

9.0 SPECIAL TRANSFUSION SITUATIONS

Some clinical situations may present particular challenges to hospital Transfusion Medicine Services, for which it is useful to have, in advance, defined policies, processes and procedures for dealing with these situations. These special situations include:

- Support of a patient with signed refusal of consent for transfusion
- Management of a patient requiring massive transfusion
- Management of a patient with auto-immune hemolytic anemia requiring transfusion
- Transfusion support of patients who are recipients of solid organ, bone marrow or stem cell transplant
- Transfusion support in sickle cell syndromes

9.1 SUPPORT OF A PATIENT WITH SIGNED REFUSAL OF CONSENT FOR TRANSFUSION

Policy	The Medical Director, Transfusion Medicine and appropriate medical/surgical staff jointly establish programs to support patients who ordinarily would require transfusion, but have refused consent for transfusion of blood components or products. Where hospital resources cannot adequately support such patients, a procedure should be established for referral to a facility where the necessary resources are available.
Reason	Pre-planned support for patients who refuse transfusion is necessary for safety of the patient.
Applies to	Patients who have refused transfusion.
Responsibilities of the Medical Director, Transfusion Medicine	<ul style="list-style-type: none"> • Work with clinical staff to develop policies, processes and procedures to support patients who have refused consent to transfusion • Ensure that any blood salvage techniques and equipment used to support such patients meet the standards (CAN/CSA) for collection, labeling, storage, reinfusion and staff training • Work with surgical and anesthetic staff to assess the perioperative risks of morbidity and mortality of any elective procedure in a patient who refuses transfusion • In cases with prohibitive risk, ensure that the surgical and anesthetic staff are fully aware of the level of risk, and have advised the patient accordingly • Provide support/consultation to physicians caring for non-surgical, anemic or bleeding medical patients who refuse transfusion • Ensure a mechanism is in place to document discussion of risks and options
Responsibilities of Transfusion Medicine service staff	<ul style="list-style-type: none"> • Record refusal of consent in the Transfusion Medicine Service patient record • Notify the Medical Director, Transfusion Medicine (or delegate) if an order is received that is not consistent with advance directive
Responsibilities of Treating Medical Staff	<ul style="list-style-type: none"> • Work with the Medical Director, Transfusion Medicine to: <ul style="list-style-type: none"> » Develop programs to support patients who have refused transfusion » Assess the perioperative risks of morbidity and mortality of any proposed elective surgical procedure in a patient who has refused transfusion • The role of these physicians is to: <ul style="list-style-type: none"> » Advise the patient if prohibitive risk exists » Assist in the application of available blood alternatives



Patient Management

Alternatives to blood component and product transfusion include:

- Minimization of iatrogenic blood loss (e.g. limit laboratory testing, use of low volume collection containers)
- Meticulous surgical technique
- Maintenance of circulating volume with crystalloid or colloid
- Where acceptable to the patient:
 - » Pre-surgical autologous blood donation (through CBS or hospital based autologous collection program)
 - » Intraoperative cell salvage procedures
- Preoperative optimization of hemoglobin level:
 - » Iron, folate, vitamin B12, erythropoetin
- Pharmacological agents that minimize bleeding
 - » DDAVP, antifibrinolytic agents, vitamin K
- Anesthetic techniques to reduce blood loss (regional anesthesia)

REFERENCES

3. AABB, 2014.
7. Aubuchon JP, 2011.
17. Bodnaruk ZM, 2004.
25. Callum JL, 2016.
60. Goodnough LT, 2003.



9.2 MANAGEMENT OF PATIENT REQUIRING MASSIVE TRANSFUSION

“Massive transfusion” is generally defined as requiring transfusion sufficient to replace one full circulating volume in less than 24 hours, or, in an adult, transfusion of 10 units or more in less than 24 hours.

Policy	The Transfusion Medicine Service has established guidelines for the management of patients requiring massive transfusion, including the administration of blood components and products and selection of red blood cells.
Reason	Patients receiving massive transfusion are at risk for developing coagulopathies that increase blood loss and contribute to morbidity and mortality. Such patients may also deplete the Transfusion Medicine Service of specific components, requiring changes to be made in blood group of components provided or incompatible blood given to patients with alloantibodies.
Applies to	Patients with severe blood loss requiring large volume, rapid transfusion, replacing at least one total blood volume in less than 24 hours.
Responsibilities of the Medical Director, Transfusion Medicine	<ul style="list-style-type: none"> • Work with clinical staff to establish a massive hemorrhage protocol to guide the general conduct of massive transfusion events and periodically test the protocol through simulation exercises • Ensure that the equipment for blood warming and cell salvage, and the training and continuing assessment of competency of staff operating the equipment, meet the required standards (CAN/CSA) • Establish the requirements for appropriate laboratory monitoring • Be informed of any patients requiring massive transfusion • Be available to treating medical staff, to consult as required on transfusion measures in individual cases
Responsibilities of Transfusion Medicine Service staff	<ul style="list-style-type: none"> • Follow associated technical procedures • Consult with the Medical Director, Transfusion Medicine (or delegate) as indicated in procedures or by circumstances
Patient Management	<ul style="list-style-type: none"> • Clinical transfusion decisions must often be made before Transfusion Medicine Service examinations have been completed. • However, these examinations should be completed as promptly and frequently as required by the clinical circumstances • In general, the bleeding patient should be transfused to maintain the following parameters: <ul style="list-style-type: none"> » Platelet count $>50 \times 10^9/L$ (with head injury $>100 \times 10^9/L$) » INR < 1.8 » aPTT $< 1.5 \times$ normal » Fibrinogen $>1.5g/L$ » Hemoglobin $> 80g/L$ • Application of blood conservation strategies <ul style="list-style-type: none"> » Antifibrinolytics » Cell salvage » Prompt surgical intervention » Uterotonic agents in obstetrical hemorrhage » Interventional radiology » Avoidance of hypothermia and acidosis • In setting of massive uncontrolled hemorrhage, component therapy should be administered according to the agreed protocol (see above)

RESOURCES

Ontario’s Recommendations for Massive Hemorrhage Protocol available at <http://transfusionontario.org/en/documents/?cat=massive-hemorrhage-protocol>



9.3 SWITCHING ABO GROUP IN MASSIVE TRANSFUSION OR DURING INVENTORY SHORTAGE

- Selection order of ABO compatible donor red blood cells is shown in table 9.1
- Selection order of ABO group of platelets or frozen plasma is shown in table 9.2
- It is not necessary to provide group specific cryoprecipitate because of the low volume of plasma (<10mls) in each unit. Non-group specific cryo is satisfactory for all blood groups. Pooling a mixture of blood groups together in one dose is not advised
- Urgent platelet transfusion should not be delayed in the event plasma compatible platelet units are not immediately available

Table 9.1. Selection Order of ABO Compatible Donor Red Blood Cells

Recipient ABO Group	1st Choice ABO identical	2nd Choice ABO compatible	3rd Choice ABO compatible	4th Choice ABO compatible
O	Group O	None	None	None
A	Group A	Group O	None	None
B	Group B	Group O	None	None
AB	Group AB	Group A	Group B	Group O

Table 9.2. Selection Order of ABO Group for Platelets or Frozen Plasma

Recipient ABO Group	Component Group 1st Choice	Component Group 2nd Choice	Component Group 3rd Choice	Component Group 4th Choice
AB	AB	A*	B*	O*
A	A	AB	B*	O*
B	B	AB	A*	O*
O	O	A	B	AB

* Choices with incompatible plasma, listed in “least incompatible” order

9.4 SWITCHING FROM RHD NEGATIVE TO RHD POSITIVE RED BLOOD CELLS IN MASSIVE TRANSFUSION

It may not be possible to provide RhD negative blood for an RhD negative patient with massive transfusion. The following policies should be implemented for switching from RhD negative to RhD positive red blood cells:

- Prior to switching, if possible, confirm that the patient’s plasma does not contain anti-D
- If a continuing transfusion requirement is expected to exceed the available supply of RhD negative blood, or if the patient is likely to require >4-8 units of red blood cells, the switch to RhD positive blood should be made early to conserve RhD negative stock for other recipients
- In general, patients expected to receive <4 units of packed cells in a single transfusion episode should not be switched unless RhD negative stocks are critically low
- RhD negative females of child bearing potential should only be switched to RhD positive blood under extraordinary circumstances. RhIG is **not recommended** when RhD positive red blood cells are given intentionally
- If RhD positive platelets must be transfused to an RhD negative female of child bearing potential, post-transfusion treatment with RhIG is **recommended**

References:

14. Bhella S, 2012.



9.5 MASSIVE TRANSFUSION IN A PATIENT WITH ALLOANTIBODIES

- Provision of antigen negative units to patients with alloantibodies may not be possible during massive transfusion due to the volume of blood required
- If antigen positive units were transfused during active bleeding, subsequent transfusion should be with antigen negative units wherever possible
- The Medical Director, Transfusion Medicine (or delegate) must advise the treating physicians that incompatible units were transfused, advise of the risk of a delayed hemolytic transfusion reaction, and recommend the appropriate laboratory parameters to be monitored

REFERENCES

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 27. CBS, Clinical Guide to Transfusion, 2011.
 48. Dzik WH, 2011.
 59. Goodnough LT, 2011.
 142. Young PP, 2011.

9.6 TRANSFUSION MANAGEMENT OF AUTOIMMUNE HEMOLYTIC ANEMIA (AIHA)

Policy	The Transfusion Medicine Service has established policies and guidelines to assist in the management of patients with AIHA.
Reason	<p>Patients with auto-antibodies requiring transfusion may pose difficulties with compatibility testing, and may be at risk for hemolytic transfusion reactions and/or developing alloantibodies.</p> <p>The Transfusion Medicine Service may be asked to determine whether the autoantibody exhibits blood group antigen specificity or, in the presence of cold autoantibodies, whether it shows a clinically significant thermal amplitude and titre.</p>
Responsibilities of the Medical Director, Transfusion Medicine	<ul style="list-style-type: none"> • Be aware of such patients and oversee the laboratory investigations, and provide guidance to Transfusion Medicine Service Staff, and consultative advice to attending physicians • Advise treating physicians of the likely duration of delay in obtaining compatible blood, and where appropriate discuss possible transfer of the patient to specialized centre with the necessary range of pre-transfusion testing ability • Establish the policies, processes and procedures for release of incompatible blood in medical emergencies when complete pre-transfusion testing is not possible <p>Note: the term “least incompatible” should never be used as there is no clinical evidence to support that the survival of transfused red blood cells can be predicted based on the strength of a serological reaction</p>
Responsibilities of Transfusion Medicine Service staff	<ul style="list-style-type: none"> • Perform appropriate technical procedures • Expedite investigations to obtain compatible blood as promptly as possible, or to exclude the possibility of underlying alloantibodies when compatible blood cannot be obtained • Consult with the technical supervisor and/or the Medical Director, Transfusion Medicine (or delegate) as indicated in technical procedures, or as necessary based on the technologist’s skills and experience, additional clinical information or results of laboratory examination • Be prepared to send appropriate blood samples to a reference centre or Canadian Blood Services for investigation when testing is beyond the scope of the hospital laboratory



Pre-transfusion examination	<ul style="list-style-type: none"> • Preliminary antibody investigation to determine whether the autoantibody exhibits any blood group antigen specificity • Examinations to determine whether there are any underlying alloantibodies, using additional technical devices such as autoadsorption, differential autoadsorption, pre-warming methods • So far as technically possible, determine the patient's red blood cell phenotype for clinically significant antigens using a pre-transfusion sample, or when not available by genotyping
Phenotype specificity	So far as possible, red blood cells provided for transfusion should not express clinically significant antigens which the patient lacks (at minimum, red blood cells should be matched for Rh and Kell antigens).
Patient management	<ul style="list-style-type: none"> • In a patient in stable condition, hemoglobin levels as low as 60 g/L may be tolerated, to try to avoid exposing the patient to transfusion and possible alloantibody development • In a symptomatic patient, blood transfusion should not be withheld even if the pre-transfusion investigation has not been completed • Patients failing to respond to RBC transfusion with an adequate post-transfusion rise in Hb or who show evidence of hemolysis post-transfusion should be investigated for incompatibility • Patients must be monitored closely for signs and symptoms of acute hemolysis and for response to each unit with a Hb estimation • If autoantibody demonstrating 'e' like specificity and patient is E negative, blood selected for transfusion should be E negative rather than e negative

REFERENCES

2. AABB, 2017.
10. Barros MMO, 2010.
15. Blackall DP, 2011.
55. Garratty G, 2010.
97. Ness PM, 2006.
103. Petz LD, 2003.



9.7 TRANSFUSION SUPPORT FOR PATIENTS FOLLOWING SOLID ORGAN OR ALLOGENEIC BONE MARROW OR STEM CELL TRANSPLANT

<p>Policy</p>	<p>The Transfusion Medicine Service in Centres performing transplant procedures shall have policies, processes and procedures to address the special needs of transplant patients for blood transfusion.</p> <p>In hospitals that are not transplant centres, the Transfusion Medicine Service providing post-transplant care will be guided by the transfusion policies and practices of the Transplant Centre where the transplant procedure was carried out.</p>
<p>Reason</p>	<p>Recipients of non-identical ABO/Rh organs or stem cells may demonstrate blood typing anomalies and may be at risk for hemolytic events.</p> <p>Transplant patients may be discharged to their community prior to complete recovery. Transfusion policies may not be identical for all transplant centres.</p>
<p>Responsibilities of the Medical Director, Transfusion Medicine</p>	<p>Transplant Centre:</p> <ul style="list-style-type: none"> • Establish policies, processes and procedures to address the particular problems of post-transplant blood transfusion practice in patients receiving non-identical ABO/Rh group organs/stem cells • When such patients are discharged to the community, establish a mechanism to ensure that the Transfusion Medicine Service and the treating physician in that community are informed as to how the patient’s particular transfusion requirements should be met • Patients should be informed in writing of their transfusion requirements <p>Receiving hospital:</p> <ul style="list-style-type: none"> • Be aware of post-transplant patients and their particular needs as communicated by the transplant centre staff • Liaise with the treating physician to accommodate the patient’s particular requirements • Inform Transfusion Medicine Service staff of the patient’s particular requirements and ensure they are entered in the patient’s Transfusion Medicine Service record
<p>Responsibilities of Transfusion Medicine Service staff</p>	<ul style="list-style-type: none"> • Follow associated technical procedures • Check the patient record for specific instructions regarding irradiation and blood group requirements • Consult with the Medical Director, Transfusion Medicine (or delegate) as indicated by procedures or circumstances

REFERENCES

- 38. Cohn CS, 2015.
- 41. Daniel-Johnson J, 2011.
- 104. Petz LD, 1987
- 126. Slichter SJ, 1998.



9.8 TRANSFUSION SUPPORT OF PATIENTS WITH SICKLE CELL SYNDROMES

Policy	The Medical Director, Transfusion Medicine and appropriate medical/surgical staff jointly establish policies, processes and procedures for the management of patients with sickle cell syndromes requiring blood transfusion.
Reason	<p>Patients with sickle cell syndromes (homozygous sickle cell disease, hemoglobin S/C disease, hemoglobin S/beta-thalassemia) have particular transfusion requirements because of:</p> <ul style="list-style-type: none"> • Increased blood viscosity due to presence of high concentrations of HbS • Increased liability to allo-immunization and risk of hemolytic transfusion reactions as a result of frequent red blood cell transfusion and genetic differences between sickle cell patients and the general blood donor pool
Responsibilities of the Medical Director, Transfusion Medicine	<ul style="list-style-type: none"> • Ensure that patients with sickle cell syndromes are so identified in the Transfusion Medicine Service records • Ensure that information on the patient’s extended red blood cell phenotyping test results are recorded in the Transfusion Medicine Service records • This information may be obtained: <ul style="list-style-type: none"> » By referring appropriate samples to a reference laboratory or CBS » By contacting Central Ontario CBS Registry of patients with sickle cell syndromes. (Central Ontario only 416-313-4675) • Establish policies, processes and procedures to optimize the extended phenotypic matching of donor red blood cells to patients requiring transfusion • Establish guidelines for red blood cell transfusion in sickle-cell patients because of significant differences in transfusion indications in different clinical situations in this patient population • Where appropriate, consult with an expert in transfusion medicine in cases presenting challenges in clinical decision-making regarding transfusion support • Consult with the treating physician regarding the provision of suitable donor red blood cells in a clinically appropriate time frame • Ensure that any equipment used for exchange transfusion and the competency of staff operating the equipment meets Canadian Standards Association requirements (CAN/CSA)
Responsibilities of Transfusion Medicine Service staff	<ul style="list-style-type: none"> • Follow policies and procedures as written • Notify the Medical Director, Transfusion Medicine when informed of a request for red blood cells for transfusion, or otherwise, of the presence of a sickle cell syndrome patient in the hospital if unable to obtain appropriate red blood cells and/or order is outside of sickle cell transfusion guidelines
Responsibilities of the treating physician	<ul style="list-style-type: none"> • To work with the Medical Director, Transfusion Medicine to arrange the optimal red blood cell transfusion regime in a clinically timely fashion. This may involve: <ul style="list-style-type: none"> » Simple red blood cell transfusion » Exchange transfusion of red blood cells » Transfer to a centre experienced in management of transfusion in patients with sickle cell syndromes



Special considerations

- In the absence of symptoms (e.g. heart failure, dyspnea, hypotension, severe fatigue) transfusion should be avoided unless the hemoglobin level is decreased to <50 g/L in the setting of uncomplicated vaso-occlusive crisis
- In the treatment or prevention of sickle cell complications the hemoglobin level should never be increased above 100 g/L
- Improvement in tissue oxygen delivery is better achieved through decreasing the HbS percentage than simply by raising the hemoglobin concentration
- Blood matched for extended blood group phenotype is desirable to reduce allo-immunization in individuals liable to require frequent transfusion
 - » Non-immunized, Rh/Kell only
 - » Allo-immunized, extended (Rh, Kell, Duffy, Kidd, MNS)
- Sickledex® positive red blood cells should not be used for exchange transfusion if possible, as this complicates calculation of its effectiveness
- For recommendations in particular cases, the literature or a medical centre specializing in care of sickle cell syndromes should be consulted

REFERENCES

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