA (M-SOFA) score to triage patients. The M-SOFA score does not require a platelet count or bilirubin result to apply, making it somewhat easier to use, although the creatinine and arterial oxygen saturation are required.

D) Validation of non-transfusion triage tools

There are no publications detailing the validation of transfusion triage tools. The following studies describe the extent of the literature on the validation of triage tools for other aspects of medical care. Christian et al performed a retrospective validation of their triage tool for critical care resources. The objective was to determine the usability of the Ontario triage protocol. Four triage officers retrospectively reviewed consecutive patients admitted to two ICUs during an 8 week period. Each patient was triaged as per the colour coded prioritization tool. Each patient was triaged separately by two triage officers and where there was a disagreement; arbitration was used to resolve the discrepancy. Overall, 234 patients were included in the cohort, of whom 39.7% met the exclusion criteria and would have been triaged to expectant or palliative management. Of the 65 patients triaged to expectant management, only 24.6% survived to discharge. The most common exclusion criteria triggering a triage to this category in those patients who survived to hospital discharge was the presence of metastatic cancer. The triage tool was able to reduce the demand for ventilators by 49.3%. Arbitration was required in 54.9% of the cases, however, the majority of cases requiring arbitration related to a single triage officer, suggesting that not all clinicians will be able to function as triage officers. Overall, their triage tool performed well in this retrospective study.

Guest et al in an observational cohort study utilized the Ontario triage protocol in a 26 bed ICU in the United Kingdom over a 2 month period. The only modification to the triage protocol was the ‘severe trauma’ exclusion criteria was modified to ‘a trauma with a TRISS (Trauma Injury Severity Score) score predicting >80% mortality’. Overall, 29 patients were triaged to palliative care. Of these 29 patients, only 10 (34%) survived to discharge. In comparison, of 20 patients triaged to highest priority, 75% survived. They concluded that the triage tool did not perform well enough to triage ICU resources. One of the limitations to this report is the lack of 6-month follow-up for detailing survival of patients with metastatic cancer. Since patients with metastatic cancer would be triaged to palliative care because of a predicted poor 6-month survival, not in-hospital survival. Clearly in follow-up studies longer term survival will be a key variable.

Kahn et al evaluated the ‘Simple Triage and Rapid Treatment (START)’ tool in a retrospective analysis of a commuter train massive casualty event involving 265 patients. Overall, 163 patients required triage, of whom 148 patient charts were sufficiently complete for inclusion in the analysis. Their objective was to determine the proportion of patients who were ‘over triaged’ and ‘under triaged’ with this triage tool, compared to the goal standard modified Baxt criteria (patients needing emergency procedures or care). They found considerable ‘over triage’.
Of 22 patients triaged to ‘red’ requiring emergency intervention, only 2 were retrospectively considered ‘red’. Overall, the tool performed poorly.

E) Limitations of the existing literature

Currently, allocation frameworks are primarily based on expert opinion and disease scores that were not designed for the purpose of rationing. Many frameworks have not been prospectively validated and others performed poorly in prospective validation studies. Utilization of scoring systems, such as the SOFA score, have been criticized for needing the results of laboratory testing, which may be unavailable in a disaster or not available in a timely fashion, and this is particularly relevant to massive transfusion.

Section 3 - Framework Development

The individuals involved in the development of this draft framework are listed in Appendix C. The working group members had broad expertise to provide input on the vast majority of patients at risk for massive transfusion. The group was convened in 2009. The working group members were from large tertiary care centres in Canada and have expertise in transfusion medicine, trauma, anesthesiology, heart/lung/liver transplantation, obstetrics, cardiovascular surgery, allied health, medical ethics, law and methodology. The group also included members of the National Advisory Committee on Blood and Blood Products. The group did not include patient representatives.

The group identified salient clinical questions to guide the systematic search for the rationing of blood for massively bleeding patients during red phase blood shortages. Massively bleeding patients were identified as patients undergoing heart/lung/liver transplantation, patients with trauma, gastrointestinal hemorrhage, ruptured aortic aneurysm, obstetrical patients, and patients requiring ventricular assist devices or extracorporeal membrane oxygenation.

A systematic search of the Medline, Cochrane Central Register of Controlled Trials, EMBASE and In Process databases until September 2009 and a bibliographical search was used to generate recommendations. The search strategy focused on predictors of massive blood loss and predictors of mortality, ethical frameworks, and allocation protocols to guide the working group in the development of this document. The full search strategies from Medline and inclusion and exclusion criteria are illustrated in Appendix G.

Face to face meetings, teleconferences and electronic correspondence were used to generate recommendations. Recommendations were developed based on the best evidence available. The levels of evidence and grading of recommendations were adapted from the Canadian Task Force on Preventative Health Care (available at www.canadiantaskforce.ca). Areas of disagreement were resolved through consensus verification with all working group members.

National and International experts, professional societies and patient representatives were asked to review the recommendations to validate their relevance. Refer to Appendix D for the results and findings from the stakeholder consultation. This framework and its recommendations is supported by
the working group members, members of the National Advisory Committee on Blood and Blood Products, Canadian Blood Services (via the National Emergency Blood Management Committee), and is currently pending support from the Provincial and Territorial Ministries of Health including the Deputy and Ministers of Health. The intention is for this framework to be implemented as a supplement to the existing National Plan for the Management of Shortages of Labile Blood Components and will be disseminated to all physicians involved in the treatment of patients requiring massive blood transfusion in Canada.

This framework will require prospective validation after publication in massively bleeding patients to ensure: 1. Adequate inclusion of the vast majority of massively bleeding patients; 2. Its ability to identify patients with poor in-hospital and 6-month survival; 3. Its value and usability to the triage teams; 4. The ability of the tracking logs to capture the necessary data for evaluation of the framework; 5. Its ability to curtail the use of blood components to reduce utilization.

Section 4 - Red Phase Blood Shortage

The National Plan for the Management of Shortages of Labile Blood Components describes four phases of blood shortage: green (supply generally meets demand), amber (blood inventory is insufficient to continue usual transfusion practice; e.g. high blood loss surgeries must be delayed), red phase and recovery phase. The National Plan for blood shortages was developed by a multidisciplinary team and is posted on the National Advisory Committee on Blood and Blood Products’ website (www.nacblood.ca). A red phase implies that blood inventory levels are insufficient to ensure that patients with non-elective indications for transfusion will receive the required blood. During the amber phase, patients requiring massive transfusion will receive standard medical care. During the red phase, it is anticipated that there will be insufficient blood to support all patients. An amber or red phase blood shortage will only be declared when all strategies for increasing blood collections have been exhausted. Patients not requiring large amounts of blood components will be managed with increasing restrictive strategies. For example, in the red phase, all red cell transfusions for hemoglobin levels in excess of 70 g/L will be deferred until the recovery phase of the blood shortage. However, patients presenting with significant hemorrhage or those that the attending physician, on the basis of their clinical acumen, determines may require large amounts of blood components will be triaged according to this framework. The current National Plan for blood shortages does not stipulate how to triage patients in need of massive transfusion when there is insufficient blood to continue usual transfusion practices.

Section 5 - Levels of Triage

There will be several levels of rationing of blood components across Canada that will occur in a blood shortage. These are defined in this document as primary, secondary and tertiary triage. Primary triage refers to National redistribution of blood components between Canadian Blood Services centres across Canada. There needs to be fair, equitable, and transparent distribution of blood components at this level during a shortage. This has been termed ‘macro-rationing’ in the literature. Secondary triage refers to fair, equitable, and transparent distribution of blood components from a blood centre to the hospitals it serves. Lastly, tertiary triage refers to the rationing of blood components to individual patients at the
hospital level. Allocation at the patient level is termed ‘micro-rationing’. This document refers primarily to tertiary triage, but the overall strategy requires that primary and secondary triage processes are in place in Canada. Although most of the complicated triage decisions will be made at the patient level, to be fair and equitable, such decisions must be part of a National coordinated effort at all triage levels. All individuals involved in primary, secondary and tertiary triage must be committed to complying with the *National Plan for the Management of Shortages of Labile Blood Components* to ensure fair and equitable access to blood components during a blood shortage across all jurisdictions in Canada.

**Section 6 - Ethical Issues**

Resource rationing is one of the most challenging ethical issues faced in health care. Rationing frameworks (triage tools) raise numerous ethical concerns about the decision-making process used to ensure a fair and just distribution of scarce resources when the demand for health care exceeds the available resources. From an ethics perspective “fairness” is the key goal of any resource allocation exercise; however, the determination of what constitutes a fair rationing process is a matter of debate. Should the sickest be given priority over the most urgent? Should resources be allocated to achieve the most benefit for the greatest number or for the larger benefit to a small number? Ultimately these are value-based decisions for which no overall consensus exists among stakeholders.

The working group was assigned the formidable task of developing a resource rationing strategy (triage tool), dealing specifically with patients requiring massive transfusions during the red phase of a blood shortage. At the initial Working Group meeting in December 2009, the ethical framework: Accountability for Reasonableness (A4R) was presented and approved as the preferred approach that would best serve to guide the working group by fostering conditions for the development of a fair decision-making process.(12)

The A4R framework is composed of conditions that describe an open, practical and transparent priority setting process that can incorporate the relevant range of decision-specific contextual factors (frequently determined based on best evidence), encourages appropriate engagement from stakeholders, and supports public accountability for managing limited resources.(13)

The five conditions (14) of the A4R framework, which served to direct the Working Group deliberations, were:

1. **Relevance**: Decisions should be based on clear and explicit reasons and the collection of relevant and accurate data.
2. **Publicity**: The decisions and their rationales should be made publicly accessible as part of formal communication plan.
3. **Revision**: There should be opportunity to revisit criteria developed as part of a preliminary prospective analysis and post red phase critical review.
4. **Empowerment**: The plan will be circulated extensively to ensure effective participation of all affected stakeholders.
5. **Enforcement:** The plan will be endorsed by the National Advisory Committee on Blood and Blood Products, Provincial and Territorial Ministries of Health including the Deputy and Ministers of Health, and be used across the country in parity.

Ultimately the goal of any triage tool is to support decision-making by detailing a procedure for making triage decisions that protects the community by maximizing benefits and minimizing harms. In development of this triage tool, the working group outlined that any system of resource rationing must be evidenced-based and prospectively validated in advance of the disaster or resource shortage. Input should be sought from relevant stakeholders and the content should be publicly debated. The content and recommendations of the triage protocol should be endorsed by stakeholders from the major medical societies involved. There should be transparency in the aims and procedures involved in the document development process to prevent misunderstanding or mistrust. The triage process should protect patients against ethnic, racial, and socioeconomic inequity. Individual physicians, administrators, and patients should not be able to overturn a triage decision in compliance with the triage process. A contemporaneous appeals process for the rationing of blood during massive bleeding is impractical, where decisions must be made within minutes of the onset of hemorrhage. The appeals process for this document will be replaced by wide stakeholder consultation, extensive layperson input, and review of triage decisions by the Hospital / Regional and the National Emergency Blood Management Committee in the event of a red phase blood shortage. ‘Ad hoc’ departures from the process are inadvisable and will lead to inequitable access to blood components across the country. Clinicians or institutions who decide to depart from the triage tool could lead to adverse outcomes for patients with a high probability of a good outcome, should the blood inventory be depleted by widespread administration of blood to patients with very poor predicted outcomes.

The working group reviewed a number of principle-based decision-making criteria (see Table 2) and considered each in the preparation of the primary triage plan and the supplemental criteria which will be used for rationing patients needing massive transfusion. As result of this deliberation, the working group felt that no single principle was sufficient to incorporate all morally relevant considerations when dealing with massive transfusions, and so the overall triage plan includes consideration of a number of ethical principles: first come/first served and maximization of the numbers of life years saved (usually the youngest first). Additionally, the working group also focused on the creation of a decision-making process that relied on a fair process (procedural fairness) to establish the ethical legitimacy of any resource allocation decision. Table 3 outlines the procedural values which guided the working group’s review of the available data and literature as it related to the development of the inclusion and exclusion criteria for a triage tool. This procedural fairness was met by widespread consultation within the health care sector and with laypersons (see Appendix D).

Age was initially included in the triage tool as a variable, similar to the Ontario ICU triage protocol (3). Age based rationing is controversial (15-19). Age was included in the tool to allow for incorporation of the ethical principle of maximizing the ‘life-cycle’ opportunity of every individual. This principle is based on the belief that each person should have his or her own fair chance at ‘fair innings’ in life and to live through most stages in life. The working group proposed an age limit of 80 years as the overall exclusion cut-off as this represents the approximate median survival of adults in Canada. However, in the
stakeholder engagement, the working group reviewed considerable feedback expressing concern over this criterion and a specific general age criterion was removed as an overall exclusion criteria.

**Section 7 – Alternatives to Blood Transfusion**

Patients for whom the decision is made not to allocate a certain resource must be offered all available therapies, including palliative care where appropriate, and be treated with dignity. In the case of transfusion, a patient not allocated to transfusion must be offered all non-transfusion therapies available and blood conservation strategies/alternatives. Blood conservation strategies should include any or all of the following: erythropoiesis-stimulating agents, intravenous / oral iron, antifibrinolytics, intraoperative cell salvage, interventional radiologic procedures, rapid access to endoscopy, and non-invasive surgeries. Palliative care should include pain and symptom relief, spiritual and psychosocial support. In addition, continued monitoring of all assessed patients at regular intervals is required to re-assess eligibility in the event that clinical indicators suggest a need to re-triage the patient to active transfusion management.

**Section 8 – Gastroenterology**

The majority of patients admitted to hospital with a gastrointestinal (GI) hemorrhage do not require transfusion, with one series reporting only 23.3% of patients requiring one or more units. In case series of patients undergoing massive transfusion, GI hemorrhage accounts for 21% to 31% of all massive transfusions. In a case series of 100 episodes of ‘massive upper gastrointestinal hemorrhage’ (which was defined as at least 2 units of blood, >1000 ml of estimated blood loss, and hemodynamic instability) the most common causes for bleeding were: varices (30%), duodenal ulcer (20%), and gastric ulcer (18%). The mortality rate in this series for patients that required admission was 70% and overall the patients received a mean of 16 units of RBC (non-survivors received a greater number of units - mean 27 units). Hence, this triage process will apply to a highly selected group of gastrointestinal bleeding patients with a very poor chance of survival. The vast majority of GI bleed patients will be managed as dictated by the National Blood Shortages Plan and will not require triage as per this document.

**Section 9 - Pediatrics**

The ethical issues surrounding rationing in children are very complex and have been reviewed recently by Kanter and Cooper. Their review calls for more work to be done before we will be ready to ration health care resources in pediatric patients (i.e., age less than 16).

The working group strongly recommended that triage priority at the level of the blood supplier should be given to pediatric institutions to ensure adequate supplies are maintained at these hospitals, since most children will meet the criteria for continued transfusion support.

**Section 10 – Transplantation**

Prior to a red phase blood shortage being declared (preferably as a green phase activity), all organ transplant centres across Canada in jurisdictions serviced by Canadian Blood Services should collate data
regarding the rate of transfusion for specific transplant procedures. Having data on the current rates of transfusion for each procedure (pre, during, and post-transplant), readily available will allow for transplant procedures to be categorized as high versus low risk for transfusion. Knowing the risk of transfusion for each transplant procedure will aid in individualizing the informed consent discussion with the patient to determine the risks of proceeding or not proceeding with a transplant procedure during a red phase blood shortage.

**Section 11 - Legal Implications**

Patient implications: During a red phase blood shortage, patient access to blood components will be limited by supply. The clinical triage team must ensure that all measures are taken to ensure individual patient rights are respected and patients are given access to all available medical therapies to ensure the best possible outcome, given the circumstances. In this setting of altered standard of care, however, some transfusion limitations may be placed on certain patients as dictated by the triage tool and the availability of blood.

Provider liability: To date none of the existing Canadian triage frameworks for allocation of resources during a pandemic have had to withstand the rigorous dissection in the court room during a legal proceeding. Triage plans attempt to fairly and impartially provide every person the opportunity to survive, however, they do not guarantee either treatment or survival. To remain fair and impartial, triage plans reduce the autonomous clinical judgment authority afforded healthcare facilities and providers. While some people will not receive all the care (in this case, transfusion) that they could possibly need, this does not by default make triage an unfair or negligent process. Healthcare facilities and providers who deliver care in accordance with the triage tool are considered by National / Provincial / Territorial Emergency Blood Management Committees as to have provided the best possible care in this setting of altered level of care. Healthcare facilities and providers have a duty to use a degree of care and skill which is expected of a reasonably competent facility/provider, acting in the same or similar circumstances. Triage decision makers at local/patient level are not however accountable for validating the ongoing quality of evidence utilized to derive this triage tool, including its inclusion and exclusion criteria. Those facilities and providers who utilize this tool in good faith and in a competent manner, should not be found negligent for triage decisions dictated by this tool.

**Section 12 - National Emergency Blood Management Committee**

The National Emergency Blood Management Committee (NEBMC) is comprised of transfusion medicine experts from the National Advisory Committee on Blood and Blood Products, members from Canadian Blood Services, blood recipient representation, and Provincial and Territorial Ministry Representatives. This group will be convened in the event of a possible National blood shortage to provide guidance on the need to call an amber or red phase. In the event of an amber or red phase, this group will provide guidance to the Provincial and Territorial Provincial Emergency Blood Management Committees (P/TEBMC) on blood management issues. The NEBMC will dictate in a red phase when this massive transfusion rationing framework is required. In addition, in extreme red phase blood shortages, the NEBMC may be required to adjust the framework for the following variables: 1. Disease severity score
cut-offs (e.g., MELD score – see below); 2. Re-assessment level (currently set at every 10th unit of red blood cells transfused – see below). Following the recovery phase, the NEBMC will be required to review the Provincial and Territorial data on triage decisions to determine if modification to the framework or tracking tools will be required. A brief report from the NEBMC to the National Advisory Committee on Blood and Blood Products should follow every red phase use of this framework. For further information, refer to the National Plan for the Management of Shortages of Labile Blood Components.

Section 13 - Communication Plan

The National Plan for the Management of Shortages of Labile Blood Components includes an Appendix detailing the communication plan for blood shortages in Canada. The communication plan covers the notification of the general public via media releases and direct communication to hospitals, health care practitioners, and transfusion recipients via Provincial and Territorial Ministries of Health. In the event of a red phase where the NEBMC declares that this framework is required, its use will be included in the communication documents to individuals as listed above. This communication is critical to ensuring that the need for blood rationing for massively bleeding patients in a red phase is openly disclosed to the public, all hospitals, health care practitioners, and patients. This communication plan can be found in the National Blood Shortage Plan at www.nacblood.ca.

Section 14 - 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’.

14.1 – 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. The triage team leader 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.(26)
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.

14.2 - 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 10th 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.

14.3 - 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.
14.4 - 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.
Emergency framework for rationing of blood for massively bleeding patients during a red phase of a blood shortage

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

1. **Patient needing or predicted to need massive transfusion**
   - **NO**
     - Follow guidance from NEBMC and National Blood Shortage Plan
   - **YES**
     - **General Exclusion Criteria:**
       - A. Severe burns of patient with any 2 of the following:
         - i. Age >60yrs
         - ii. >60% of total body surface area affected
         - iii. Inhalation injury requiring mechanical ventilation
       - B. Cardiac arrest
       - C. Advanced, progressive baseline cognitive impairment
       - D. Advanced, progressive untreatable neuromuscular disease
       - E. Metastatic malignant disease with expected survival less than 6 months
       - F. Advanced and irreversible immunocompromise
       - G. Severe and irreversible acute neurologic event or condition
       - H. End-stage organ failure meeting the following criteria:
         - i. Heart – NYHA class III or IV heart failure
         - ii. Lungs – COPD with FEV1 < 25% predicted, baseline PaO2 < 55mmHg, or secondary pulmonary hypertension; Cystic fibrosis with post-bronchodilator FEV1 < 30% or baseline PaO2 < 55mmHg; Pulmonary fibrosis with VC or TLC < 60% predicted, baseline PaO2 < 55mmHg, or secondary pulmonary hypertension; mprimary pulmonary hypertension with NYHA class III or IV heart failure, right atrial pressure > 10mmHg, or mean pulmonary arterial pressure > 50mmHg

2. **Does patient meet one of the above general exclusions?**
   - **YES**
     - **Do not transfuse. Re-assess as per section 15.6**
   - **NO**
     - **Specific Exclusion Criteria based on clinical factors specific to patient populations (see section 15.3):**
       - Trauma
       - Ruptured Abdominal Aortic Aneurysm
       - ECMO/VAD
       - Heart/Lung Liver Transplantation
       - Gastroenterology (GI Bleed)
       - Obstetrical Bleed
       - Other

   - **Go to page 2**
Emergency framework for rationing of blood for massively bleeding patients during a red phase of a blood shortage

Figure 1 – (page 2)

Does patient meet one of the above specific exclusions?  

YES → Do not transfuse. Re-assess as per section 15.6

NO →

Is there sufficient inventory to meet current demand at hospital level?

YES → Proceed with transfusion

NO → Is inventory concern related to competing patients eligible for transfusion?

YES → Supplemental Inclusion Criteria (in order presented)
1. Youngest first
2. Highest likelihood of hemostasis control
3. First-come, first-served

NO → Do not transfuse. Re-assess as per section 15.6

Is a patient meeting these inclusions?

YES → Re-evaluate at specified intervals for eligibility for ongoing transfusion:
1. Every 24 hours
2. Every 10 units of RBC (to be adjusted by the NEBMC as determined by blood availability)
3. Re-assess according to the reassessment criteria for triaged patients (section 15.6)

NO → Do not transfuse. Re-assess as per section 15.6
Section 15 – Recommendations

The emergency framework for rationing of blood for patients predicted to need massive transfusion

Goal: To provide blood transfusions to Canadians in an ethical, fair, and transparent way to ensure that the greatest number of life years are saved and to minimize the suffering and maximize the use of blood alternatives for those who are triaged to no transfusion due to insufficient availability of blood.

15.1 - Inclusion Criteria: All patients needing or predicted to need massive transfusion due to 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) during a red phase blood shortage.

All patients should receive access to all available blood conservation strategies including but not limited to:

- Thrombopoietin mimetics, erythropoiesis-stimulating agents, intravenous/oral iron, antifibrinolytics, intraoperative cell salvage, interventional radiologic procedures, rapid access to endoscopy, and non-invasive surgeries.

15.2 - General Exclusion Criteria (adapted from Table 3):

Note: These general exclusion criteria only apply to patients needing massive transfusion support.

A. Severe burns of patient with any 2 of the following:
   - Age > 60 yr
   - > 60% of total body surface area affected
   - Inhalation injury requiring mechanical ventilation
B. Advanced, progressive baseline cognitive impairment
C. Advanced, progressive untreatable neuromuscular disease
D. Metastatic malignant disease with expected survival less than 6 months
E. Advanced and irreversible immunocompromise
F. Severe and irreversible acute neurologic event or condition
G. End-stage organ failure meeting the following criteria:
   - Heart - NYHA class III or IV heart failure
   - Lungs
     i. COPD with FEV1 < 25% predicted, baseline PaO2 < 55 mm Hg, or secondary pulmonary hypertension
     ii. Cystic fibrosis with post-bronchodilator FEV1 < 30% or baseline PaO2 < 55 mm Hg;
     iii. Pulmonary fibrosis with VC or TLC < 60% predicted, baseline PaO2 < 55 mm Hg, or secondary pulmonary hypertension;
     iv. Primary pulmonary hypertension with NYHA class III or IV heart failure, right atrial pressure > 10 mm Hg, or mean pulmonary arterial pressure > 50 mm Hg

Abbreviations: SpO2 = oxygen saturation measured by pulse oximetry, FIO2 = fraction of inspired oxygen, NYHA = New York Heart Association, COPD = chronic obstructive pulmonary disease, FEV1 = forced expiratory volume in 1 second, PaO2 = partial pressure
15.3 - Specific Exclusion Criteria for Massively Bleeding Patients:

15.3.1 - 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

15.3.2 - Ruptured Abdominal Aortic Aneurysm (RAAA)

1. During a critical blood shortage, do not transfuse patients with RAAA 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 RAAA 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

15.3.3 - 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, ensure that physicians and patients/families that patients receiving ECMO/VAD support who have multi-organ failure are aware that they may not receive transfusion support if massively bleeding.
   Level of evidence: III
   Grade of recommendation: B
15.3.4 – Organ 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

15.3.5 – Gastroenterology (refer to Section 8 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

15.3.6 - 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
15.3.7 - 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%.

15.4 - Levels of Evidence

I  Evidence from randomized controlled trial(s)
II-1 Evidence from controlled trial(s) without randomization
II-2 Evidence from cohort or case-control analytic studies, preferably from more than one centre or research group
II-3 Evidence from comparisons between times or places with or without the intervention; dramatic results in uncontrolled experiments could be included here
III Opinions of respected authorities, based on clinical experience; descriptive studies or reports of expert committees

15.5 - Recommendation Grades

A  There is good evidence to recommend the action.
B  There is fair evidence to recommend the action.
C  The existing evidence is conflicting and does not allow making a recommendation for or against the use of the action, however other factors may influence decision-making.
D  There is fair evidence to recommend against the action.
E  There is good evidence to recommend against action.
I  There is insufficient evidence (in quantity and/or quality) to make a recommendation, however other factors may influence decision-making

15.6 - 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.

Transfusion decisions will be documented on the patient tracking tool shown in Appendix E.

15.7 - Competing patients triaged to active transfusion care – Supplemental Criteria

If two or more patients are competing for blood components at the same hospital for whom both qualify for active transfusion management by the triage team (based on their equal status at the conclusion of the general exclusion criteria and clinical factors specific to patient population exclusion criteria stages of the triage process), and current inventory levels necessitates further triage – the following principles (in order) will be used to make the very difficult decision regarding who will get priority for transfusion resources: 1. Youngest first; 2. Highest likelihood of hemostasis control; (based on clinical decision making by the triage team), and 3. First-come, first-served. 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.

Section 16 - Dissemination of this Rationing Framework

Pending support from the Provincial and Territorial Ministries of Health, this emergency framework will be implemented as a supplement to the National Plan for the Management of Shortages of Labile Blood Components and will be disseminated by the National Advisory Committee on Blood and Blood Products to relevant stakeholders. In addition, this document as well as a truncated version will be disseminated by each Provincial/Territorial Representative or Provincial Blood Office/Program to each hospital through their normal communication channels. Also, efforts will be made to ensure that the framework is presented at relevant stakeholder annual meetings to ensure widespread dissemination. The framework will also be submitted for peer-reviewed publication.

Section 17 - Implementation Barriers

There are numerous barriers that have potential to derail this framework during a red phase blood shortage. These are the anticipated concerns of the committee:

a) Inadequate dissemination of the framework.
   - At the present time, not all Provinces/Territories have PEMBC or Provincial Blood Offices and some Provinces have insufficient resources to ensure both dissemination and education of the relevant clinical groups. Adequate resources must be allocated at the Provincial/Territorial level to ensure the adequacy of dissemination.
b) Triage team reluctance to withhold therapy due to difficulty transitioning from caring for individual patients to making decisions in the best interest of the whole hospital population in need of transfusion resources.

c) Fear of legal liability.
   - The triage team must be given assurance that the best way to prevent legal liability is to follow the framework to ensure ‘over triage’ and ‘under triage’ are minimized. Clinicians should face legal liability only if they withhold blood components from patients that clearly meet the inclusion criteria for transfusion or if they transfuse patients with an obvious very poor chance of long-term survival and subsequently cause harm to other patients who would have clearly benefited from blood had it been available.

d) Pressure from families, clinicians, and hospital administrators/staff to deviate from the framework for individual patients.
   - Any pressure from any hospital staff to deviate from the framework for specific patients should be immediately reported to the HEBMC. The chair of the HEBMC shall resolve such issues so that the triage team can focus on triage decisions and patient care.

e) Non-disclosure of transfusion activity by the hospital transfusion service.
   - At the present time, there is no information system to allow for real-time monitoring of transfusion activity in Canada (excluding Quebec). Once the blood leaves Canadian Blood Services, its final status is unknown, therefore it is possible for a hospital to underreport transfusion inventories to Canadian Blood Services and thus manipulate the system to maintain better inventory than are dictated by the inventory set out in the National Blood Shortages Plan.

Section 18 - Next Steps and Future Research

This framework is the first attempt to develop a strategy for fair and equitable distribution of blood to massively bleeding patients during a red phase blood shortage. The working group recognizes that the majority of the recommendations are based on expert opinion, in conjunction with a detailed review of the literature, and that over time the framework will be revised to reflect new knowledge in this area. The working group recommends the following to improve the ability to fairly triage blood for these patients:

1) Prospective or retrospective validation of the framework to determine the effectiveness of the tool to decrease the use of blood products.
2) Prospective validation of the documentation tool.
3) Development of training material for triage teams.
4) Development and execution of mock drills.
5) Survey of intensive care and emergency room clinicians regarding their attitudes towards triaging blood for massively bleeding patients to determine their willingness to act as triage officers, their acceptance of explicit rationing criteria, and their acceptance of the recommendations.
6) Real-time hospital inventory available nationally to determine where and when blood products are being issued across Canada. This would assist with transparency as all transfusion activity would be visible electronically.

7) Validate the utility of the SOFA score for massively bleeding patients and for pediatric patients.

8) Planned revision after every red phase and every three years.

The working group felt strongly that we have a ‘duty to plan’ for severe blood shortage for patients who will need a large number of blood components and that this document is a work in progress. Harwood RJ(27) stated in a letter to the editor on planning for shortages in a pandemic, “The requirement to plan properly cannot be emphasized strongly enough. It is unreasonable to burden medical staff with a dilemma when it lies in society’s power to help resolve these issues ahead of time. Whatever the moral obligation that doctors have to society, it is not sufficient to try to resolve these issues ‘on the hoof’ in the midst of a pandemic. They must be settled before a pandemic arrives.”
Appendix A - Terminology

**Allocation vs. Rationing** – The terminology used to describe the triaging of scarce resources is currently under debate. Allocation is the most commonly used term, although its use has been scrutinized. Allocation refers to the ‘the action or process of allocating or distributing something’. Rationing refers to ‘the controlled distribution of resources and scarce goods and services’. Matas argues that when we hide behind the word ‘allocation’, we forget that there will be winners and losers with each triage decision that is made. We have utilized the term ‘rationing’, where appropriate, throughout this document to acknowledge Matas’ concerns regarding these two terms.

**Implicit vs. Explicit Rationing** – ‘Implicit’ rationing refers to rationing based on an individualized approach. In contrast, ‘explicit’ rationing refers to rationing based on strict criteria. A systematic review of studies on how physicians ration healthcare resources concluded that implicit rationing is already happening (e.g. delay in treatment, early discharge) and that we need ethically sound criteria to support explicit rationing strategies. Implicit rationing results in role conflict, where physicians must make decisions that are not necessarily best for their patient, but best for the community of patients that they serve. In addition, implicit rationing decisions will vary clinician to clinician for the same clinical scenario.

**Over triage vs. Under triage** – ‘Over triage’ refers to rationing scarce resources to a patient who is unlikely to survive or benefit from the resources. In contrast, ‘under triage’ refers to failing to allocate resources to a patient who is likely to benefit and has a high likelihood of a good outcome if allocated resources.

**Crisis standard of care** - The optimal level of health care that can be delivered during a catastrophic event, requiring a substantial change in usual health care operations.
Table 1. The SOFA score as described by Vincent et al.(4)

<table>
<thead>
<tr>
<th>SOFA Score</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>PaO2/FIO2 Ratio</td>
<td>&gt;400</td>
<td>≤400</td>
<td>&lt;300</td>
<td>&lt;200 and mechanically vented</td>
<td>≤100 and mechanically vented</td>
</tr>
<tr>
<td>Platelet Count</td>
<td>&gt;150</td>
<td>≤150</td>
<td>≤100</td>
<td>≤50</td>
<td>≤20</td>
</tr>
<tr>
<td>Bilirubin umol/L</td>
<td>&lt;20</td>
<td>20-32</td>
<td>33-101</td>
<td>102-204</td>
<td>&gt;204</td>
</tr>
<tr>
<td>Hypotension (ug/kg/min)</td>
<td>None</td>
<td>MAP&lt;70</td>
<td>Dopamine ≤5 or dobutamine (any dose)</td>
<td>Dopamine &gt;5 or epinephrine ≤0.1 or norepinephrine ≤0.1</td>
<td>Dopamine &gt;15 or epinephrine &gt;0.1 or norepinephrine &gt;0.1</td>
</tr>
<tr>
<td>Glasgow Coma Scale</td>
<td>15</td>
<td>13-14</td>
<td>10-12</td>
<td>6-9</td>
<td>&lt;6</td>
</tr>
<tr>
<td>Creatinine (umol/L)</td>
<td>&lt;110</td>
<td>110-170</td>
<td>171-299</td>
<td>300-440 or &lt;500 mL/day</td>
<td>&gt;440 or &lt;200 mL/day</td>
</tr>
</tbody>
</table>
Table 2. Ethical principles and their role in blood triage decisions. Adopted from Persad et al for blood transfusion triage decisions.(31)

<table>
<thead>
<tr>
<th>Principle</th>
<th>Advantages</th>
<th>Disadvantages</th>
<th>Recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Treat people Equally</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lottery</td>
<td>Easy to apply, no patient information required</td>
<td>Ignores all other ethical principles</td>
<td>Exclude as it requires stewards to be blind to other relevant facts</td>
</tr>
<tr>
<td>First-come, first-served</td>
<td>Easy to apply, no patient information required</td>
<td>Patients with greater resources may be able to access medical resources faster and hence may not be fair</td>
<td>Include as supplemental, blood will not be hoarded in anticipation of a patient with better expected outcomes</td>
</tr>
<tr>
<td><strong>Favour the worst off</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sickest first</td>
<td>Provides resources to patients suffering the most</td>
<td>Ignores prognosis</td>
<td>Exclude as it ignores post treatment prognosis</td>
</tr>
<tr>
<td>Youngest first</td>
<td>Benefits those who have had the least life</td>
<td>Ignores prognosis which may be extremely poor even for a child</td>
<td>Include for patients in same triage zone for prioritization and for exclusion criteria</td>
</tr>
<tr>
<td><strong>Maximize total benefits</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of lives saved</td>
<td>Benefits the greatest number</td>
<td>Ignores long term prognosis</td>
<td>Exclude</td>
</tr>
<tr>
<td>Number of life-years saved</td>
<td>Maximizes life-years produced</td>
<td>Discriminates against older patients</td>
<td>Include via triage criteria</td>
</tr>
<tr>
<td>(prognosis)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Social usefulness</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Instrumental value</td>
<td>Future oriented (i.e. health care workers and emergency personnel get priority access)</td>
<td>Patients unlikely to be back to work before the end of the scarcity</td>
<td>Exclude</td>
</tr>
<tr>
<td>Reciprocity</td>
<td>Past oriented (i.e. previous blood donors get priority)</td>
<td>Blood donor criteria are very restrictive (e.g. residence in the UK between 1980 and 1996)</td>
<td>Exclude</td>
</tr>
</tbody>
</table>
**Table 3.** Procedural values to guide ethical decision-making. Adopted from the Stand on Guard for Thee document (32)

<table>
<thead>
<tr>
<th>Procedural Value</th>
<th>Description</th>
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<tbody>
<tr>
<td>Reasonable</td>
<td>Decisions should be based on reasons (i.e. evidence, principles, and values) that stakeholders can agree are relevant to meeting health needs in a blood shortage. The decisions should be made by people who are credible and accountable.</td>
</tr>
<tr>
<td>Open and transparent</td>
<td>The process by which decisions are made must be open to scrutiny, and the basis upon which decisions are made should be publicly accessible.</td>
</tr>
<tr>
<td>Inclusive</td>
<td>Decisions should be made explicitly with stakeholder views in mind, and there should be opportunities to engage stakeholders in the decision-making process.</td>
</tr>
<tr>
<td>Responsive</td>
<td>There should be opportunities to revisit and revise decisions as new information emerges throughout the crisis. There should be mechanisms to address disputes and complaints.</td>
</tr>
<tr>
<td>Accountable</td>
<td>There should be mechanisms in place to ensure that decision makers are answerable for their actions and inactions.</td>
</tr>
</tbody>
</table>
Appendix C - Blood Shortage and Massive Transfusion Working Group.

The NAC Blood Shortage Working Group (BSWG) serves as the technical, medical and scientific working group, on behalf of the National Advisory Committee on Blood and Blood Products (NAC) in the development of a national framework for responding to any crisis which impacts the adequacy of the blood supply in Canada.

The NAC BSWG established this sub-group to develop this document that is intended to guide healthcare professionals in triaging patients in need of massive transfusion during a red phase blood shortage, where demand greatly exceeds supply and where all other measures to increase the supply of blood have been exhausted.

The following have made significant contributions to the development of this document:

<table>
<thead>
<tr>
<th>Name</th>
<th>Contribution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dr. Jeannie Callum</td>
<td>Working Group Chair, National Advisory Committee on Blood and Blood Products</td>
</tr>
<tr>
<td>Dr. Nadine Shehata</td>
<td>Canadian Blood Services</td>
</tr>
<tr>
<td>Dr. Susan Nahiriak</td>
<td>National Advisory Committee on Blood and Blood Products</td>
</tr>
<tr>
<td>Dr. Lucinda Whitman</td>
<td>National Advisory Committee on Blood and Blood Products (Chair)</td>
</tr>
<tr>
<td>Dr. Heather Hume</td>
<td>Pediatric Hematologist, St. Justine Hospital, Montreal</td>
</tr>
<tr>
<td>Mr. Ahmed Coovadia</td>
<td>Canadian Blood Services</td>
</tr>
<tr>
<td>Dr. Brian Muirhead</td>
<td>National Advisory Committee on Blood and Blood Products</td>
</tr>
<tr>
<td>Dr. Keyvan Karkouti</td>
<td>Anesthesiologist, University Health Network</td>
</tr>
<tr>
<td>Dr. Shuen Tan</td>
<td>Fellow in Transfusion Medicine</td>
</tr>
<tr>
<td>Dr. Homer Tien</td>
<td>Chief of Trauma, Sunnybrook Health Sciences Centre; Lt.-Col. Canadian National Defense</td>
</tr>
<tr>
<td>Dr. Sharvesh Logsetty</td>
<td>Trauma Association of Canada</td>
</tr>
<tr>
<td>Dr. Barto Nascimento</td>
<td>Trauma &amp; Transfusion Fellow</td>
</tr>
<tr>
<td>Dr. Morad Hameed</td>
<td>Trauma Association of Canada</td>
</tr>
<tr>
<td>Dr. Amanda Skoll</td>
<td>Society for Obstetrics and Gynecology</td>
</tr>
<tr>
<td>Mr. Blair Henry</td>
<td>Clinical and Research Ethicist, Sunnybrook Health Sciences Centre</td>
</tr>
<tr>
<td>Ms. Joanna Noble</td>
<td>Risk Management, Healthcare Insurance Reciprocal of Canada</td>
</tr>
<tr>
<td>Ms. Jodi Murray</td>
<td>Legal, Canadian Blood Services</td>
</tr>
<tr>
<td>Dr. Daryl Kucey</td>
<td>Canadian Association of Vascular Surgery</td>
</tr>
<tr>
<td>Dr. Daryl Kucey</td>
<td>Canadian Society of Transplantation</td>
</tr>
<tr>
<td>Dr. Prosanto Chaudhury</td>
<td>Canadian Association of Emergency Physicians</td>
</tr>
<tr>
<td>Dr. Paul Moayyedi</td>
<td>Gastroenterologist, McMaster University</td>
</tr>
<tr>
<td>Ms. Teddie Tanguay</td>
<td>Canadian Association of Critical Care Nurses</td>
</tr>
<tr>
<td>Dr. Gurmeet Singh</td>
<td>Cardiac Surgeon, University of Alberta</td>
</tr>
<tr>
<td>Dr. Marc de Perrot</td>
<td>Lung transplantation, Thoracic Surgeon, University Health Network</td>
</tr>
<tr>
<td>Dr. Vincent Laroche</td>
<td>Public Health Ministry of Quebec; Member, National Advisory Committee</td>
</tr>
</tbody>
</table>
Appendix D - Community and Stakeholder Engagement

Community and stakeholder engagement is critical to garner support and objectively review the proposed rationing process, and to validate the triage criteria. Public engagement is critical for procedural justice since a contemporaneous appeals process is not feasible in a disaster setting or during a massive hemorrhage. Hence, a pre-emptive community and stakeholder engagement process has been conducted to allow for feedback on the triage protocol well in advance of a red phase blood shortage.

For this document, the community and stakeholder engagement strategy was divided into two components. Firstly, in the development of the triage tool, clinicians with expertise in the treatment of patients requiring massive transfusions were invited to be members of the working group (2009). Following the development of the draft document, a planned consultation process involving the National Liaison Committee and the Regional Liaison Committees of Canadian Blood Services (NLC/RLC) was conducted (33). Members of these committees include blood recipients, patient group representatives, blood donors, blood system volunteers and healthcare professionals. The committees were asked to review the entire draft document and provided input. Additionally, a wider lay community consultation process was conducted. Several groups were contacted to ensure widespread lay consultation during the development of the draft emergency framework, including the NLC/RLC as detailed above.

The following are lists of those organizations and societies who were requested to provide written feedback and/or complete a survey regarding the content of the draft emergency framework document in 2011.

<table>
<thead>
<tr>
<th>Stakeholder Organization</th>
<th>Response Received</th>
<th>Individual Member Response (s)</th>
<th>Stakeholder Official Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aplastic Anemia and Mylelodysplasia Association of Canada</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Canadian Anaesthesiologists Society</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Canadian Association of Critical Care Nurses</td>
<td>Yes</td>
<td>No</td>
<td>Yes – Board of Directors</td>
</tr>
<tr>
<td>Canadian Association of Emergency Physicians</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Canadian Bioethics Society</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Canadian Cancer Society</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Canadian Critical Care Society</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Canadian Liver Foundation</td>
<td>Yes</td>
<td>No</td>
<td>Yes – Medical</td>
</tr>
</tbody>
</table>
The following organizations did not provide comment or feedback:


The emergency framework working group members also widely disseminated the draft framework to individuals with particular expertise in the management of massively bleeding patients, blood
management and ethics. Comments and feedback received was compiled and discussed by the core working group members and after consultation with the larger working group the framework was extensively revised and reformatted.

For ease of review, main feedback was categorized as follows:

- Positive feedback
- Minor grammatical
- Legal implications / Ethical considerations
- Transplantation
- Age as an Exclusion Criteria
- Use of Pre-hospital data
- Consensus process
- Triage team
- Failure of hospitals to comply resulting in inequity
- Other

**Positive feedback** - The majority of those organizations and individuals that provided feedback indicated that the rationale for developing the emergency framework document was clear and they also confirmed that there is a need for a framework outlining a process for emergency disposition of blood components should a red phase blood shortage be declared. The literature review was deemed to be thorough and the draft framework was comprehensive.

**Minor / Grammatical** - In consideration of the end-users of the emergency framework, it has been reformatted, sectioned and a number of appendices created for ease of reading and reference.

**Legal Implications / Ethical Considerations** – As a result of feedback, the section on ethics (Section 6) has been strengthened, in particular the considerations given to supplementary triage criteria. In terms of legal protection for those in decision making positions under the guidance of this emergency framework, it is anticipated that support and endorsement of this framework by the provincial ministries of health will in turn result in this framework being the temporary standard of care when implemented during a red phase blood shortage. Support at all levels of government and the system is imperative to ensure maximum compliance which ultimately means maximum blood components available for the greatest number of patients. The provincial /territorial representatives have been asked to consider incorporating or linking provincial contingency plans with other existing provincial contingency plans in an attempt to ensure that triage tools developed separately are not contradictory and reflect potential for multiple resource scarcity.

**Transplantation** – Significant feedback was received with regard to the recommendations to not transfuse for the purpose of harvesting organs for transplant. Harvested organs can save lives and if this process is not done (for some organs) during a red phase blood shortage extra lives would potentially be lost. The Canadian Society for Transplantation presented alternate recommendations for consideration
by the working group. The revised recommendations were welcomed and incorporated into the final document.

**Age as an exclusion criterion** – The working group had originally proposed an age limit of 80 years as an overall exclusion cut-off for receipt of blood components in a red phase blood shortage. Stakeholders expressed considerable concern over the inclusion of this criterion. As a result, the age limit of 80 years has been removed (Section 6 – Ethical Issues)

**Use of pre-hospital data** – Comments were received regarding the validity of using pre-hospital data (vitals etc.) to make end-of-life decisions. With respect to pre-hospital cardiac arrest, the literature does not indicate that the diagnosis of pre-hospital cardiac arrest in trauma patients is unreliable. The pre-hospital diagnosis of cardiac arrest and the actual duration of patient transport are often used as criteria for stopping resuscitation (personal e-mail correspondence – Dr. H. Tien).

**Consensus Process** – Stakeholders recognized that successful application of the emergency framework is contingent on awareness and support for the proposed triage process across all jurisdictions and at all decision-making levels (hospitals and provincial governments). As such, support for the framework is being sought by the provincial Deputy Ministers and Ministers of Health. Support from all jurisdictions will ensure that the framework is available and processes are in place prior to a red phase blood shortage being declared. Cross-jurisdictional support will aid in consistency of patient treatment and triage across the country. A truncated version of the emergency framework has been developed to highlight this needed consistency as it is recommended that it be incorporated verbatim into all provincial blood contingency plans. Consistency across the country is imperative. Efforts will be made to ensure that the framework is presented at relevant stakeholder annual meetings to ensure widespread dissemination.

**Triage Team** – As a result of feedback, the role of the triage team has been expanded and this section contains more detail with regard to the documentation, implications and various roles and responsibilities of the proposed triage team members. It is important for the triage team to apply the recommendations objectively and away from the direct care of the patient. As such, the concept of a ‘blinded’ triage process is recommended to mitigate potential bedside biases. Clarification on how a triage team would work in a smaller hospital has been provided. These teams can be regional or provincial – each province can address this in their own provincial plans in terms of how this would work. Triage team characteristics have been expanded upon to ensure the team is functional and members have the skills necessary to ensure the triage process is applied appropriately. The Provincial / Territorial representatives were consulted on the education and training of the triage teams. An approach is outlined in Section 12.1.

**Failure of hospitals to comply resulting in inequity** - Stakeholders highlighted that it is imperative to ensure fair access to the limited blood supply and that all jurisdictions and physicians be required to follow these guidelines in a red phase blood shortage. To ensure fair access, this document is being prepared in advance of an actual shortage and communicated to stakeholders. Support is being sought
at the Deputy and Ministerial levels of government. Support at all levels will ensure jurisdictional compliance to this framework. It is recommended that a truncated version of this framework be incorporated verbatim into provincial blood contingency plans ensuring consistency across all jurisdictions in terms of process. The members of the National Emergency Blood Management Committee are such that accountability and transparency are supported. This is addressed in the National Plan for the Management of Shortages of Labile Blood Components.

**Other** – Other revisions or considerations included (but not limited to): the definition for massive bleeding / hemorrhage, the importance of access to erythropoietin during a blood shortage (communicated to the provincial/territorial representatives), clarification on what constitutes a massive GI bleed, and priority given to stocking pediatric facilities with blood components during a red phase shortage.

The extensive community and stakeholder engagement resulted in a saturation of comments and feedback received. Many comments from stakeholders were similar and repetitive and as a result the working group concluded that all relevant comments and feedback had been captured and addressed appropriately in this engagement process. The need for ongoing refinement and revision as new data becomes available is vital and as such this emergency framework will be reviewed on a regular basis and after every activation ensuring it adequately addresses the requirement for consistent, fair and equitable provision of blood components to Canadian patients during a red phase blood shortage.
Appendix E – Documentation Tools

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

<table>
<thead>
<tr>
<th>Tracking Number</th>
<th>Medical Record Number</th>
<th>Last Name</th>
<th>First Name</th>
<th>Location</th>
<th>Blood Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
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</tbody>
</table>
### Patient Triage Record – Emergency Disposition of Blood during Red Phase Blood Shortage

<table>
<thead>
<tr>
<th>Patient Tracking Number</th>
<th>Hospital</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reason for Massive hemorrhage</td>
<td>Date of Triage</td>
</tr>
<tr>
<td>Predicted to need &gt;10 units in the next 24 hours</td>
<td>Age</td>
</tr>
<tr>
<td>□ Yes  □ No</td>
<td>Hemoglobin</td>
</tr>
<tr>
<td>Has patient received product in the previous 24 h?</td>
<td>Platelet</td>
</tr>
<tr>
<td>□ Yes  □ No</td>
<td>INR</td>
</tr>
<tr>
<td>If yes, list products:</td>
<td>PTT</td>
</tr>
<tr>
<td></td>
<td>Fibrinogen</td>
</tr>
<tr>
<td>Meets any exclusion criteria</td>
<td>Product Required</td>
</tr>
<tr>
<td>□ Yes  □ No</td>
<td></td>
</tr>
<tr>
<td>If yes, which one(s)?</td>
<td></td>
</tr>
<tr>
<td>Meets any specific exclusion criteria</td>
<td>Date/Time of assessment</td>
</tr>
<tr>
<td>□ Yes  □ No</td>
<td></td>
</tr>
<tr>
<td>If yes, which one(s)?</td>
<td></td>
</tr>
<tr>
<td>Decision made to administer blood?</td>
<td>Date/Time</td>
</tr>
<tr>
<td>□ Yes  □ No</td>
<td></td>
</tr>
<tr>
<td>Patient outcome at 24 hours</td>
<td>Date/Time</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Comments by Triage Team</td>
<td>Comments regarding patient and family concerns</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Triage Documentation completed by</td>
<td>Signature</td>
</tr>
<tr>
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<tr>
<td>Triage Officer Name</td>
<td>Signature</td>
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<tr>
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<tr>
<td>Follow-up</td>
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</tr>
<tr>
<td>Patient Outcome at Discharge</td>
<td>Patient Outcome at 6 months</td>
</tr>
</tbody>
</table>
Appendix F

References


Appendix G - Identification and Selection of Studies

Inclusion/Exclusion Criteria

We included studies that were 1) original reports, 2) systematic reviews or guidelines and were 3) published in English. We excluded studies that were 1) case reports or 2) abstracts. For the trauma literature, we excluded reports that were from 1) Developing countries (defined as countries outside North America and the European Union) as trauma care in those countries was deemed to be dissimilar to developed countries, 2) reports that included less than 100 patients, 3) reports published earlier than year 2000 as the care of trauma patients has advanced over the years and 4) reports of combat trauma. For the literature search for patients undergoing heart/lung/liver transplantation and patients requiring ventricular assist devices and extracorporeal membrane oxygenation, we excluded reports from 1) reports that included less than 100 patients, 2) reports published earlier than year 2000 as transplant regimens have evolved and 3) reports from the journal Transplantation Proceedings as the reports are not peer reviewed. For the literature search for obstetrical care, reports from developing countries were excluded as obstetrical care is not well developed in those countries. Summaries of included and excluded reports are illustrated in Tables 1 to 3. Table 3 summarizes reports excluded for reasons not stated above and the rationale for exclusion.

One reviewer (NS) assessed the citations for inclusion and extracted data to generate tables containing data on trial design, quality, and outcome results. Tables 1-3 describe the reports.
Table 1: Citations Reviewed

<table>
<thead>
<tr>
<th>Disease Category</th>
<th>Electronic Database</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Medline</td>
</tr>
<tr>
<td>Trauma</td>
<td>706</td>
</tr>
<tr>
<td>Trauma and Massive Bleeding</td>
<td>19</td>
</tr>
<tr>
<td>Heart and Lung Transplantation</td>
<td>1648</td>
</tr>
<tr>
<td>Heart and Lung Transplantation and Massive Bleeding</td>
<td>11</td>
</tr>
<tr>
<td>Liver Transplantation</td>
<td>2380</td>
</tr>
<tr>
<td>Liver Transplantation and Massive Bleeding</td>
<td>59</td>
</tr>
<tr>
<td>Ventricular Assist Device</td>
<td>660</td>
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<tr>
<td>Ventricular Assist Device and Massive Bleeding</td>
<td>3</td>
</tr>
<tr>
<td>Extracorporeal Membrane Oxygenation</td>
<td>465</td>
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<tr>
<td>Extracorporeal membrane oxygenation and Massive Bleeding</td>
<td>10</td>
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<tr>
<td>Ruptured Aortic Aneurysm</td>
<td>848</td>
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<tr>
<td>Ruptured Aortic Aneurysm and Massive Bleeding</td>
<td>19</td>
</tr>
<tr>
<td>Obstetrics</td>
<td>718</td>
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<tr>
<td>Obstetrics and Massive Bleeding</td>
<td>131</td>
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<tr>
<td>Gastrointestinal bleeding</td>
<td>857</td>
</tr>
<tr>
<td>Gastroenterology and Massive Bleeding</td>
<td>285</td>
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</table>

CCTR, Cochrane Clinical Trials Registry
Table 2: The Number of Reports Used to Generate Recommendations

<table>
<thead>
<tr>
<th>Disease Category</th>
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<tbody>
<tr>
<td>Trauma</td>
<td>97</td>
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<td>Trauma and Massive Bleeding</td>
<td>2</td>
</tr>
<tr>
<td>Heart Transplantation</td>
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<td>Lung Transplantation</td>
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<tr>
<td>Liver Transplantation</td>
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<tr>
<td>Liver Transplantation and Massive Bleeding</td>
<td>10</td>
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<tr>
<td>Ventricular Assist Device</td>
<td>10</td>
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<tr>
<td>Extracorporeal Membrane Oxygenation</td>
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<tr>
<td>Ruptured Aortic Aneurysm</td>
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<td>Obstetrics</td>
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<td>Gastrointestinal bleeding</td>
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Table 3: Reports Excluded After Review

<table>
<thead>
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<th>Rationale for Exclusion</th>
<th>Number</th>
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<tbody>
<tr>
<td><strong>Trauma</strong></td>
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</tr>
<tr>
<td>No predictors of mortality stated</td>
<td>5</td>
</tr>
<tr>
<td>Combined outcome of death or vegetative state</td>
<td>1</td>
</tr>
<tr>
<td>Mortality risk score development for use in studies using administrative databases</td>
<td>1</td>
</tr>
<tr>
<td>No relevant outcomes</td>
<td>2</td>
</tr>
<tr>
<td>No statistical analysis</td>
<td>2</td>
</tr>
<tr>
<td>Only assessed patients who died</td>
<td>2</td>
</tr>
<tr>
<td>Glasgow coma score used as the outcome</td>
<td>1</td>
</tr>
<tr>
<td>Systematic review of improvements necessary for prognostic models</td>
<td>1</td>
</tr>
<tr>
<td><strong>Heart Transplantation</strong></td>
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</tr>
<tr>
<td>No predictors of mortality</td>
<td>5</td>
</tr>
<tr>
<td>Predictors of survival for patients on the waiting list</td>
<td>1</td>
</tr>
<tr>
<td>Composite outcome</td>
<td>1</td>
</tr>
<tr>
<td>Compared only one predictor (age)</td>
<td>1</td>
</tr>
<tr>
<td>Risks bridging to transplantation</td>
<td>1</td>
</tr>
<tr>
<td>Risks for heart failure</td>
<td>1</td>
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<tr>
<td>Personality predictors of mortality</td>
<td>1</td>
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<tr>
<td>Risk factors of death with and without transplantation</td>
<td>1</td>
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<tr>
<td><strong>Lung Transplantation</strong></td>
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</tr>
<tr>
<td>No predictors of survival</td>
<td>5</td>
</tr>
<tr>
<td>Duplicate report</td>
<td>1</td>
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<tr>
<td>Compared only one predictor (patient volume, and graft ischemic time, HLA)</td>
<td>3</td>
</tr>
<tr>
<td>Only analyzed donor characteristics</td>
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<tr>
<td>Systematic review of predictors for “outcomes”</td>
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### Rationale for Exclusion

<table>
<thead>
<tr>
<th>Rationale for Exclusion</th>
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<tr>
<td><strong>Liver Transplantation</strong></td>
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<tr>
<td>Composite outcome of graft loss and death</td>
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<tr>
<td>Predictors of patients who can benefit from transplantation</td>
<td>1</td>
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<tr>
<td>Review of study previously published</td>
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<tr>
<td>Assessed predictors after ICU admission</td>
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<tr>
<td>Assessed predictors of no transfusion</td>
<td>1</td>
</tr>
<tr>
<td>Assessed postoperative predictors of mortality</td>
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<tr>
<td>Sample size not stated</td>
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<tr>
<td>Assessed predictors for mortality patients on the waiting list</td>
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<tr>
<td>Assessed predictors of graft survival</td>
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<tr>
<td>Patients having hepatic resection</td>
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</tr>
<tr>
<td>Effect of Aprotinin on outcomes</td>
<td>2</td>
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<tr>
<td>Economic study</td>
<td>1</td>
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<tr>
<td>Predictors of transplantation without transfusion</td>
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<tr>
<td>Assessed a behavioral scale as predictor of mortality</td>
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<tr>
<td>Assessed MELD score for non transplant mortality</td>
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<tr>
<td><strong>VAD</strong></td>
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<tr>
<td>No predictors of survival</td>
<td>7</td>
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<tr>
<td>Patient population was not a transplant population (cardiac surgery)</td>
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<tr>
<td>Only donor characteristics were analyzed</td>
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<tr>
<td>Patient group analyzed not specified</td>
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<tr>
<td>Abstract</td>
<td>1</td>
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<tr>
<td>Analyzed patients with VAD and inotropic support separately</td>
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<tr>
<td>Only predictors of inotropic support analyzed</td>
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### Emergency framework for rationing of blood for massively bleeding patients during a red phase of a blood shortage

Table 3: Reports Excluded (continued)

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<tr>
<td>ECMO</td>
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<td>Only assessed predictors of ARDS</td>
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<tr>
<td><strong>Ruptured Abdominal Aortic Aneurysm</strong></td>
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</tr>
<tr>
<td>No predictors stated</td>
<td>4</td>
</tr>
<tr>
<td>Assessed postoperative variables and mortality</td>
<td>2</td>
</tr>
<tr>
<td>Association with one variable and mortality (i.e. age/sex)</td>
<td>3(age)</td>
</tr>
<tr>
<td></td>
<td>1(sex)</td>
</tr>
<tr>
<td>Combined ruptured and elective or emergent</td>
<td>7</td>
</tr>
<tr>
<td>Compared outcomes for patients with COPD</td>
<td>1</td>
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<tr>
<td>No statistical tests used</td>
<td>1</td>
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<td><strong>Obstetrics</strong></td>
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<td>Descriptive studies</td>
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<tr>
<td>Association with one variable and mortality (age)</td>
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<tr>
<td>No predictors of mortality stated</td>
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<tr>
<td>Association between predictors and morbidity</td>
<td>2</td>
</tr>
<tr>
<td>Combined outcome of mortality and “near miss”</td>
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</table>
Table 3: Reports Excluded (continued)

<table>
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<th>Rationale for Exclusion</th>
<th>Number</th>
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</thead>
<tbody>
<tr>
<td><strong>Gastroenterology</strong></td>
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<tr>
<td>No predictors of mortality</td>
<td>7</td>
</tr>
<tr>
<td>Descriptive studies</td>
<td>11</td>
</tr>
<tr>
<td>Only one predictor assessed (age)</td>
<td>1</td>
</tr>
<tr>
<td>Composite outcome used</td>
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</tr>
<tr>
<td>Gastric cancer</td>
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<tr>
<td>Assessed association between PUD and liver cirrhosis</td>
<td>1</td>
</tr>
<tr>
<td>Case series of achalasia</td>
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<tr>
<td>No statistical tests</td>
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**Systematic Review II**

**Medline Search Terms for Gastroenterology**

1 gastrointestinal bleed$.mp. (8568)
2 gastrointestinal blood loss$.mp. (336)
3 gastrointestinal tract blood loss$.mp. (5)
4 exp Gastrointestinal Hemorrhage/ (37489)
5 gastrointestinal hemorrhage$.mp. (31115)
6 gastrointestinal haemorrhage$.mp. (917)
7 hemorrhage$, gastrointestinal.mp. (17)
8 haemorrhage$, gastrointestinal.mp. (7)
9 hematochezia$.mp. (640)
10 Hematemesis/ (1673)
11 hematemesis.mp. (2556)
12 hematemeses.mp. (48)
13 Melena/ (1603)
14 melena$.mp. (2493)
15 rectal bleed$.mp. (2095)
16 rectal blood loss$.mp. (27)
17 rectal hemangioma$.mp. (20)
18 rectum bleed$.mp. (5)
19 rectal haemorrhage$.mp. (32)
20 rectal hemorrhage$.mp. (106)
21 colon bleed$.mp. (9)
Medline Search Terms for Gastroenterology and Massive Bleeding

1 gastrointestinal bleed$.mp. (8572)
2 gastrointestinal blood loss$.mp. (336)
3 gastrointestinal tract blood loss$.mp. (5)
4 exp Gastrointestinal Hemorrhage/ (37508)
5 gastrointestinal hemorrhage$.mp. (31136)
6 gastrointestinal haemorrhage$.mp. (917)
7 hemorrhage$, gastrointestinal.mp. (18)
8 haemorrhage$, gastrointestinal.mp. (7)
9 hematochezia$.mp. (642)
10 Hematemesis/ (1674)
11 hematemesis.mp. (2558)
12 hematemeses.mp. (48)
13 Melena/ (1603)
14 melena$.mp. (2494)
15 rectal bleed$.mp. (2098)
16 rectal blood loss$.mp. (27)
17 rectal hemangiom$.mp. (20)
18 rectum bleed$.mp. (5)
19 rectal haemorrhage$.mp. (32)
20 rectal hemorrhage$.mp. (106)
21 colon bleed$.mp. (9)
22 colonic bleed$.mp. (115)
23 duodenal bleed$.mp. (70)
24 Peptic Ulcer Hemorrhage/ (6341)
25 peptic ulcer hemorrhage$.mp. (6356)
26 peptic ulcer haemorrhage$.mp. (40)
Emergency framework for rationing of blood for massively bleeding patients during a red phase of a blood shortage

27 hemorrhage$, peptic ulcer.mp. (3)
28 stomach ulcer hemorrhage$.mp. (2)
29 duodenal ulcer hemorrhage$.mp. (38)
30 duodenal ulcer haemorrhage$.mp. (9)
31 or/1-30 (43994)
32 massive blood transfusion$.mp. (253)
33 massiv$ transfus$.mp. (642)
34 massive blood loss$.mp. (378)
35 acute blood loss$.mp. (563)
36 massive blood replacement$.mp. (30)
37 whole blood transfus$.mp. (228)
38 (massive$ bleed$ adj3 patient$).mp. (160)
39 massive transfusion protocol$.mp. (20)
40 massive transfusion practice$.mp. (6)
41 large volume blood transfusion$.mp. (6)
42 large volume transfusion$.mp. (13)
43 massive bleed$.mp. (1326)
44 massive hemorrhage$.mp. (1556)
45 Blood Transfusion/ (47115)
46 Blood Component Transfusion/ (2192)
47 Erythrocyte Transfusion/ (4602)
48 Platelet Transfusion/ (3638)
49 or/45-48 (54046)
50 ((massive$ or whole) adj4 (transfus$ or replacement$)).mp. (5774)
51 50 and 49 (1458)
52 or/32-44,51 (5452)
53 52 and 31 (913)
54 limit 53 to english language (567)
55 limit 54 to case reports (282)
56 54 not 55 (285)

Medline Search Terms for Trauma

1 civilian trauma$.tw. (179)
2 exp "Wounds and Injuries"/ (574532)
3 Military Medicine/ (28722)
4 exp Naval Medicine/ (9376)
5 Military Personnel/ (19725)
6 War/ (20961)
7 iraq war, 2003 -/ (360)
8 or/3-7 (63914)
9 2 not 8 (565905)
10 1 or 9 (566029)
11 exp Mortality/ (213079)
Medline In Process Search Terms for Trauma and Massive Bleeding

1. massive blood transfus$.tw. (9)
2. massive transfus$.tw. (30)
3. massive blood loss$.tw. (15)
4. acute blood loss$.tw. (8)
5. whole blood transfus$.tw. (6)
6. (massive$ bleed$ adj3 patient$).tw. (11)
7. massive bleed$.tw. (69)
8. massive hemorrhage$.tw. (62)
9. or/1-8 (188)
10. blood transfusion$.tw. (1039)
11. blood component transfusion$.tw. (5)
12. erythrocye transfusion$.tw. (13)
13. platelet transfusion$.tw. (92)
14. or/10-13 (1139)
15. ((massive$ or whole) adj4 (transfus$ or replacement$)).tw. (76)
16. 15 and 14 (28)
17. 16 or 9 (193)
18. civilian trauma$.tw. (16)
19. trauma$.tw. (8739)
20. "Wounds and Injuries".tw. (6)
21. or/18-20 (8743)
22. Military.tw. (1129)
23. Naval Medicine.tw. (1)
24. war.tw. (1055)
25. or/22-24 (2073)
26. 21 not 25 (8519)
27. 26 and 17 (21)
Medline Search Terms for Liver Transplantation

1. Liver Transplantation/ (33822)
2. liver transplant$.tw. (29153)
3. transplant$, liver.tw. (752)
4. hepatic transplant$.tw. (898)
5. transplant$, hepatic.tw. (98)
6. graft$, liver.tw. (252)
7. liver graft$.tw. (2451)
8. Transplants/ (1384)
9. Transplantation/ (6763)
10. or/8-9 (8128)
11. Liver/ (336160)
12. or/1-7,12 (39498)
13. exp Mortality/ (212912)
14. and/13-14 (3179)
15. limit 15 to english language (2862)
16. limit 16 to case reports (482)
17. 16 not 17 (2380)

Medline Search Terms for Liver Transplantation and Massive Bleeding

1. massive blood transfusion$.tw. (247)
2. massiv$ transfus$.tw. (611)
3. massive blood loss$.tw. (370)
4. acute blood loss$.tw. (549)
5. massive blood replacement$.tw. (30)
6. whole blood transfus$.tw. (226)
7. (massive$ bleed$ adj3 patient$).tw. (148)
8. massive transfusion protocol$.tw. (17)
9. massive transfusion practice$.tw. (6)
10. large volume blood transfusion$.tw. (6)
11. large volume transfusion$.tw. (13)
12. massive bleed$.tw. (1270)
13. massive hemorrhage$.tw. (1517)
14. Blood Transfusion/ (46385)
15. Blood Component Transfusion/ (2117)
16. Erythrocyte Transfusion/ (4435)
17. Platelet Transfusion/ (3561)
18. or/14-17 (53054)
19. ((massive$ or whole) adj4 (transfus$ or replacement$)).mp. (5691)
20. 18 and 19 (1413)
21. or/1-13,20 (5295)
Medline Search Terms for Heart and Lung Transplantation

1. Heart Transplantation/ (25081)
2. Heart-Lung Transplantation/ (1767)
3. cardiac transplant$.tw. (7355)
4. transplant$, cardiac.tw. (148)
5. heart transplant$.tw. (13048)
6. transplant$, heart.tw. (778)
7. graft$, heart.tw. (61)
8. heart-lung transplant$.tw. (1545)
9. transplant$, heart-lung.tw. (15)
10. graft$, heart-lung.tw. (0)
11. or/1-10 (30168)
12. Transplants/ (1384)
13. Transplantation/ (6763)
14. or/12-13 (8128)
15. Heart/ (108165)
16. (heart adj2 lung).tw. (11378)
17. or/15-16 (118537)
18. 17 and 14 (130)
19. or/11,18 (30255)
20. exp Mortality/ (212912)
21. 19 and 20 (2207)
22. limit 21 to (english language and humans) (1927)
23. limit 22 to case reports (279)
24. 22 not 23 (1648)

Medline Search Terms for Lung Transplantation

1. Lung Transplantation/ (9057)
Medline Search Terms for Heart and Lung Transplantation and Massive Bleeding

1 massive blood transfusion$.tw. (247)
2 massiv$ transfus$.tw. (611)
3 massive blood loss$.tw. (370)
4 acute blood loss$.tw. (549)
5 massive blood replacement$.tw. (30)
6 whole blood transfus$.tw. (226)
7 (massive$ bleed$ adj3 patient$).tw. (148)
8 massive transfusion protocol$.tw. (17)
9 massive transfusion practice$.tw. (6)
10 large volume blood transfusion$.tw. (6)
11 large volume transfusion$.tw. (13)
12 massive bleed$.tw. (1270)
13 massive hemorrhage$.tw. (1517)
14 Blood Transfusion/ (46385)
15 Blood Component Transfusion/ (2117)
16 Erythrocyte Transfusion/ (4435)
17 Platelet Transfusion/ (3561)
18 or/14-17 (53054)
19 ((massive$ or whole) adj4 (transfus$ or replacement$)).mp. (5691)
20 18 and 19 (1413)
21 or/1-13,20 (5295)
22 Heart Transplantation/ (24622)
Emergency framework for rationing of blood for massively bleeding patients during a red phase of a blood shortage

Medline Search Terms for Ruptured Aortic Aneurysm

1 exp Mortality/ (212912)
2 Aortic Aneurysm, Abdominal/ (9872)
3 abdominal aortic aneurysm$.tw. (9129)
4 aortic aneurysm$, abdominal.tw. (10)
5 aneurysm$, abdominal aortic.tw. (11)
6 or/2-5 (12766)
7 6 and 1 (1184)
8 limit 7 to english language (1035)
9 limit 8 to case reports (187)
10 8 not 9 (848)

Medline Search Terms for Ruptured Aortic Aneurysm and Massive Bleeding

1 massive blood transfusion$.tw. (247)
2 massiv$ transfus$.tw. (611)
3 massive blood loss$.tw. (370)
4 acute blood loss$.tw. (549)
5 massive blood replacement$.tw. (30)
6 whole blood transfus$.tw. (226)
7 (massive$ bleed$ adj3 patient$).tw. (148)
8 massive transfusion protocol$.tw. (17)
9 massive transfusion practice$.tw. (6)
10 large volume blood transfusion$.tw. (6)
Medline Search Terms for Obstetrics

1 massive blood loss$.tw. (378)
2 acute blood loss$.tw. (563)
3 (massive$ bleed$ adj3 patient$).tw. (160)
4 massive bleed$.tw. (1326)
5 massive hemorrhage$.tw. (1556)
6 exp Hemorrhage/ (197818)
7 hemorrhage$.mp. (175553)
8 haemorrhage$.mp. (22516)
9 bleed$.mp. (101691)
10 or/1-9 (295986)
11 exp Mortality/ (213079)
12 Mothers/ (18584)
13 mother$.mp. (126700)
14 maternal$.mp. (171567)
15 or/12-14 (254417)
16 11 and 10 and 15 (1528)
17 exp Carcinoma/ (392867)
18 exp Neoplasms/ (2078572)
19 or/17-18 (2078572)
20 16 not 19 (1492)
21 limit 20 to case reports (110)
22 20 not 21 (1382)
23 limit 22 to english language (1135)
24 from 23 keep 1-100 (100)
25 neonate mortality.mp. (8)
Medline Search Terms for Obstetrics and Massive Bleeding

1 massive blood transfusion$.tw. (247)
2 massiv$ transfus$.tw. (611)
3 massive blood loss$.tw. (370)
4 acute blood loss$.tw. (549)
5 massive blood replacement$.tw. (30)
6 whole blood transfus$.tw. (226)
7 (massive$ bleed$ adj3 patient$).tw. (148)
8 massive transfusion protocol$.tw. (17)
9 massive transfusion practice$.tw. (6)
10 large volume blood transfusion$.tw. (6)
11 large volume transfusion$.tw. (13)
12 massive bleed$.tw. (1270)
13 massive hemorrhage$.tw. (1517)
14 Blood Transfusion/ (46385)
15 Blood Component Transfusion/ (2117)
16 Erythrocyte Transfusion/ (4435)
17 Platelet Transfusion/ (3561)
18 or/14-17 (53054)
19 ((massive$ or whole) adj4 (transfus$ or replacement$)).mp. (5691)
20 18 and 19 (1413)
21 or/1-13,20 (5295)
22 Obstetrics/ (13026)
23 obstetric$.tw. (51232)
24 exp Obstetric Surgical Procedures/ (86979)
25 obstetric$ surgical procedure$.tw. (11)
26 obstetric$ surger$.tw. (248)
27 procedure$, obstetric$ surgical.tw. (0)
28 surgical procedure$, obstetric$.tw. (1)
29 surger$, obstetric$.tw. (83)
30 exp Pregnancy Complications/ (274045)
31 or/22-30 (362539)
32 21 and 31 (398)
33 limit 32 to english language (248)
34 limit 33 to case reports (117)
35 33 not 34 (131)
Medline Search for Extracorporeal Membrane Oxygenation

1 Extracorporeal Membrane Oxygenation/ (3581)
2 Extracorporeal Membrane Oxygenat$.mp. (4331)
3 oxygenat$, extracorporeal membrane.mp. (5)
4 membrane oxygenat$, extracorporeal.mp. (9)
5 ECMO.mp. (2104)
6 or/1-5 (4489)
7 exp Mortality/ (215587)
8 6 and 7 (616)
9 limit 8 to english language (584)
10 limit 9 to case reports (119)
11 9 not 10 (465)

Medline Search for Ventricular Assist Device

1 Heart-Assist Devices/ (6089)
2 heart assist device$.mp. (6130)
3 vascular assist device$.mp. (1)
4 vascular assist pump$.mp. (0)
5 heart assist pump$.mp. (3)
6 left ventric$ assist device$.mp. (2138)
7 LVAD.mp. (1115)
8 ventric$ assist device$.mp. (3608)
9 artificial ventric$.mp. (111)
10 (artificial adj1 ventric$).mp. (119)
11 ventric$, artificial.mp. (9)
12 artificial heart ventric$.mp. (27)
13 exp Assisted Circulation/ (10960)
14 assist$ circulation.mp. (3274)
15 circulation, assist$.mp. (20)
16 (assist$ adj circulation).mp. (3274)
17 or/1-16 (11659)
18 exp Mortality/ (218784)
19 17 and 18 (843)
20 limit 19 to english language (779)
21 limit 20 to case reports (119)
22 20 not 21 (660)
Appendix H– References Used to Generate Recommendations

The information used from the references that will be listed in this appendix is currently being reviewed to confirm accuracy of the data extraction/review that was conducted.