

6.0 SPECIAL PRODUCT SELECTION

6.1 PLATELET SELECTION

Policy	<ul style="list-style-type: none">• The Transfusion Medicine Service will provide group-specific platelets whenever possible within the constraints of availability and urgency• Policies should be established for providing non-group specific platelets when group-specific component is not available. Such policies shall be incorporated into appropriate processes and technical procedures <p>Note: Major or minor incompatible platelet component should not be issued to prevent outdate or wastage when group specific platelets are available, unless strategies are in place for prevention of hemolytic reactions</p>
Reason	<ul style="list-style-type: none">• Mitigate the risk of hemolytic reactions to high titre anti-A or anti-B alloantibodies when group O platelets are given to a non-group O recipient, and to prevent immunization of group RhD negative recipients by transfusion of RhD positive component, particularly those of child-bearing potential
Applies to:	<ul style="list-style-type: none">• All patients receiving platelets for whom group specific platelets are not available within an acceptable time frame
Responsibilities of the Medical Director, Transfusion Medicine	<ul style="list-style-type: none">• Establish policy, processes and procedures for:<ul style="list-style-type: none">» Provision of non-group specific platelets when group specific platelets are not available informing the ordering MD and patient about signs and symptoms of hemolytic transfusion reactions» Consideration of the titration of anti-A and anti-B in situations when group O platelets are to be give to non-group O recipients» Reduction of risk of acute hemolytic transfusion reaction by plasma volume reduction or elimination of high anti-A or anti-B titre component• Consult as required with clinical staff on individual cases
Responsibilities of Transfusion Medicine Service Staff	<ul style="list-style-type: none">• Follow prescribed technical procedures• Consult with Medical Director, Transfusion Medicine (or delegate) as indicated in procedures, or by clinical circumstances



6.2 CLINICAL PRACTICE RECOMMENDATIONS FOR THE USE OF NON-ABO SPECIFIC PLATELETS

Purpose	These recommendations were developed by ORBCoN in collaboration with an expert working group to assist clinical decision making for the use of non-ABO or non-RhD type specific platelets when ABO/RhD type specific platelets are not readily available.
Guideline	<p>Prior to use of these recommendations the following should be considered</p> <ul style="list-style-type: none"> • There is evidence to suggest that ABO type specific platelets will result in higher platelet increment • There is no definitive evidence to suggest that adverse events or mortality are different with ABO type specific platelets or ABO non type specific, plasma compatible platelets • If ABO plasma compatible platelets are not available, group O platelets may be transfused provided to a non-O recipient so long as the ordering physician is informed to enable appropriate monitoring of the patient for signs of hemolysis • A trial of ABO type specific platelets should be given to patients who are refractory prior to screening for HLA antibodies • All institutions should have a policy to address the use of Rh Positive platelets for Rh Negative recipients including whether Rh Immune globulin (Rhig) will be administered
Recommendation	<ul style="list-style-type: none"> • ABO and Rh type specific platelets should be used when available • ABO plasma compatible platelets are a reasonable substitute when ABO type specific platelets are not available • Patients who require long term platelet support should ideally receive ABO type specific platelets • RhD Positive platelets may be given to RhD Negative recipients when RhD Negative platelets are not available
Other Considerations	<ul style="list-style-type: none"> • There have been cases of hemolysis following transfusion of ABO plasma incompatible platelets containing high titre isohemagglutinins • Buffy coat platelets and apheresis single donor platelets contain approximately 250-300mls of plasma from one donor whose isohemagglutinin titre is unknown • Titration of ABO isohemagglutinins is of questionable value due to poor predictability between in vitro titres and red blood cell survival. The test is difficult to standardize and there is no reference to support the use of platelets beyond a certain level of titration • ABO plasma incompatible platelets can be volume reduced by centrifugation removal of supernatant plasma

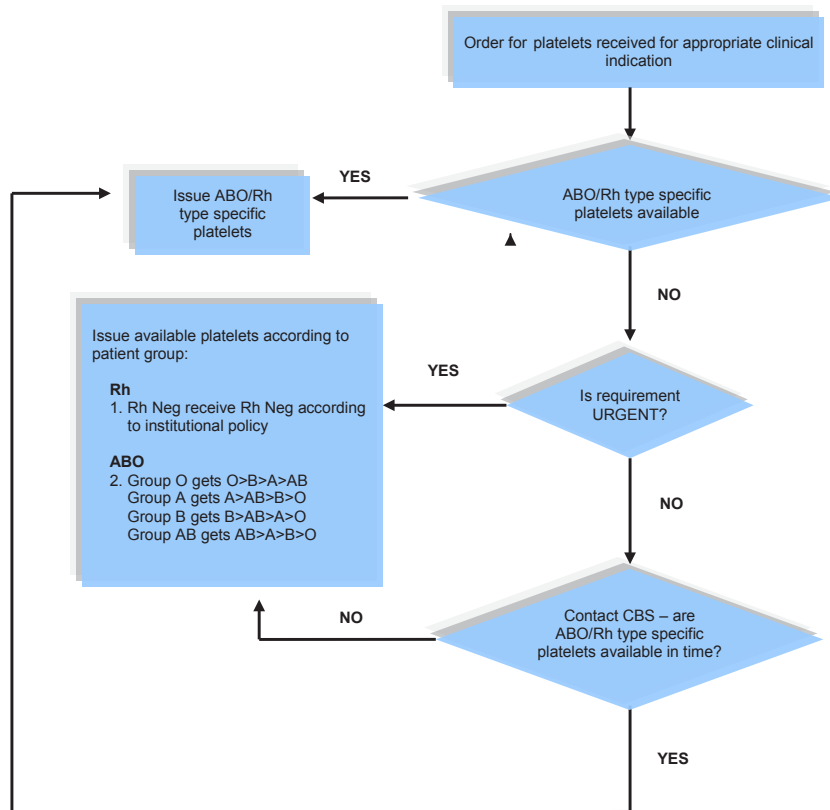


Algorithm for the Use of Non-Group ABO/RhD Type Specific Platelets



Algorithm for the use of Non-ABO/Rh Type Specific Platelets

Each institution should have a policy to address use of Rhlg when Rh Neg patients receive Rh Pos platelets, particularly when the patient is a female of child bearing potential



6.3 SPECIAL CIRCUMSTANCES

RhD positive platelets for RhD negative recipient	<ul style="list-style-type: none">• When possible only RhD negative platelets should be given to RhD negative patients• RhD negative females with child-bearing potential and RhD negative children under 18 years of age of either sex should preferentially receive RhD negative platelets• If RhD positive platelets must be transfused to any RhD negative recipient, post-transfusion treatment with RhIG is recommended (note that a single 300 µg dose of RhIg should cover five adult therapeutic doses of RhD-positive platelets within a 6-week period – 2003 UK British Journal of Haematology, 2003, 122, 10–23)
ABO and anti-CMV negative product requested	<ul style="list-style-type: none">• ABO match of platelet component takes precedence over provision of anti-CMV negative component if there is delay in obtaining group specific anti-CMV negative component since leukoreduction is considered an acceptable alternative
ABO and HLA matched component required	<ul style="list-style-type: none">• HLA/HPA match usually takes precedence over ABO match• If a group O, HLA/HPA matched component for a non-group O recipient is known to have a high titre anti-A or anti-B and plasma volume reduction is not possible, consultation with the Medical Director, Transfusion Medicine (or delegate) is required before release for transfusion• CBS should be informed so that an alternate ABO group HLA/HPA match donor can be sought

REFERENCES

20. "Blood Transfusion Task Force. Guidelines for the Use of Platelet Transfusions." 2003.
26. Callum, J.L. 2011.
27. "Clinical Guide to Transfusion." 2011.
80. Lozano, M. 2003.
119. Shehata, N. 2009.



6.4 PLATELET REFRACTORINESS AND INDICATIONS FOR HLA MATCHED PLATELETS

Policy	<ul style="list-style-type: none"> • The Transfusion Medicine Service provides HLA matched platelets for appropriate patient populations whenever possible • The procedures for evaluation of requests for HLA matched platelets involves availability of information to identify patients who require these components, in case that information is not known to the ordering physician • The requirement for HLA matched platelets is placed on the Transfusion Medicine Service patient record, and these records are always to be checked as part of the evaluation of product request procedures
Reason	<ul style="list-style-type: none"> • Provision of specialized platelet component for thrombocytopenic alloimmunized patients, refractory to platelet transfusion
Responsibilities of the Medical Director, Transfusion Medicine	<ul style="list-style-type: none"> • Ensure a process is in place to identify patients who are refractory to platelet transfusion • Ensure there is a process in place to manage requests for HLA matched platelets • Establish hospital policy for screening of requests and appropriate communication with CBS • Be aware of HLA matched recipients and requests for HLA matched platelets • Establish a policy for the authorization of the extension of the expiry date of platelets under exceptional circumstances • Ensure policies, processes and procedures are in place to confirm effectiveness of HLA-matched platelets and to discontinue their use if ineffective • Consult with and promote education of treating physicians in the management of platelet refractoriness
Responsibilities of Transfusion Medicine Service Staff	<ul style="list-style-type: none"> • Follow established written technical procedures. • Consult with Medical Director, Transfusion Medicine (or delegate) as indicated in procedures or circumstances • Report any instances where HLA matched platelets were not given to a patient meeting criteria for HLA matched platelets • Advise Medical Director, Transfusion Medicine (or delegate) if the component is outdating in order to label "Expiry date extended by Medical Director" and authorize release into general inventory



6.5 CLINICAL PRACTICE RECOMMENDATIONS FOR MANAGEMENT OF PLATELET REFRACTORINESS

<p>Purpose</p>	<p>These recommendations were developed by ORBCoN in collaboration with an expert working group to assist clinical decision making regarding the appropriate use of HLA matched single donor platelets. The provision of HLA matched single donor platelets is resource intensive both from a blood supplier perspective, and that of the initiating institution, and should be reserved for HLA sensitized patients proven to be refractory to random donor platelets.</p> <p><i>Note: when considering these guidelines, the following should be observed:</i></p> <ul style="list-style-type: none"> • <i>There is no evidence that any one patient group will benefit from the use of single donor platelets in the absence of HLA or HPA refractoriness</i> • <i>Leukoreduced (LR) buffy coat platelets and LR single donor apheresis platelets, should be used interchangeably for non-refractory patients</i>
<p>Guideline</p>	<p>HLA matched platelets are exclusively indicated for refractory patients with demonstrated HLA antibodies. Criteria for determining platelet refractoriness in patients with HLA alloimmunization:</p> <ul style="list-style-type: none"> • 10-60 minute increment $<10 \times 10^9$ /L following at least two infusions of ABO-identical platelet transfusions¹ and • Positive antibody screen for HLA-alloantibodies
<p>Recommendation</p>	<ul style="list-style-type: none"> • Single donor apheresis platelets should be released based on CBS supply and hospital demand for platelet products.
<p>Other considerations</p>	<p>Other considerations:</p> <ul style="list-style-type: none"> • Other causes of non-immune refractoriness are identified and treated • Communication with clinical and CBS teams to make sure platelets only collected when needed is key to maintaining adequate supply/demand

48. Dzik, W. 2007.



6.6 CMV SERONEGATIVE RED BLOOD CELLS AND PLATELETS

Policy	<ul style="list-style-type: none"> • For at risk patients, the patient’s CMV serological status should be determined • If an at risk patient’s CMV status is in doubt, CMV seronegative red blood cells and platelets should be transfused • The procedure for evaluation of request for blood products contains information to identify patients who require CMV seronegative components, in the event it is not recognized by the ordering physician • The procedure includes a process to obtain the results of CMV serological examination when it is unknown • The requirement for CMV seronegative red blood cells and platelets is placed on the Transfusion Medicine Service patient records, and these records are always checked as part of the evaluation of product request procedures
Reason	<ul style="list-style-type: none"> • CMV is transmitted by the leukocytes of donors who have been exposed to the virus. The virus poses a threat to categories of patients identified in the section below • Leukoreduction removes most CMV from blood components but it is not known if the use of CMV seronegative component provides an additional increment of protection • Acellular components and products are not considered to carry a risk of transfusion transmitted CMV
Responsibilities of the Medical Director, Transfusion Medicine	<ul style="list-style-type: none"> • Be familiar with the indications for CMV seronegative products • Establish a policy for the provision of CMV seronegative products • Consult with, and provide information to clinical and Transfusion Medicine Staff regarding the appropriate uses of CMV seronegative components • Discuss risks and benefits with treating physicians when CMV seronegative component is indicated but unavailable
Responsibilities of Transfusion Medicine Service staff	<ul style="list-style-type: none"> • Follow associated technical procedures • Consult Medical Director, Transfusion Medicine (or delegate) as indicated in procedures or by circumstances • Report all instances where a CMV seronegative component is not given to a patient who met criteria



6.7 INDICATIONS FOR USE OF CMV SERONEGATIVE RED BLOOD CELLS AND PLATELETS

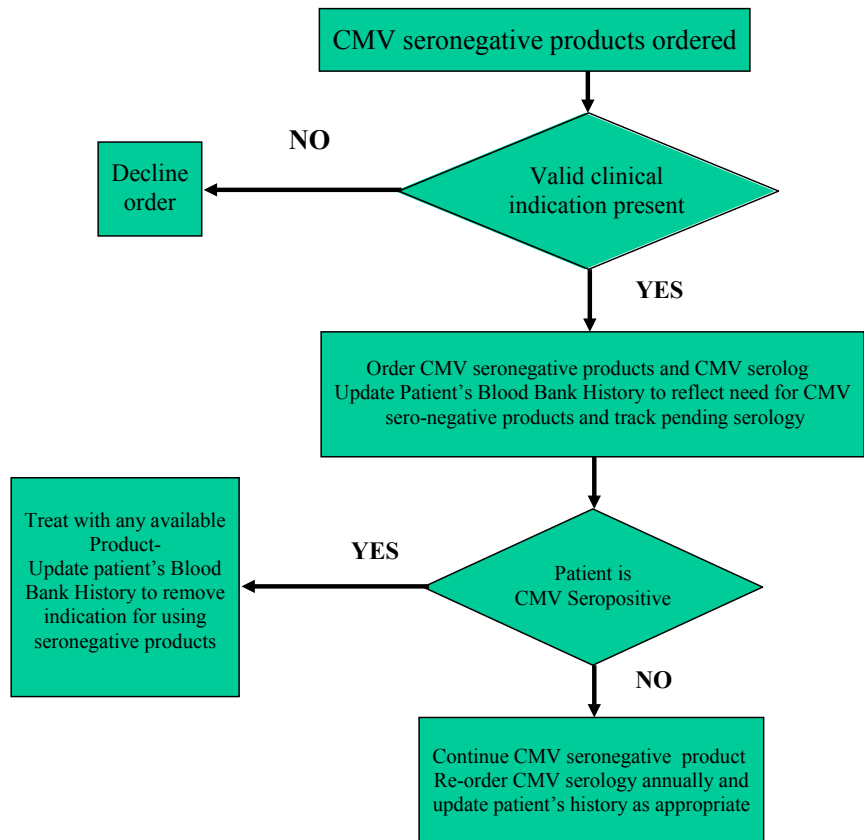
Purpose	<p>These recommendations were developed by ORBCoN in collaboration with an expert working group to assist clinical decision making for the appropriate use of CMV (Cytomegalovirus) seronegative blood components. According to the standards set out by CSA and CSTM, blood transfusion services must have a policy indicating which blood recipients are to receive blood components that are deemed to have a reduced risk of CMV transmission. Since CMV seronegative blood components are in limited supply and should be accessible to all patients who are at high-risk for CMV transmission, the following recommendations have been drafted</p> <p>Note: Leukoreduction as performed by CBS and Hema-Quebec reduces the risk of CMV transmission to the point where it is uncertain whether the use of CMV seronegative product provides any additional increment of safety</p>
Guideline	<p>Note: when considering these recommendations, the following should be observed</p> <ul style="list-style-type: none"> • For at-risk patients, every attempt should be made to determine the patient’s CMV serological status • When a high risk patient’s CMV status is in doubt, and the patient’s diagnosis is one that requires CMV seronegative components, CMV seronegative blood components should be transfused until status is confirmed • If CMV seronegative components are not readily available and a delay in transfusion would compromise patient care, transfusion may proceed with CMV unscreened blood components at the discretion of the primary physician
Recommendation	<p>CMV seronegative components are indicated for the following group of patients:</p> <ul style="list-style-type: none"> • CMV seronegative pregnant women • Intrauterine transfusions • CMV seronegative patients with conditions commonly treated by allogeneic HPC transplant
Other considerations	<ul style="list-style-type: none"> • A process for CMV screening should be mandatory for patients whose CMV status is unknown if they meet the indications for CMV seronegative components described above • Patients requiring CMV seronegative products (i.e. known CMV seronegative patients) should be re-screened at one year intervals • All institutions shall have a policy for the appropriate use of CMV seronegative components



Algorithm for the use of CMV seronegative components



Algorithm for the use of CMV Seronegative Blood Components



REFERENCES

- 16. Blajchman, M. 2001.
- 26. Callum, J.L. 2011.
- 27. "Clinical guide to transfusion." 2011.
- 37. "CMV Fact Sheet." 2010.
- 133. Vamvakas, E.C. 2005



6.8 IRRADIATED BLOOD COMPONENTS

Policy	<ul style="list-style-type: none"> • The Transfusion Medicine Service provides irradiated blood components for appropriate patient populations whenever possible • The procedures for evaluation of requests for blood components contains information to identify patients who require irradiated products, in the event it is not recognized by the ordering physician • The need for irradiated products is placed on the Transfusion Medicine Service patient record and these records are always checked as part of the evaluation of product request procedures
Reason	<ul style="list-style-type: none"> • Irradiating blood components reduces the risk of transfusion associated graft-versus-host disease (TA-GvHD), where donor cells mount an immune response in an immunologically compromised recipient • Prevention of TA-GvHD is particularly important in view of the high associated mortality • The Transfusion Medicine Service record check provides additional security that a patient receives the appropriate blood components
Responsibilities of the Medical Director, Transfusion Medicine	<ul style="list-style-type: none"> • Be familiar with the indications for irradiation of blood components. • Consult with, and provide information to, clinical and Transfusion Medicine staff on the appropriate uses of irradiated blood components • Ensure that an explanation is given to the patient of the reason for the use of irradiated component, and the possible consequences of not receiving irradiated component • Ensuring that the patient has, in writing, a statement of requirement for irradiated component (e.g. wallet card with essential information)
Responsibilities of Transfusion Medicine Service staff	<ul style="list-style-type: none"> • Follow associated technical procedures • Consult with Medical Director, Transfusion Medicine (or delegate) as indicated • Report all instances where irradiated blood components were not given to a patient who met criteria
Applies to:	<ul style="list-style-type: none"> • Specific populations of patients listed in table 6.1. Every attempt should be made to ascertain the patient’s purine analogue drug status • Where there is doubt, irradiated blood components should be transfused • If irradiated blood components are not readily available and delay in transfusion could compromise patient care, transfusion may proceed at the discretion of the patient’s attending physician



Table 6.1 Recommended Indications for the Use of Irradiated Components

Patient Category	Specific Conditions or Clinical Situations
Miscellaneous	<ul style="list-style-type: none"> • Any component collected from a relative • All HLA-matched components • All granulocyte units
Hematological malignancies or stem-cell transplant	<ul style="list-style-type: none"> • Hodgkin’s lymphoma • Non-Hodgkin’s lymphoma, chronic lymphocytic leukemia, multiple myeloma from diagnosis for the rest of their lives • Undiagnosed pancytopenia • Allogeneic stem cell transplant from start of conditioning to end of graft-vs-host disease prophylaxis • Autologous stem cell transplant. • Patients receiving purine analogues, anti-thymocyte globulin, eculizumab
Pediatrics	<ul style="list-style-type: none"> • Infants <6 months of age who are suspected to have a congenital immune deficiency • All intrauterine transfusions (IUT) <ul style="list-style-type: none"> » All “top-up” transfusions if previous IUT given » All exchange or platelet transfusions if previous IUT given • All exchange transfusions if delay for preparation does not compromise patient care
Congenital immune deficiency	<ul style="list-style-type: none"> • Di George’s syndrome • Congenital heart disease less than 6 months age • Open heart surgery less than 6 months old • Congenital cell mediated immune deficiency • Severe combined immune deficiency (SCID) • Wiskott-Aldrich syndrome • Purine nucleoside phosphorylase deficiency • Reticular dysgenesis • Adenosine deaminase deficiency • MHC I, II deficiency • Leukocyte adhesion molecule deficiency

REFERENCES

62. Gorlin, J.B. 2011.
 114. Ruhl, H. 2009.
 131. Treleaven, J. 2011.



6.9 WASHED RED BLOOD CELLS AND PLATELETS

Policy	<ul style="list-style-type: none"> • The Transfusion Medicine Service provides washed cells for appropriate patient populations, when possible • The procedure for evaluation of a request for washed red blood cells contains information to identify patients who require these components, in the event that it is not recognized by the ordering physician • The need for washed cells is placed on the Transfusion Medicine Service patient record, and these records are always checked as part of the evaluation of component request procedures • Orders for washed platelet components should be discussed with a medical expert in Transfusion Medicine
Reason	Red blood cell units and platelets are washed to remove plasma or additive solutions for patients identified in the indications section below
Applies to	Patients for whom contents in the plasma or additive solution have been shown to, or may, cause morbidity
Responsibilities of the Medical Director, Transfusion Medicine	<ul style="list-style-type: none"> • Be familiar with the indications for the need and use of washed red blood cells and platelets • Be familiar with the process to obtain washed red blood cells from CBS (washed platelets are not available through CBS) • Ensure a process is in place to handle requests • Consult with, and provide information to, clinical and Transfusion Medicine staff on appropriate uses of washed red blood cells and platelets • According to hospital policy, the Medical Director, Transfusion Medicine may need to screen all requests for washed components, or it may be appropriate for ordering physicians to consult directly with CBS physicians
Responsibilities of Transfusion Medicine Service staff	<ul style="list-style-type: none"> • Follow associated technical procedures • Consult with Medical Director, Transfusion Medicine (or delegate) as indicated in procedures or by circumstances • Report all instances where washed red blood cells or platelets were not given to a patient who met the criteria



6.10 INDICATIONS FOR WASHED RED BLOOD CELLS

Indications for washed red blood cells

- For removal of plasma/platelets when transfusing red blood cells to recipients who are:
- Known to have a history of severe or repeated allergic reactions to plasma contents, which are unresponsive to pre-medication
 - HPA-1 negative with anti-HPA-1
 - History of anaphylactic transfusion reaction associated with anti-IgA antibodies, when IgA deficient blood products are not available

Note: while IgA deficiency is common (1 in 700), only a fraction of these patients will make an anti-IgA antibody, and a smaller fraction again will develop anaphylactic transfusion reactions. Because IgA-deficient and washed blood products are difficult to source, investigation for anti-IgA antibodies is generally only advised for patients who have actually had an anaphylactic transfusion reaction. Testing for IgA deficiency is available through CBS (refer to www.blood.ca). As most patients with a history of anaphylactic transfusion reactions do not have anti-IgA antibodies, provision of IgA deficient blood products is not advised while awaiting results of testing

For removal of additive solution:

- Neonates undergoing exchange or massive transfusion
- Repeated febrile non-hemolytic transfusion reactions despite adequate pre-medication
- Repeated urticarial reactions despite adequate pre-medication

6.11 INDICATIONS FOR WASHED OR PLASMA DEPLETED PLATELETS

Indications for washed or “concentrated” platelets

- Orders for washed platelet components should be discussed with a medical expert in Transfusion Medicine
- Washed platelets are **rarely** indicated
- Washing platelets to remove incompatible plasma may result in significant loss of platelets in addition to promoting platelet activation. The resulting component is likely to have reduced effectiveness

REFERENCES

2. American Association of Blood Banks. 2011.
34. “Circular of Information for the Use of Human blood and Blood Components.”
43. Davenport, R.D. 2007.
85. Mollison, P.L. 1993.



6.12 EMERGENCY RELEASE OF RED BLOOD CELL UNITS

<p>Policy during regular working hours</p>	<ul style="list-style-type: none"> • Transfusion Medicine staff will issue group O red blood cells in emergency situations when compatibility examinations cannot be done or results are not yet available, and the patient requires immediate red blood cell transfusion • RhD negative females of child bearing potential (each hospital should establish an age) and males under 18 years of age should preferentially receive RhD negative components • If RhD negative red blood cells are not available the Medical Director, Transfusion Medicine (or delegate) should be contacted immediately • A policy should be in place to address the administration of Rh-Immune globulin when RhD positive platelets or red blood cells are transfused to an RhD Negative recipient • The requesting physician must sign for the emergency release of red blood cells on the request or patient record, as provided for in CSA Standards • Group-specific red blood cells are never released on the basis of the blood group in the patient record, as provided for in CSA Standards, group O cells will be transfused until the patient's ABO and RhD group have been determined on a current acceptable sample
<p>Policy (outside of regular laboratory hours)</p>	<ul style="list-style-type: none"> • Transfusion Medicine Service staff will establish a procedure for the Emergency release/issue of blood products by clinical personnel to include provision that: <ul style="list-style-type: none"> » Only trained and competent clinical personnel are approved to release/issue blood products from the laboratory or other specific locations where such units are stored within the facility » Clinical personnel who do this task will have their competence assessed at regular, defined intervals » Results of such competence assessment will be recorded as part of the employee record » Names and signatures of such clinical staff will be on record in the Transfusion Medicine Service
<p>Reason</p>	<p>The clinical urgency of the emergency situation does not allow time to undertake or complete regular compatibility examinations.</p>
<p>Applies to:</p>	<p>Patients who require red blood cell transfusion before grouping and compatibility examinations are complete.</p>
<p>Responsibilities of the Medical Director, Transfusion Medicine</p>	<ul style="list-style-type: none"> • Develop the policy, process and procedures for emergency release of blood, including the capability to: <ul style="list-style-type: none"> » Perform STAT examinations » Provide consultation to clinical staff » Avoid unnecessarily restrictive practices » Ensure timely or immediate availability of red blood cells to meet the needs of the requesting clinical service • Consult with Transfusion Medicine and clinical staff as needed • If a crossmatch completed during or after transfusion has occurred appears incompatible, immediately inform the treating physician(s) to minimize and manage any adverse reaction



Responsibilities of Transfusion Medicine staff	<ul style="list-style-type: none"> • Follow the procedures in the Emergency Release of Group O and Group Specific Red Blood Cells process • Provide component as promptly as possible during the emergency • Consult with supervisor or Medical Director, Transfusion Service (or delegate) as needed • It is recognized that documentation often occurs after transfusion, due to clinical urgency, but the Transfusion Medicine Service must insist upon: <ul style="list-style-type: none"> » Strict identification of donor units and patient samples even in the case of “unidentified” patients » Documentation of unit disposition » Documentation of the emergency status of the transfusion » Signature of the requesting physician that emergency release of component is required • If possible a serologic crossmatch should be performed on units transfused under Emergency Release procedures
Crossmatch	<ul style="list-style-type: none"> • The Transfusion Medicine Service should retain/obtain samples from the transfused uncrossmatched units and perform compatibility examinations when patient plasma/serum samples are available • Such compatibility testing should reflect the routine pre-transfusion methods, including an antibody screen, and proceeding to direct crossmatch versus bag segments only if antibody screen is positive • If the subsequent crossmatch is incompatible, the Medical Director, Transfusion Medicine(or delegate) must immediately inform the treating physician to minimize and manage any adverse reaction • Investigation of any blood transfused prior to arrival / testing should be done (prior hospital treatment or transfused en route to hospital) • If mixed field is detected in ABO/Rh testing and blood group cannot be clearly determined, group O RhD Negative red blood cells should be issued until the discrepancy can be resolved
Responsibilities of the treating physician	<ul style="list-style-type: none"> • Ensure a blood sample is obtained prior to transfusion or as soon as possible after transfusion has commenced if transfusion has already begun • Ensure required procedures for positive patient identification and specimen labeling are followed • Sign the request for emergency release of red blood cell units
Responsibilities of treating nurse	<ul style="list-style-type: none"> • Trained and competent in the emergency issue of red blood cell units if the Transfusion Medicine laboratory is not staffed, or from a storage location other than the Transfusion Medicine laboratory • Dispatch the patient pre-transfusion sample to the Transfusion Medicine laboratory as soon as possible



Conditions

- RhD negative red blood cells should be used for females of child bearing potential and males < 18 years of age
- A switch to group-specific uncrossmatched blood should be possible within 15-30 minutes, provided appropriate pre-transfusion sample(s) has (have) been received and tested according to hospital policy, to conserve group O inventory
- A policy should be established to determine after how many units of compatible non-ABO identical blood, switching to identical ABO blood should not occur
- Cross-matched blood according to the routine procedures should be issued as soon as possible, subject to the immediately preceding policy statement
- A policy should be established for the release of blood to transport personnel for both identified and unidentified patients and should include:
 - » Instructions for packing, labeling and transport
 - » Notification of the receiving facility when known
 - » Contact information for the sending facility
 - » Final disposition information including the patient ID and date/time of infusion

REFERENCES

2. American Association of Blood Banks. 2011.

40. Dananayake, T. 2011.

