Blood Shortage Management: A Shared National, Provincial and Local Responsibility

March 5, 2019
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Disclosures

• No financial conflicts to disclose
Learning Objectives

1. Explain the key elements of the national plan for management of blood shortages
2. Describe the key elements of provincial and hospital contingency plans for managing blood shortages
3. Apply the principles of rationing red cells for massively bleeding patients during a critical red cell shortage
4. Identify lessons learned from recent blood shortages and exercises
Case Scenario

• Canada is currently in a Red Phase of a red blood cell (RBC) shortage
• Multiple patients present to your hospital and your RBC stocks are critically low, with enough likely to support one of these patients only
• Which of the following patients will be transfused as part of their therapy?...
1. Transfusion dependent aplastic anemia patient age 12. PLT 17 and Hb 76
2. Male staff member age 56 with ruptured AAA found without pulse or BP in hospital parking lot
3. Female pedestrian age 25 struck by car, unconscious, bleeding 100 mL/min from head wound, partial amputation of leg, distended abdomen suggestive of internal bleeding
4. Male age 63 on the organ transplant waiting list for 5 years, deceased donor organ available
Red Cell Issues in Canada (CBS)
RBC Demand Growth
Predicting a Blood Shortfall

Fig. 5. Projected blood demand and supply: Ontario, 2008 through 2036. (●) Hospital transfusions (demand); (▲) Ontario donations shipped (supply).
## Blood Shortage - Causes

<table>
<thead>
<tr>
<th>Event</th>
<th>↑ Demand</th>
<th>↓ Supply</th>
</tr>
</thead>
<tbody>
<tr>
<td>Natural disaster (fire, flood, winter storm)</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Man-made disaster (industrial accident)</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Pandemic outbreak</td>
<td>?</td>
<td>✓</td>
</tr>
<tr>
<td>Power outage</td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Mass casualty/trauma, one massive transfusion</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Inventory stockpiling</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Manufacturing failure/delay</td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Labour disruption</td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Transportation disruption</td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>seasonal</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

Source: Alberta Blood Contingency Plan 2015
The National Plan

THE NATIONAL PLAN FOR MANAGEMENT OF SHORTAGES OF LABILE BLOOD COMPONENTS

NATIONAL ADVISORY COMMITTEE ON BLOOD & BLOOD PRODUCTS & CANADIAN BLOOD SERVICES

National Advisory Committee on Blood and Blood Products
Comité consultatif national sur le sang et les produits sanguins

Canadian Blood Services
it’s in you to give

2015 October 7
Purpose of the National Plan

- To maximize the effectiveness of a national response to any crisis which impacts the adequacy of the blood supply in Canada
- To provide a framework for provinces/territories, and hospitals/regional health authorities to create their own plans to ensure consistent and equitable allocation of scarce blood resources
- To recommend a proactive approach to inventory management
- The Plan applies to blood components however, the principles could be applied to blood products also
The National Plan

• Assumes:
  – all efforts to increase the available supply have been exceeded
  – allocation of available scarce supply is based on ethical principles
  – Legal liability concerns are acknowledged
  – all areas served by CBS affected about equally
  – close collaboration between jurisdictions and with Héma-Québec
The National Plan

Structure:

1. Inventory levels defined by ‘Phases’
   - **Green phase** is optimum
   - **Green phase advisory** was introduced in 2014 to indicate that blood stocks are less than optimum but not yet Amber and recovery is anticipated within a relatively short time period
   - **Amber phase** implies supply is insufficient to continue with routine practices and hospitals will need to reduce blood use
   - **Red phase** implies blood inventory is critically low and insufficient to support use for even non-elective indications and may need to preserved for life-threatening need only

2. Key Participant Roles and Responsibilities
   - CBS
   - CBS P/T BLC and Ministries of Health
   - National Advisory Committee
   - Hospitals/Regional Health Authorities
# Inventory Levels

<table>
<thead>
<tr>
<th>RBC Inventory level</th>
<th>CBS Days on Hand</th>
<th>CBS # Units on hand</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Green Phase</strong> (minimal decrease to optimal)</td>
<td>&gt; 72 hours</td>
<td>&gt; 8,322</td>
</tr>
<tr>
<td><strong>Amber Phase</strong> (serious)</td>
<td>48-72 hours</td>
<td>5,548-8,322</td>
</tr>
<tr>
<td><strong>Red Phase</strong> (critical)</td>
<td>&lt; 48 hours</td>
<td>&lt; 5,548</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Platelet Inventory Level</th>
<th>% of National Daily Requirement (# of doses)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Green Phase</strong> (minimal decrease to optimal)</td>
<td>80 – 100% (&gt; 259)</td>
</tr>
<tr>
<td><strong>Amber Phase</strong> (serious)</td>
<td>25-79%, recovery NOT expected within 12-24 hours (81-259)</td>
</tr>
<tr>
<td><strong>Red Phase</strong> (critical)</td>
<td>&lt; 25%, recovery NOT expected within 12-24 hours (&lt; 81)</td>
</tr>
</tbody>
</table>
National Emergency Blood Management Committee (NEBMC)

• Chaired by the Chair of National Advisory Committee on Blood and Blood Products (NAC), currently Dr. Jennifer Fesser of Charlottetown, PEI
• CBS Supply Chain and Medical, Government relations and Communications representatives
• All NAC members (see www.nacblood.ca)
• All provincial/territorial blood representatives (P/T)
• Two patient representatives: past or present recipient and a representative from a national patient society
• Ex-officio: Québec Ministry, Héma-Québec, Health Canada
GUIDELINES FOR USE BY PHASE
<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>Follow your hospital/RHA guidelines</td>
<td>Follow your hospital/RHA guidelines</td>
</tr>
<tr>
<td><strong>Follow your hospital/RHA guidelines</strong></td>
<td></td>
<td>Follow triage/rationing allocation framework if instructed by NEBMC</td>
</tr>
<tr>
<td><strong>Surgery/Obstetrics</strong></td>
<td>Urgent and emergency 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 NEBMC</td>
</tr>
<tr>
<td><strong>Follow your hospital/RHA guidelines</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Non-Surgical Anemias</strong></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>
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 $&gt;10 \times 10^9/L$. For head trauma or CNS bleeding maintain a PC $&gt;100 \times 10^9/L$. Other significant bleeding, or acute promyelocytic leukemia at acute presentation, maintain a PC $&gt;50 \times 10^9/L$.</td>
<td>For head trauma or CNS bleeding maintain a PC $&gt;80 \times 10^9/L$.</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 $&gt;20 \times 10^9/L$ (central venous catheter insertion, paracentesis, thoracentesis). For lumbar maintain a PC $&gt;50 \times 10^9/L$. For CNS surgery maintain a PC $&gt;100 \times 10^9/L$.</td>
<td>Urgent and emergency surgery in consultation with H/RBEMC. In presence of active bleeding or surgical procedure maintain a PC $&gt;50 \times 10^9/L$ or if CNS trauma/surgery PC $&gt;80 \times 10^9/L$.</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 $10 \times 10^9/L$ for prophylactic platelet transfusions.</td>
<td>Adhere to a maximum threshold PC of $10 \times 10^9/L$. For prophylactic platelet transfusions, consider lowering this threshold for routine prophylactic transfusions to $5 \times 10^9/L$.</td>
<td>Eliminate all prophylactic transfusions.</td>
</tr>
<tr>
<td>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 $&gt;10 \times 10^9/L$ must be reviewed by designated medical personnel. Split PC doses and use half doses in non-bleeding patients if necessary.</td>
<td></td>
<td>All requests for platelet transfusions in non-bleeding patients must be reviewed by designated medical personnel.</td>
</tr>
</tbody>
</table>
Provincial/Territorial Emergency Blood Management Committees

• Minister of Health to establish this committee with a responsibility to:
  – Develop a jurisdictional plan for the management of blood shortages consistent with the National Plan
  – Act as a conduit of communication between NEBMC and hospitals
  – Manage non-adherence to requests to reduce blood use
Hospital Emergency Blood Management Committees

- Senior or executive management representation
- Medical Director of Transfusion Service
- Multidisciplinary physician representation
- Nursing
- Transfusion Service manager, safety officer
- Risk manager, Communications...
Responsibilities of Hospitals

- Develop Emergency Blood Management Plan
- Communication plan: who is to be notified and how
  - Physicians, nurses, administration, technologists, risk management, public relations, and their delegates
- Plan for stepwise reduction in blood use
  - Including deferral/cancellation of surgery/transfusion
- Documentation of decisions
- Redistribution plans with area hospitals
- Plan for managed Recovery Phase
<table>
<thead>
<tr>
<th>Phase</th>
<th>Inventory Level</th>
<th>Hospital Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Green</td>
<td>Normal</td>
<td>• Practice good blood management, develop plan</td>
</tr>
<tr>
<td>Amber</td>
<td>Reduction of inventory by up to 50%</td>
<td>• Reduce inventory held by 50%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Initiate internal communication</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Emergency blood management committee (EBMC) meets</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Triage blood requests</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Review elective OR cases, consider deferral</td>
</tr>
<tr>
<td>Red</td>
<td>Shortage is severe and anticipated to be prolonged</td>
<td>• Reduce inventory to critical levels</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Initiate heightened internal communication</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• EBMC meets and initiate plan for reduction of blood use</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Blood issued only for life threatening need</td>
</tr>
<tr>
<td>Recovery</td>
<td>Supplier inventory improves</td>
<td>• Ensure return to normal operations occurs at a gradual and controlled pace</td>
</tr>
</tbody>
</table>
# Summary of Actions

## Summary Table: Actions to be Taken During Phases of Blood Shortage

<table>
<thead>
<tr>
<th>Phase</th>
<th>Canadian Blood Services (CBS)</th>
<th>Ministry of Health and Long-Term Care (MOH/LTC)</th>
<th>Hospital</th>
</tr>
</thead>
</table>
| **Green (Includes Green Phase Advisory)** | - All hospital orders as requested  
- Practice effective management of national blood component inventories  
- Review and revise plans to be used during blood shortages  
- Collaborate in planning and participate in national/provincial blood shortage exercises | - Chair the Ontario Emergency Blood Management Committees (OEBMC)  
- Through OEBMC, establish a link to the Ontario Plan and Toolkit to support development of provincial emergency blood management plans  
- Assign staff to blood shortage exercises | - Report hospital inventory to CBS (blood as web-based reporting)  
- Practice effective blood utilization  
- Define inventory levels for all phases  
- Establish and maintain Hospital Emergency Blood Management Committee (HEBMC)  
- Maintain and train staff to Hospital Emergency Blood Management Plan (HEBMP)  
- Participate in blood shortage exercises |
| **Amber** | - Notify hospital Transfusion Services by fax/email/text of Amber Phase  
- Communicate regularly with hospital transfusion services regarding inventory status, using defined protocols (conference calls, fax)  
- Coordinate and oversee media announcements regarding the blood supply and any call for donations as required | - Notify OEBMC/Scarlet when needed  
- Monitor and review key messages and updates from CBS/NEMDC  
- Establish and maintain communication with non-compliant hospitals  
- Review hospital inventory and compliance with reducing demand for blood (coordinate/operate through data provided by CBS)  
- Lead communication to hospitals and the public about potential impact to patient care | - Activate HEBMP for Amber Phase  
- Notify internal hospital staff  
- Report hospital inventory levels to CBS  
- Participate in CBS conference calls  
- Reduce target for ordering inventory to Amber level  
- Consider deferral of elective procedures requiring blood (discuss deferral decisions if shortage is prolonged)  
- Follow recommendations received from ONHPC/OEMMSC |
| **Red** | - Notify hospital Transfusion Services by fax/email/text of Red Phase  
- Communicate regularly with hospital transfusion services regarding inventory status, using defined protocols (conference calls, fax)  
- Coordinate and oversee media announcements regarding the blood supply and any call for donations as required | - Convene OEBMC  
- Notify OEBMC/Scarlet when needed  
- Monitor and review key messages and updates from CBS/NEMDC  
- Establish and maintain communication with non-compliant hospitals  
- Activate the Ministry Emergency Operations Centre (MEMO/C)  
- Lead communication to hospitals and the public through MEMO/C regarding impact to patient care | - Activate HEBMP for Red Phase  
- Notify internal hospital personnel  
- Convene HEBMC  
- Report hospital inventory levels to CBS  
- Participate in CBS conference calls  
- Reduce target for ordering inventory to Red level  
- Implement triage, triage and triage all requests for blood according to HEBMP  
- Document deferrals regarding elective procedures, deferral decisions if blood is needed  
- Follow recommendations received from ONHPC/OEMMSC |
| **Recovery** | - Notify hospital Transfusion Services via fax/email/text of Recovery Phase  
- Notify other hospitals/districts with surplus inventory to allow hospital inventories to return to optimal levels  
- Develop and report on NEMDC | - Monitor and review key messages and updates from CBS/NEMDC  
- Assemble CBS as needed in monitoring hospital recovery  
- Review event with OEBMC and report to OEBMC | - Notify internal hospital personnel  
- Increase blood usage, activity, activity and increase inventory levels gradually  
- Elective elective procedures gradually as blood inventory levels may be unable to returning to shortage during recovery period  
- Review event and report to OEBMC as directed |

**Version 5: October 31, 2018**

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www.transfusionontario.org
Green Phase is a busy time at hospitals…

1. Establish functioning Transfusion Committee, EBMC, Triage Team for Red Phase of a red cell shortage
2. Implement transfusion guidelines, monitor adherence to them, and scrutinize out-of-guideline orders
3. Establish blood conservation strategies
4. Establish inventory management policies, including inventory levels for all phases of a blood shortage
5. Minimize wastage of blood components/products
6. Report inventory levels and disposition data to CBS
   • ideally this is done regularly and by ABO/Rh
7. Develop appropriate redistribution mechanisms
8. Run or participate in simulation exercises. Review and revise plan as required
So is Recovery Phase...

1. Blood inventory levels are increasing, and are expected to remain at levels that allow for the resumption of transfusion

2. **Slowly** increase inventory, resume surgery/transfusion, and replenish emergency inventory to affected sites

3. This is the phase that has the **highest risk** for conflicting messages

4. A rapid increase in demand may shift the situation back into shortage
Inventory Management

- Web-based reporting to CBS of hospital inventory and disposition data has been available since May 12, 2014
- Hospitals are asked to report by ABO/Rh where applicable
- The minimum data elements required to calculate the Inventory Index:
  - Average daily red cell demand (ADRD) can be determined by hospital, by province, by CBS nationally (annually divide by 365 days)
  - Red cell demand = transfused + outdated + wasted
  - Actual inventory

Inventory Index = Inventory (on a given day) ÷ ADRD
# Inventory Index Calculation

<table>
<thead>
<tr>
<th>Calculation step</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hospital totals all RBC transfused, outdated and wasted for the past 12 months = average yearly RBC demand</td>
<td>3650</td>
</tr>
<tr>
<td>Hospital divides by 365 to calculate average daily RBC demand (ADRD)</td>
<td>3650/365=10</td>
</tr>
<tr>
<td></td>
<td>ADRD=10</td>
</tr>
<tr>
<td>Hospital notes average total inventory</td>
<td>90 units</td>
</tr>
<tr>
<td>Inventory Index = Inventory/ADRD</td>
<td>90/10=9</td>
</tr>
<tr>
<td></td>
<td>Hospital Inventory Index=9</td>
</tr>
</tbody>
</table>
Blood Component and Product Disposition System

The Blood Component and Product Disposition System is a web-based application developed by Canadian Blood Services for hospitals to share disposition data for blood components and plasma protein products (including solvent/detergent treated plasma). The system also provides an opportunity for hospitals to input data on blood component inventory; important information used in contingency planning.
Hospital Average Daily Red Cell Demand
(transfused+outdated+wasted/365)
Sourced from disposition data provided by hospitals

C. Doncaster, Utilization, Canadian Blood Services
Total National Inventory RBC
CBS = 25,372 U
Hospitals = 24,994 U
(86% of hospitals reporting)
Total (CBS+hosp) = 50,366

National II = 11.88
Provincial II = 10.42 to 13.4

Slide credit C. Doncaster, CBS
Example Hospital

The inventory lines may move. “Lean” Inventory Index is 6-8.
The following table provided by CBS is an example of how the Inventory Index might represent actual hospital inventory and a corresponding inventory phase. The calculations are based on actual 2015-2016 hospital disposition data and a calculated ADRD of 2056 red cell units.

Calculated ADRD = 2056 red cell units

<table>
<thead>
<tr>
<th>National Number Units - Hospitals</th>
<th>Inventory Index</th>
<th>Phase – <em>not yet determined, presented for consideration and reference only</em></th>
</tr>
</thead>
<tbody>
<tr>
<td>25,000</td>
<td>12.16</td>
<td>Green</td>
</tr>
<tr>
<td>20,000</td>
<td>9.73</td>
<td>Green</td>
</tr>
<tr>
<td>19,000</td>
<td>9.24</td>
<td>Green</td>
</tr>
<tr>
<td>18,000</td>
<td>8.75</td>
<td>Green</td>
</tr>
<tr>
<td>17,000</td>
<td>8.27</td>
<td>Green</td>
</tr>
<tr>
<td>16,000</td>
<td>7.78</td>
<td>Green Advisory</td>
</tr>
<tr>
<td>15,000</td>
<td>7.30</td>
<td>Green Advisory</td>
</tr>
<tr>
<td>14,000</td>
<td>6.81</td>
<td>Amber</td>
</tr>
<tr>
<td>10,000</td>
<td>4.86</td>
<td>Red</td>
</tr>
<tr>
<td>5,000</td>
<td>2.43</td>
<td>Red</td>
</tr>
</tbody>
</table>

[https://www.nacblood.ca/resources/shortages-plan/index.html](https://www.nacblood.ca/resources/shortages-plan/index.html)
“Red Line” Inventory in Rural Sites

• Needs discussion at hospital and provincial levels
• Balance risk between holding inventory ‘just in case’ at rural sites with denying blood to a patient in another site due to lack of inventory
“Red Line” Inventory in Rural Sites

For example, in 73 Ontario small hospitals

<table>
<thead>
<tr>
<th></th>
<th>O positive RBC</th>
<th>O negative RBC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Green phase</td>
<td>404</td>
<td>303</td>
</tr>
<tr>
<td>Red phase</td>
<td>163</td>
<td>147</td>
</tr>
</tbody>
</table>

Some other groups are also stocked in 21 hospitals in the central and southwest regions of the province.

Small = fewer than 100 beds

Slide credit: T. Cameron, ORBCoN
National Emergency Framework

For treating massively bleeding patients in a Red Phase blood shortage
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

2012-04-14

Approved by CBS Provincial/Territorial Blood Liaison Committee January 2012

www.nacblood.ca
Purposes of the Emergency Framework

• To guide health care professionals in triaging patients requiring massive transfusion during a red phase blood shortage
  – when demand for blood greatly exceeds supply
  – when all other measures to increase the blood supply have been exhausted

• To standardize care across jurisdictions

• To allow for fair and just distribution of blood

• Massive transfusion: one blood volume/24 hr, half blood volume/3 hr, ≥ 4U RBC/1 hr
massive transfusion?

general exclusion criteria

is there enough?

> 1 eligible patient?

supplemental Inclusion criteria

specific exclusion criteria

re-assess q24h/q10U
Triage Tool – General Exclusion Criteria

- Severe burns with
  - Age > 60 yrs, or > 60% body surface affected, or
  - Inhalation injury requiring mechanical ventilation
- Cardiac arrest
- Advanced progressive baseline cognitive impairment
- Metastatic cancer with life expectancy < 6 mo.
- Immunocompromised, advanced and irreversible
- Acute neurological condition, severe and irreversible
- End-stage organ failure (with certain criteria)
Specific Exclusion Criteria

- Trauma
- Ruptured AAA
- ECMO/VAD
- Organ transplantation
- Gastroenterology
- Obstetrics
- Other massively bleeding patients
Specific Exclusion Criteria - Trauma

1. Non-survivable brain injury
2. GCS=3 with irreversible hypotension and fixed and dilated pupils
3. After brain death, for organ transplantation
4. Penetrating cranial trauma and GCS=3, non-reversible
5. Penetrating cranial trauma and GCS<8, non-reversible, with hypotension and severe thoracoabdominal trauma
Specific Exclusion Criteria - Trauma

6. Blunt trauma and GCS=3, non-reversible
7. Blunt trauma with loss of vital signs pre-hospitalization
8. Transcranial gunshot injury
9. Age >65 with severe brain injury, profound shock, severe thoracic or abdominal trauma
10. Age >75 and moderate brain injury and GCS <12 and profound shock and thoracoabdominal injury
Specific Exclusion Criteria
Ruptured AAA

1. Pre-operative cardiac arrest
2. Systolic blood pressure <70 mmHg unresponsive to fluids, with loss of consciousness
3. Do not meet criteria for emergent vascular repair
Specific Exclusion Criteria
Organ Transplantation

• Deceased donor recovery should proceed, but without transfusion of the deceased donor in the process of stabilization
• Deceased donor transplantation should proceed with informed consent regarding increased risk from restriction of transfusion or possible unavailability of blood
• Living donor transplantation should be deferred
Specific Exclusion Criteria
Obstetrics and Other

- Transfusion should not be withheld from bleeding obstetrical patients
- Other patients not included in the above exclusion criteria: do not transfuse if the Triage Team believes the mortality rate to exceed 80%
Supplemental Inclusion Criteria and Re-evaluation of Transfused Patients

1. Youngest first
2. Highest likelihood of hemostatic control
3. First-come first-served

Then, re-evaluate according to assessment criteria for triaged patients:
1. Every 24 hours
2. Every 10 units of RBC, or as determined by NEBMC
How do I deal with this??

...what is the risk of liability?...
Legal Considerations

National Plan

• The National Plan recognizes the potential for legal activity on behalf of patients denied blood

• It is recommended that the Plan undergo legal/risk management review at participating institutions

• It is hoped that the existence of the Plan will assist hospitals and physicians to make the most appropriate medical (and hence legal) decisions
Legal Considerations
Emergency Framework/Triage Tool

• There is an altered standard of care during a Red Phase, when access is limited by supply
• Patients must have access to all other available therapies short of transfusion
• Providers who use the Triage Tool competently and in good faith should not be found negligent for decisions dictated by it
• Careful record-keeping of decisions will be of paramount importance (use of triage forms)
Documentation of Blood Orders (non-surgery) During a Blood Shortage

**Instructions for completion:** Record all orders, indicate if order was filled, reduced or deferred. Use the comment field to note any remarkable events including blood group substitutions if ABO/Rh type specific blood is not available. Use new page each day.

<table>
<thead>
<tr>
<th>CBS Notification Phase:</th>
<th>Green Advisory</th>
<th>Amber</th>
<th>Red</th>
<th>Recovery</th>
</tr>
</thead>
</table>

**Blood Component:**

**Date of notification of blood shortage received:**

<table>
<thead>
<tr>
<th>Patient name/ID &amp; location</th>
<th>Products ordered</th>
<th>Time</th>
<th>Products issued</th>
<th>Relevant laboratory results (e.g. hgb, plt)</th>
<th>Comments - alternative therapy or adverse events</th>
</tr>
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Validation of Emergency Framework

• Done as part of the 2013 National Plan validation exercise
• Study sites:
  – Royal Columbian Hospital, BC
  – Sunnybrook Health Sciences Centre, ON
  – Alberta Health Services – Edmonton, AB
• Nov 14-18 2013 all patients in whom a massive hemorrhage was identified evaluated for:
  – fulfillment of triage stopping criteria for the particular clinical situation
  – total number of RBC units transfused
  – survival outcomes
Results and Conclusions

- Only one of six met ‘stopping’ criteria
- Of the two ruptured AAA neither met stopping criteria, they used 8 and 29 units of RBC and both died within 24 hours
- Simulation exercises of longer duration are needed
- Maybe the ruptured AAA stopping criteria can be revised
Lessons Learned
From actual events and simulation exercises
Lessons from Simulation Exercises

• Several provinces have completed simulation exercises
• Some common themes in the reports
  • Communication roll-out
  • Maintenance of up-to-date contact lists
  • Definition of optimal inventory
  • Staff training on the hospital EBMP
  • Processes for recovery phase
  • Who will triage orders, and be clear on the guidelines
  • Documentation of transfusion deferrals
  • Timely reporting of inventory levels to CBS
## Ontario Exercises Improvement

<table>
<thead>
<tr>
<th>Recommendation</th>
<th>2010 %</th>
<th>2014 %</th>
<th>2018 %</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hospital plans should be finalized</td>
<td>92</td>
<td>94</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Staff should be trained on blood shortage plans</td>
<td>57</td>
<td>82</td>
<td></td>
<td></td>
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<tr>
<td>Processes for redistribution should be in place</td>
<td>58</td>
<td>79</td>
<td></td>
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<tr>
<td>A hospital committee should be in place to manage blood shortages</td>
<td>65</td>
<td>66</td>
<td></td>
<td>Some smaller hospitals don’t have a separate committee but use an existing committee such as the Transfusion Committee</td>
</tr>
<tr>
<td>Hospitals should report their inventory to CBS when requested</td>
<td>64</td>
<td>47</td>
<td>86</td>
<td></td>
</tr>
<tr>
<td>Deferral of any transfusion/surgery should be documented</td>
<td>3</td>
<td>63</td>
<td>85</td>
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</tbody>
</table>
Lessons from a “Near Miss”

Ontario 2014-2015

• Ontario Public Service Employees Union in strike position January 2015, affecting Ottawa and Brampton CBS sites (collection, processing, delivery affected)
• Situation lasted from 24 Dec 2014 to 29 Jan 2015
• Ontario EBMC met several times
• CBS held multiple teleconferences with hospitals
• Hospitals were asked to increase inventories of RBC, frozen products and plasma protein products
Lessons from a “Near Miss”

Ontario 2014-2015

• Issues:
  • Use of ‘hub’ hospitals for redistribution of inventory, associated costs
  • What to do about platelets?
    • Revise the guideline? Splitting doses?
  • Role of CBS in equitable distribution of inventory
  • Hospital reporting of inventory to CBS is critical
  • Level of engagement was very high
  • Resulted in a ‘spike’ in products discarded due to outdated in January/February 2015
Provincial Red Cell Utilization

Ontario RBC_ALL Component Disposition FY 2013/14 - 2015/16

- **2013-14**
  - Tx = 394084
  - Outdate Rate = 2428 (0.6%)
  - Dis_Other = 3215 (0.8%)

- **2014-15**
  - Tx = 370035
  - Outdate Rate = 3395 (0.9%)
  - Dis_Other = 3039 (0.8%)

- **2015-16**
  - Tx = 362380
  - Outdate Rate = 2486 (0.7%)
  - Dis_Other = 3177 (0.9%)
Cryoprecipitate shortage 2018/19

• 2018-12-27 NEBMC meets to discuss situation
• 2018-12-28 OEBMC meets to discuss
• Hospitals informed of Green Advisory phase for cryo (Ontario technically in Amber phase)
• Ontario uses 80% of cryo produced
Cryoprecipitate shortage 2018/19

- Large academic centres in Ontario all agree to switch to FC as a replacement for cryo
- Allowed CBS to move to recovery phase
- Allowed recovery to be planned
- Ended 2019-02-01
Lessons Learned

• Communication plan worked
• Collaboration resulted in solution and recovery
• Use of new Ministry web-based tool recently tested in blood shortage simulation exercise
• Where alternative products are available, hospitals should be ready to implement
Back to the Case Scenario
Case Scenario

- Canada is currently in a Red Phase of a red blood cell (RBC) shortage
- Multiple patients present to your hospital and your RBC stocks are critically low, with enough likely to support one of these patients only
- Which of the following patients will be transfused as part of their therapy?...
Case Scenario

1. Transfusion dependent aplastic anemia patient age 12. PLT 17 and Hb 76
2. Male staff member age 56 with ruptured AAA found without pulse or BP in hospital parking lot
3. Female pedestrian age 25 struck by car, unconscious, bleeding 100 mL/min from head wound, partial amputation of leg, distended abdomen suggestive of internal bleeding
4. Male age 63 on the organ transplant waiting list for 5 years, deceased donor organ available
Case Scenario

1. Transfusion dependent aplastic anemia patient age 12. PLT 17 and Hb 76

2. Male staff member age 56 with ruptured AAA found without pulse or BP in hospital parking lot

3. Female pedestrian age 25 struck by car, unconscious, bleeding 100 mL/min from head wound, partial amputation of leg, distended abdomen suggestive of internal bleeding

4. Male age 63 on the organ transplant waiting list for 5 years, deceased donor organ available

1. Hb > 70 g/L
Case Scenario

1. Transfusion dependent aplastic anemia patient age 12. PLT 17 and Hb 76
2. Male staff member age 56 with ruptured AAA found without pulse or BP in hospital parking lot
3. Female pedestrian age 25 struck by car, unconscious, bleeding 100 mL/min from head wound, partial amputation of leg, distended abdomen suggestive of internal bleeding
4. Male age 63 on the organ transplant waiting list for 5 years, deceased donor organ available

2. Ruptured AAA with preoperative cardiac arrest
Case Scenario

3. Meets trauma criteria for receipt of RBC: transfuse and re-assess

3. Female pedestrian age 25 struck by car, unconscious, bleeding 100 mL/min from head wound, partial amputation of leg, distended abdomen suggestive of internal bleeding

4. Male age 63 on the organ transplant waiting list for 5 years, deceased donor organ available
Case Scenario

4. Deceased donor organ harvested without transfusion of donor; transplant may proceed but without RBC transfusion, informed consent to state this

4. Male age 63 on the organ transplant waiting list for 5 years, deceased donor organ available
Thanks to

• Allison Collins, Chair, Ontario Contingency Planning Working Group
• Dr. Susan Nahiriak, NAC Blood Shortage Working Group
• Cheryl Doncaster, CBS
• Dr. Taher Rad, University of Calgary
• Tracy Cameron, ORBCoN

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Questions?