Allocation of Red Cells During A Blood Shortage

2015 Blood Matters Conference
November 6th, 2015

Susan Nahirniak MD, FRCPC

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

Disclosures

- No financial disclosures
- Member of the National Advisory Committee on Blood and Blood Products (aka NAC)
- Chair of the NAC's Blood Shortage Working Group

A Duty to Plan

"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 difficult issues 'on the hoof' in the midst of a pandemic. They must be settled before a pandemic arrives."

RJ Harwood. Anaesthesia 2009; 64: 216-29.

Table 1: Causes of Blood Contingencies*

Event	Potential for Demand Surge	Potential for Decreased Supply
Natural disasters: e.g., hurricane (tropical cyclone), severe windstorm (tornado), winter storm, wildfire, earthquake, flood, tsunami	✓	✓
Man-made hazards: e.g., industrial accident (fire, building collapse, hazardous material spill), chemical event, biological event, radiological event, nuclear event, explosive event	✓	✓
Pandemic outbreak	Unlikely	✓
Wide-area power outage		✓
Workplace violence	✓	✓ (if at CBS or hospital)
Mass casualty/multiple trauma	✓	
Massive transfusion of one patient	✓	
Inventory stockpiling	✓ (artificial demand)	✓ (blood not where required)
Manufacturing or testing failures/delays		✓
Product contamination/recall		✓
Labour disruption		✓
Transportation disruption		✓
Seasonal influence: e.g. increase in trauma; decrease in donations	✓	✓
Changes in donor deferral criteria		✓

*Adapted from Alberta Blood Contingency Project Final Report (Draft), November 2007

National Plan for the Management of Shortages of Labile Blood Components

National Advisory Committee on
Blood & Blood Products
and
Canadian Blood Services

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Canadian Blood Services
it's in you to give

National Plan for the Management of Shortages of Labile Blood Components

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Just updated! New version will be on www.nacblood.ca soon!

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Canadian Blood Services
it's in you to give

National Blood Shortage Plan

INVENTORY & PHASES

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Three + Recovery Phases

- **Green phase:** ideal inventory to short-term minor shortages that can be managed with existing CBS/hospital actions

- **Amber phase:** the current or projected national blood inventory is (or will be) insufficient for hospitals to continue *usual* transfusion practice.

- **Red Phase:** the existing or expected national inventory is insufficient to meet the needs of all requests for non-elective blood products.

- **Recovery Phase:** blood inventories have begun to increase and are expected to be maintained at a level which would enable hospitals to move from Red to Amber and subsequently to the Green Phase, or from Amber to Green Phase

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 Cell Inventory – Canadian Blood Services
*** Green phase includes green advisory.**

RBC Inventory Level	*CBS Days On Hand*	*CBS # Units on Hand*
Green *Phase (minimal decrease to optimal)	>72 hours	>7,741
Amber Phase (serious)	48 – 72 hours	5,161-7,741
Red Phase (critical)	< 48 hours	<5,161

RBC Inventory Level	*CBS Days On Hand*	*CBS # Units on Hand*	
Green* Phase (minimal decrease to optimal)	>72 hours	O pos: >2,975	O neg: >926
		A pos: >2,293	A neg: >543
		B pos: >655	B neg: >153
		AB pos: >152	AB neg: >44
Amber Phase (serious)	48 – 72 hours	O pos: 1,983-2,975	O neg: 618-926
		A pos: 1,529-2,293	A neg: 362-543
		B pos: 436-655	B neg: 102-153
		AB pos: 102-152	AB neg: 29-44
Red Phase (critical)	< 48 hours	O pos: <1,983	O neg: <618
		A pos: <1,529	A neg: <362
		B pos: <436	B neg: <102
		AB pos: <102	AB neg: <29

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

Green Phase	Amber Phase	Red Phase
Major Hemorrhage	**Major Hemorrhage**	**Major Hemorrhage**
Follow your hospital/RHA guidelines	Follow your hospital/RHA guidelines	Follow your hospital/RHA guidelines Follow triage/rationing allocation framework if instructed by NEBMC [1]
Surgery/Obstetrics	**Surgery/Obstetrics**	**Surgery/Obstetrics**
Follow your hospital/RHA guidelines	Urgent [2] and emergency [3] surgery in consultation with H/RBEMC. Peri/post partum hemorrhage. For all situations, the minimal number of units to stabilize patient should be used.	Emergency situations in consultation with H/RBEMC Follow triage/rationing allocation framework if instructed by NEBMC [1]
Non-Surgical Anemias [4]	**Non-Surgical Anemias [4]**	**Non-Surgical Anemias [4]**
Follow your hospital/RHA guidelines	All requests for RBC transfusion in patients with a Hb level > 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.	All requests for RBC transfusion in patients with a Hb level > 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.

[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

What does the fine print say?

Urgent surgery – patient likely to have major morbidity if surgery not performed within the next one to 28 days

Emergency surgery – patient likely to die (have major morbidity*)* with 24 hours without surgery.

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..

Amber phase called - So now what?

Things to consider

1. Activation of your Province and/or hospital Emergency Blood Management committee
   - Ensure notification fan out and communication has occurred

2. Assessment of your current inventory
   - Breakdown by blood group & age
   - Include any special units, crossmatched units and units in remote storage locations

Things to consider

3. Who is responsible for your “triage”?

4. Are there units that can be recalled?

5. What is your blood group switching policy?

6. Are you capable of “splitting units”?

Things to consider

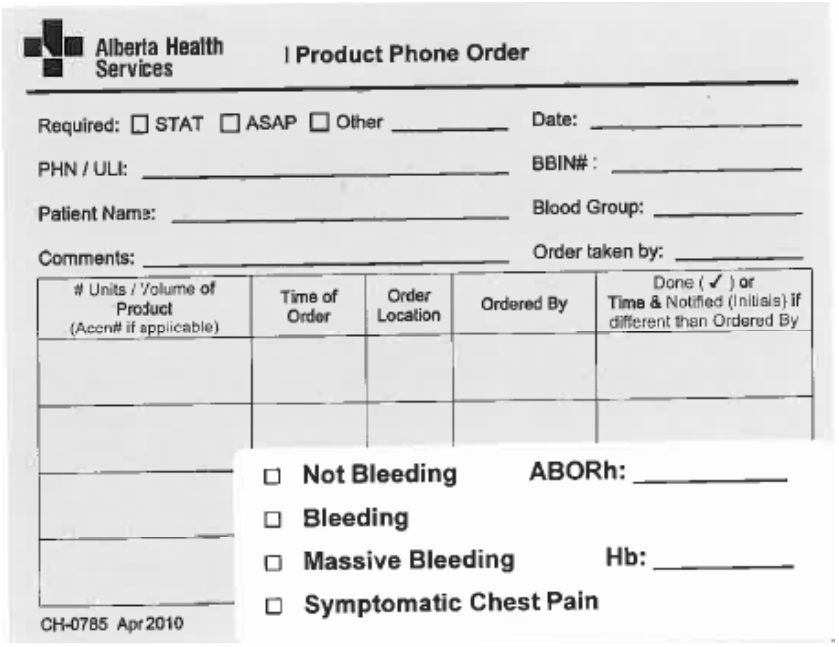
7. Will the shortage alter your policy for special unit requirements?

8. What is your policy for release of quarantined or untested units?

9. How will you issue units in the shortage scenario?

What documentation tools do you have?

Tracking Logs



Alberta Health Services | Product Phone Order

Required: ☐ STAT ☐ ASAP ☐ Other _____ Date: _____

PHN / ULI: _____ BBIN# : _____

Patient Name: _____ Blood Group: _____

Comments: _____ Order taken by: _____

# Units / Volume of Product (Accn# if applicable)	Time of Order	Order Location	Ordered By	Done (✓) or Time & Notified (Initials) if different than Ordered By

☐ Not Bleeding ABORh: _____

☐ Bleeding

☐ Massive Bleeding Hb: _____

☐ Symptomatic Chest Pain

CH-0785 Apr 2010

Appendix A – Documentation Tools and Clinical Scoring

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

Revised 2018-11-04

*Indication	
Not Bleeding	NB
Bleeding	B
Massively Bleeding	MB
Systematic Chest Pains	SCP

Tracking Number	Date	Medical Record Number	Last Name, First Name	Location	Indication NB, B, MB or SCP	Hgb Level	ABO Rh Blood Group	Number of Units: Requested	Issued	Saved by following protocol	Comments
1											
2											
3											
4											
5											
6											
7											
8											
9											
10											

Blood Shortage Blood Component Screening and Tracking Log – November 2013 Exercise

Phase: ☐ Amber ☐ Red ☐ Recovery Component(s) affected: ____________ Facility: Date: ________

Is Patient needing or predicted to need massive transfusion? ☐ Y ☐ N If yes, go to "Patient Triage Log" If no, complete line below.

Patient Name (Last/First):	Patient MRN	Patient Age	Patient ABO/D	Ordering Physician	Indication Not Bleeding = NB Bleeding = B Unknown = U In the OR = O	Hgb /Plt	# of Components Ordered	# of Components Issued	Surgery Cancelled?		# of units saved by following Protocol
									Yes	No	
Do not complete for the Nov 2013 exercise					Do not delay issue, capture information if possible.		Not required for Nov 2013 exercise		Not required for Nov 2013 exercise		To be completed after the exercise

Is Patient needing or predicted to need massive transfusion? ☐ Y ☐ N If yes, go to "Patient Triage Log" If no, complete line below.

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									Yes	No	
Do not complete for the Nov 2013 exercise					Do not delay issue, capture information if possible.		Not required for Nov 2013 exercise		Not required for Nov 2013 exercise		To be completed after the exercise

Blood Component Screening Log for Use During a Blood Shortage

Phase: ☐ Amber ☐ Red

Facility: _____

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

Time	MR#	Last Name	Product & # **Requested**	MD Requesting	Clinical Indication	Products **Available**	Decision	MD reviewing
			☐ Red Cells, #___ ☐ Platelets, #____ ☐ Plasma, #_____			☐ Red Cells, #___ ☐ Platelets, #____ ☐ Plasma, #_____		
			☐ Red Cells, #___ ☐ Platelets, #____ ☐ Plasma, #_____			☐ Red Cells, #___ ☐ Platelets, #____ ☐ Plasma, #_____		
			☐ Red Cells, #___ ☐ Platelets, #____ ☐ Plasma, #_____			☐ Red Cells, #___ ☐ Platelets, #____ ☐ Plasma, #_____		
			☐ Red Cells. #___ ☐ Platelets, #____ ☐ Plasma, #_____			☐ Red Cells. #___ ☐ Platelets, #____ ☐ Plasma, #_____		
			☐ Red Cells, #___ ☐ Platelets, #____ ☐ Plasma, #_____			☐ Red Cells, #___ ☐ Platelets, #____ ☐ Plasma, #_____		

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So now it goes into RED!

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Notes

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ALLOCATION OF BLOOD PRODUCTS TO MASSIVELY HEMORRHAGING PATIENTS DURING RED PHASE TRIAGE TOOL

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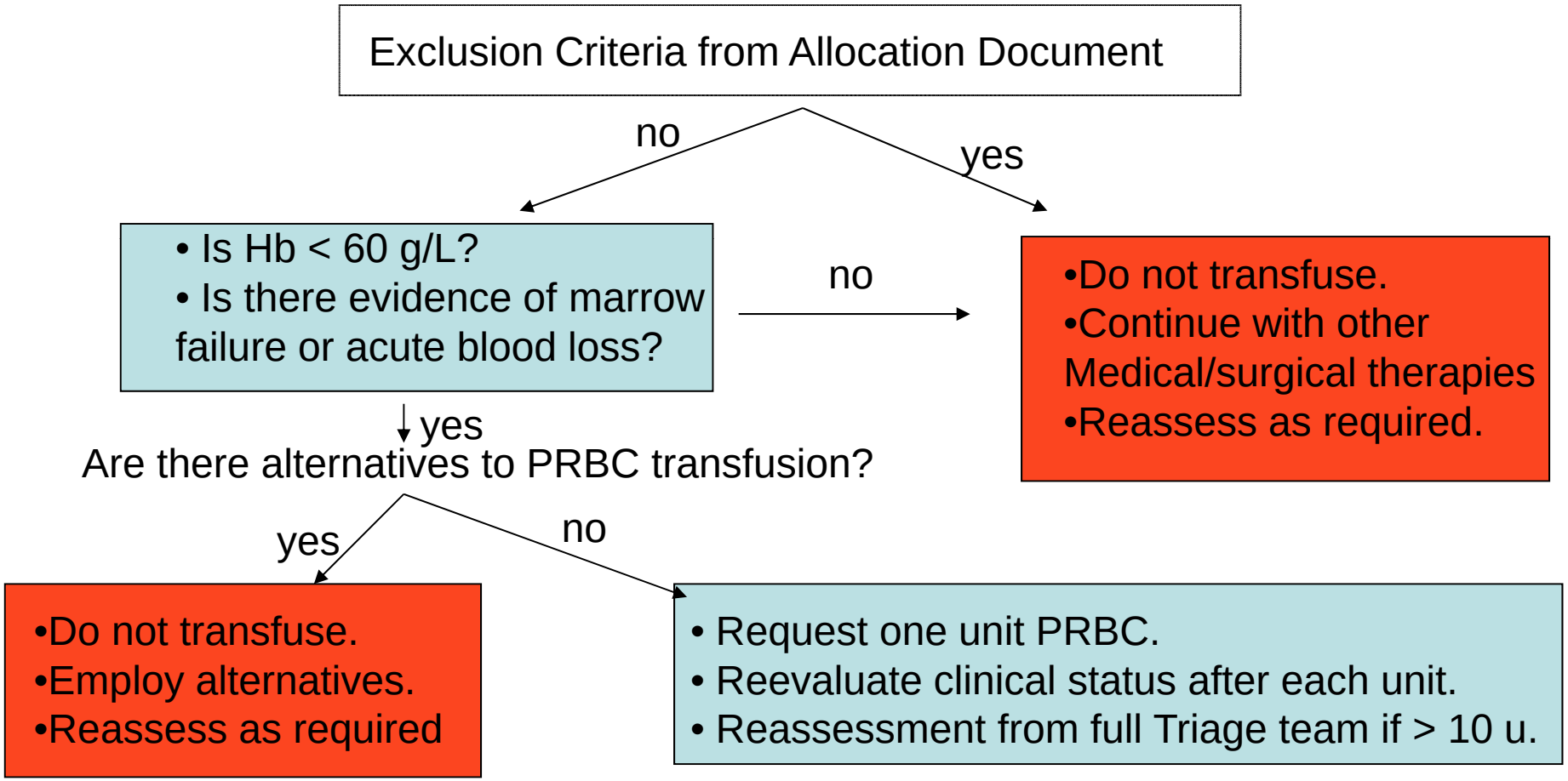
Who gets massively transfused?

- Trauma
- Organ donors
- Organ transplant recipients
- Ruptured aneurysm
- GI bleed
- Pregnant women
- Patients with heart/lung devices

Triage Tool – Red Phase



Red Phase: Do NOT Transfuse

Do Not Transfuse if your adult or pediatric patient has:

- non survivable brain injury.
- a Glasgow Coma Scale =3 with hypotension not attributable to reversible factors and who have fixed and dilated pupils
- penetrating cranial trauma and a Glasgow coma scale =3 that is not attributable to reversible factors.
- penetrating cranial trauma, a Glasgow coma scale <8 that is not attributable to reversible factors, hypotension and severe thoracoabdominal trauma.
- blunt trauma, and a Glasgow Coma Scale =3 that is not attributable to reversible factors.
- blunt trauma who have lost vital signs in the field at any time/pre-hospitalization.
- transcranial gunshot injuries.
- age >65 years with severe brain injury and profound shock and severe thoracic or abdominal trauma.
- age >75 years with moderate brain injury, a Glasgow Coma scale of <12, who are in profound shock and who have thoracoabdominal injury.
- A ruptured aortic aneurysm and has had a cardiac arrest preoperatively.
- Ruptured AAA patients with a systolic blood pressure less than 70mmHg who are unresponsive to fluid resuscitation and have lost consciousness.
- Ruptured AAA and does not meet criteria for emergent vascular repair.
- Requirement for ECMO/VAD and has multi-organ (> 1 organ) failure.
- Gastrointestinal bleeding and a Rockall score >8.
- 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.

Do Not Transfuse for the sole purpose of harvesting organs

Triage Tool – Red Phase

Is transfusion being considered?

↓ yes

Does your adult or pediatric patient have :

- a non survivable brain injury.
- a Glasgow Coma Scale =3 with hypotension not attributable to reversible factors and who have fixed and dilated pupils
- penetrating cranial trauma and a Glasgow coma scale =3 that is not attributable to reversible factors.
- penetrating cranial trauma, a Glasgow coma scale <8 that is not attributable to reversible factors, hypotension and severe thoracoabdominal trauma.
- blunt trauma, and a Glasgow Coma Scale =3 that is not attributable to reversible factors.
- blunt trauma who have lost vital signs in the field at any time/pre-hospitalization.
- transcranial gunshot injuries.
- age >65 years with severe brain injury and profound shock and severe thoracic or abdominal trauma.
- age >75 years with moderate brain injury, a Glasgow Coma scale of <12, who are in profound shock and who have thoracoabdominal injury.
- A ruptured aortic aneurysm and has had a cardiac arrest preoperatively.
- Ruptured AAA patients with a systolic blood pressure less than 70mmHg who are unresponsive to fluid resuscitation and have lost consciousness.
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- Requirement for ECMO/VAD and has multi-organ (> 1 organ) failure.
- Gastrointestinal bleeding and a Rockall score >8.
- 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.

yes →

Do Not Transfuse

no →

Is Hb >60 g/L?

Are there reasonable alternatives to transfusion that can be employed?

Is the transfusion for the sole purpose of potential organ harvest?

↓ yes

↑ no

Is this an obstetrical hemorrhage with hemodynamic instability and severe anemia?

Is this a bone marrow failure patient with Hb<60g/L AND significant symptoms?

Is this an acute hemorrhage with documented anemia, & hemodynamic instability requiring bridging transfusion support until definitive treatment can be obtained?

↑ yes

TRANSFUSE

Request product(s) if available.

•Reassess at requested frequency.

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Prior Validation of Plan

- November 14-18th 2013 all red cell requests required capture of the following criteria :
  - bleeding status of patient
  - number of units requested
  - pre transfusion hemoglobin
  - Whether or not it was for an elective surgical procedure.

- Three participants
  - Royal Columbian Hospital (RC)
  - Sunnybrook Hospital (SB)
  - Alberta Health Services – Edmonton (AHS-EZ)

Validation Results

- A total 656 RBC units were issued to 325 patients.
- Deferrals by Hemoglobin cutoffs = 35% of RBC requested

Bleeding Status	Hemoglobin (g/L)	Transfusion Service (Number of RBC units)		
		AHS-EZ N=414	RC N=68	SB N=93
Bleeding	<70	48	26	13
	≥ 70	132	20	16
Not Bleeding	<70	57	0	31
	≥70	160	6	33
Unknown	<70	2	4	0
	≥70	15	12	0
Number of RBC units potentially deferred (%)		171 (41%)	18 (26%)	41 (44%)

Note in previous iteration of plan the Hb triggers were higher!

- Deferral by “Elective” surgery classification = 7% of RBC requested
  - AHS-EZ = 38 units
  - RC = 7 units
  - SB = 2 units

Validation Conclusions

1. Validated the basic criteria of hemoglobin cut off and bleeding status as useful in mitigating temporary shortages

2. Although commonly cited as a conservation strategy, the cancellation of elective surgical cases would only have saved a total of 47 units (7% of total requests).

Will This Work??

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Full plan and associated appendices and tools available at:

www.nacblood.ca

Or

www.transfusionmedicine.ca