Guideline SK 9

Selection of Blood Components for Transfusion and Special Transfusion Requirements

1.0 Principle

1.1 To select appropriate blood components for transfusion in adults and children.

1.2 To select blood components for patients with special transfusion requirements.

2.0 Definitions

2.1 Special Transfusion Requirements – blood components which have undergone modifications or with attributes necessary to meet unique patient needs.

- Blood component modifications include irradiation, washing, pooling or dividing.
- Blood component attributes include, but are not limited to, autologous red blood cells, phenotypically-matched red blood cells, IgA deficient plasma, and HLA or HPA matched apheresis platelets.

3.0 Acronyms

3.1 CBS – Canadian Blood Services

3.2 CMV – cytomegalovirus

3.3 HLA – human leukocyte antigen

3.4 HPA – human platelet antigen

3.5 RhIG – Rh Immune Globulin

3.6 TML – Transfusion Medicine Laboratory

4.0 Scope and Related Policies

4.1 Neonates have very specific transfusion requirements which fall outside the scope of this guideline. Refer to *'Transfusion Best Practice Recommendations for Neonatal Patients – Saskatchewan'* available on the SaskBlood website.

4.1.1 In Saskatchewan, neonatal transfusions should only be performed in hospitals with neonatal intensive care units (NICU). In exceptional circumstances, such transfusions may be authorized outside of the NICU environment at the direction of a neonatologist. (Approved by the Senior Medical Officer Committee on May 11, 2011)

4.2 For the purposes of transfusion medicine in Saskatchewan, a female of childbearing age is defined as 45 years of age and younger and a child is defined as 16 years of age and younger.(SHA clinical leadership decision September 2024)

Selection of Red Blood Cells

4.3 Patients shall be transfused with ABO group-identical red blood cells or ABO group-compatible red blood cells. WCDAA TM.8.2.3; CSA 10.7.1

4.4 ABO group-identical red blood cells shall not be issued until there are two separate and identical blood groups on file that are collected from two different phlebotomies. Patients without an ABO blood group on file (who have never been typed and screened before) shall receive Group O, RhD specific red blood cells. WCDAA TM.8.1.5; CSA 10.6.1.3

4.5 RhD positive patients may receive red blood cells that are either RhD positive or RhD negative. WCDAA TM.8.2.3; CSA 10.7.3

4.6 RhD negative patients should receive RhD negative red blood cells. If RhD negative red blood cells are not available, consider the patient's sex and age before selecting RhD positive red blood cells. WCDAA TM.8.2.3; CSA 10.7.3

4.6.1 Females 45 years of age and younger, and males 16 years of age and younger, who are RhD negative or of unknown RhD status shall receive RhD negative red blood cells. If RhD negative red blood cells are in short supply or an RhD negative woman of childbearing potential receives RhD positive red blood cells, the on-call Transfusion Medicine Physician shall be notified immediately.

Note: See step 4.14.1 for requirements relating to RhIg.

4.6.2 Females 46 years of age or older and males 17 years of age or older who are RhD negative or of unknown RhD status may receive RhD positive red blood cells in circumstances of massive transfusion or when RhD negative red blood cells are in short supply, provided that the decision or policy has been approved by the on-call Transfusion Medicine Physician.

4.7 Females 45 years of age and younger should receive Kell (K) negative red blood cells whenever possible to minimize the risk of alloimmunization. WCDAA TM.8.2.3, CSA 10.7.4

4.7.1 Providing Kell negative units may not be possible in urgent, massive transfusion situations, or when the patient requires special donor unit attributes or red cells negative for other red cell antigens. In these circumstances, Kell positive or Kell status unknown red blood cells may be administered. Transfusion Medicine Physician consultation is recommended.

4.8 Kell unknown red blood cells transfused to a female 45 years of age and younger, shall undergo retrospective Kell typing.

4.8.1 Transfusion of Kell positive red blood cells to a female 45 years of age and younger shall be reported as a critical incident.

4.9 When clinically significant red cell antibodies (other than anti-A and anti-B) are found or the patient's history contains a record of such antibodies, red blood cells lacking the corresponding antigen should be selected for transfusion and shall be demonstrated to be compatible by a crossmatch method designed to detect such antibodies. Any exception shall be approved by the on-call Transfusion Medicine Physician. WCDAA TM.8.1.5; CSA 10.7.5

4.9.1 The red blood cells shall be crossmatch compatible. Transfusion of crossmatch incompatible red blood cells shall be approved by the on-call Transfusion Medicine Physician.

4.9.2 The TML is not required to repeat the blood supplier's phenotyping of donor red cells for antigens other than A, B and D, if the blood supplier provides phenotyping. WCDAA TM.8.1.5

Selection of Platelets

4.10 The donor plasma in platelets should be ABO compatible with the patient's red cells. A policy shall be place concerning group substitution when ABO compatible platelets are not available. WCDAA TM.8.2.5; CSA 10.7.8

4.11 RhD negative females 45 years of age and younger, and males 16 years of age and younger, should preferentially receive platelets that are RhD negative. See step 4.14.1 for requirements relating to RhIg.

Selection of Plasma

4.12 Plasma selected for transfusion shall be ABO compatible with the patient's red cells but does not require a crossmatch. WCDAA TM.8.2.4; CSA 10.7.6

4.13 A policy shall be in place concerning ABO compatibility of cryoprecipitate components. WCDAA TM.8.2.4; CSA 10.7.7

4.13.1 Cryoprecipitate selected for transfusion is preferred to be ABO compatible but it is not required for adult patients. Neonates and children should be given ABO compatible units when possible, or as defined by TML policy. RhD compatibility is not considered.

Emergency Release

4.14 When there is insufficient time to complete the ABO and RhD group of the recipient or a sample cannot be obtained: WCDAA TM.8.1.7; CSA 10.9.3.2

4.14.1 Group O red cells shall be issued. For females 45 years of age and younger, see 4.6.1 and 4.7 for RhD and Kell considerations. WCDAA TM.8.1.7; CSA 10.9.3.2

4.14.2 If platelets are required, any blood group of platelets may be issued.

4.14.3 If plasma is required, group AB plasma should be issued. If AB plasma is unavailable, the use of group A plasma may be considered at the discretion of the on-call Transfusion Medicine Physician.

Rh Immune Globulin (RhIg) Prophylaxis after Transfusion of Red Blood Cells or Platelets

4.15 The TML shall have a policy for RhIg administration whenever RhD positive red blood cells or platelets are transfused to an RhD negative patient. WCDAA 8.4.2; CSA 11.9.7

4.15.1 Prophylactic RhIG should be considered whenever RhD negative females 45 years of age and younger and males 16 years of age and younger are exposed to RhD positive red blood cells or platelets to prevent the formation of anti-D, providing their plasma does not contain anti-D. Transfusion Medicine Physician consultation is recommended.

Special Transfusion Requirements

4.16 Establishments that pool, irradiate or wash blood, are required to register with Health Canada for those activities. Establishments whose only transformation activity is to pool cryoprecipitate are not required to register. Blood Regulations Section 30

4.17 All cellular blood components have undergone pre-storage leukoreduction and are considered ‘CMV safe’. CMV seronegative cellular blood components are indicated in the setting of intrauterine transfusion only.

4.18 Patients with HLA antibodies and demonstrated refractoriness should receive HLA matched apheresis platelets.

4.18.1 If HLA matched platelets are unavailable and HLA antibody specificity is unknown, buffy coat platelet pools should preferentially be selected for transfusion.

4.18.2 If HLA matched platelets are unavailable and the patient HLA antibody specificity is known, apheresis platelets which are HLA antigen negative relative to the reported antibodies may be preferentially selected. Transfusion Medicine Physician consultation is recommended.

4.19 Patients with HPA antibodies, a history of post-transfusion purpura or neonatal alloimmune thrombocytopenia should receive HPA matched apheresis platelets. Transfusion Medicine Physician consultation is recommended.

4.20 The TML shall have a written policy indicating which patients or categories of patients are to receive irradiated cellular blood components. The TML shall have a written policy with respect to permitted storage periods for irradiated blood components. WCDAA TM.8.3.1; CSA 11.7.1

4.21 Once it has been determined that a patient requires irradiated cellular blood components, there shall be a mechanism in place to ensure that all future cellular blood components for that patient are irradiated, as long as clinically indicated. WCDAA TM.8.3.1; CSA 11.7.2

4.22 Although stocking irradiated red blood cells is not encouraged, these units may be released for transfusion to patients who do not have a requirement to receive irradiated blood components (provided that there is compliance with required storage conditions and re-release policies). WCDAA TM.8.3.1; CSA 11.7.3

4.23 Red blood cells may be irradiated up to 28 days after collection and should be transfused as soon as possible, but no later than 14 days after irradiation and no later than 28 days after collection. WCDAA TM.8.5.11; CSA 7.12.6

4.24 Platelets may be irradiated at any time during their 7 day storage period. Once the platelets are irradiated, they may continue to be stored up to their standard expiry date. Guidance Document: Blood Regulations

4.25 A permanent label shall be applied to irradiated cellular blood components identifying: WCDAA TM.8.5.11; CSA 8.6.5.2

a) that the blood component has been irradiated

b) the facility performing the radiation

c) the new expiry date, if changed

4.26 The irradiating facility shall maintain a record of the date of irradiation. CSA 7.12.7

4.26.1 Irradiated blood components for intrauterine or neonatal recipients shall have a written policy with respect to permitted storage periods. CSA 10.9.1.9

4.27 The TML shall have a written policy indicating which patients or categories of patients are to receive pathogen-reduced blood components and blood products (e.g. pathogen-reduced platelets, solvent detergent plasma). WCDAA TM.8.3.1

4.27.1 All CBS orders of solvent detergent plasma (S/D plasma) require approval from the CBS Medical Director.

4.28 Policies, processes and procedures shall be established for red cells-washed to ensure the final product shall have: WCDAA TM.8.5.3; CSA 7.5.3.1, 7.5.3.2

a) almost all of the plasma was removed

b) 75% of the original red cells remaining

c) hematocrit not greater than 0.8 L/L

4.29 Patients with a history of severe allergic transfusion reaction, IgA deficiency (less than 0.05 mg/dL or 0.5 mg/L), and confirmed anti-IgA should be transfused with red blood cells – IgA deficient or red blood cells – washed that are validated to show sufficiently low IgA levels (less than 0.05 mg/dL or 0.5 mg/L). Platelets and plasma should be from IgA-deficient donors. WCDAA TM.8.3.3; CSA 11.10

4.30 Red blood cells prophylactically phenotype-matched for the RhD (D, C, c, E, e) and Kell antigens should be provided to patients with Sickle Cell Disease, Thalassemia, and congenital and immune bone marrow failure disorders.

4.30.1 Extended antigen matching (RhD, Kell, Duffy, Kidd, S) of red blood cells should be considered for patients with red blood cell alloantibodies with chronic transfusion requirements.

4.30.2 The on-call Transfusion Medicine Physician should be consulted for discussion regarding prophylactic red blood cell matching in patient situations other than those described.

4.31 If the TML does not have established policies and procedures for patients with special transfusion requirements, consult with the on-call Transfusion Medicine Physician to authorize all requests.

4.32 A standard operating procedure shall be in place to ensure that autologous blood components are used prior to the transfusion of allogeneic blood components. WCDAA TM.14.2.5; CSA 12.4.2

Exceptional Release of Non-Conforming Blood Components

4.33 Blood components shall not be used after their expiration date unless such use has been approved in writing by the on-call Transfusion Medicine Physician. WCDAA TM.8.2.2; CSA 10.7.2

5.0 Materials

5.1 Selected blood components, modified blood components or blood components for special transfusion requirements.

5.2 Related resources available on the SaskBlood website:

- Transfusion Best Practice Recommendations in Adult Patients – Saskatchewan

- Transfusion Best Practice Recommendations for Neonatal Patients - Saskatchewan
- Transfusion Best Practice Recommendations for Pediatric Patients – Saskatchewan
- Special Requirements for Blood Components in Saskatchewan
- Guideline SK 10 Emergency Release of Red Blood Cells and Plasma
- Guideline SK 20 Emergency Neonatal Red Blood Cell Transfusion

6.0 Quality Management

6.1 Each TML shall have a policy for the management of RhD negative patients who receive blood components containing RhD positive red cells. RhD incompatible transfusions should be tracked and reviewed as a quality indicator. CSA 11.9.7

6.2 The TML shall have a quality improvement system in place to monitor positive compliance with the policies and procedures for selection of blood components and provision of special transfusion requirements. This could be done through random audits of record keeping systems and /or other quality improvement mechanisms. CSA 4.6.1.1, 4.6.3.1

6.3 A formal, documented training program that includes both initial and ongoing training of personnel in the necessary skills related to their responsibilities in selecting blood components and carrying out special transfusion requirements shall be in place. A system shall be in place to assess the effectiveness of their training programs and the frequency of this assessment shall be defined. WCDAA TM.1.2.3; CSA 4.3.2.1, 4.3.2.2, 4.3.4, 4.3.6.2, 14.4.2

6.4 A formal competency assessment program shall be in place for all personnel involved in the selection of blood components and provision of special transfusion requirements. Competency shall be assessed and documented following training and at regular and routine intervals thereafter. The effectiveness of the competency assessment program shall be evaluated periodically as needed and this evaluation shall be documented. WCDAA TM 1.2.4; CSA 4.3.3.1, 4.3.3.2, 4.3.4, 4.3.6.2, 14.4.2

7.0 Procedure

7.1 Review the following criteria when selecting blood components for transfusion:

- Appropriateness of the component requested
- Availability of the component requested
- Availability of autologous or directed blood components
- Patient ABO/RhD type
- Patient antibody screen result
- Patient’s age and sex
- Diagnosis, if available
- Amount and type of blood components available

- Date and/or time of intended transfusion
- Special transfusion requirements
- Patient history of antibodies

7.2 Choose autologous prior to allogeneic blood for patients pre-identified to have these components available.

7.2.1 If autologous is no longer available (e.g. is transfused or outdated), the request for transfusion using allogeneic blood must be confirmed by the ordering physician/authorized health practitioner.

7.3 Check the expiry date for all blood components selected.

Red Blood Cell Compatibility:

7.4 Select ABO identical red blood cells whenever possible. ABO compatible red blood cells may be required if the TML cannot provide sufficient quantities of the patient's blood group.

7.5 Select RhD identical red blood cells whenever possible.

7.5.1 RhD positive patients may receive RhD positive or RhD negative red blood cells depending on inventory.

7.5.2 RhD negative patients should receive RhD negative red blood cells as follows:

7.5.2.1 Females 45 years of age and younger and males 16 years of age and younger, except in emergency situations when RhD negative red blood cells are not available. Discussion with the on-call Transfusion Medicine Physician shall take place in such situations.

7.5.2.2 Any patient with (or a history of producing) anti-D.

7.5.2.3 All other RhD negative patients may receive RhD positive blood in emergency situations provided they do not have an anti-D.

7.6 If ABO and RhD identical red blood cells are not available, then select ABO and RhD compatible red blood cells as outlined in the table below.

Patient's ABO/RhD	1st Choice	2nd Choice	3rd Choice	4th Choice
O negative	O negative	none	none	none
O positive	O positive	O negative	none	none
A negative	A negative	O negative	none	none
A positive	A positive	A negative	O positive	O negative
B negative	B negative	O negative	none	none
B positive	B positive	B negative	O positive	O negative
AB negative	AB negative	A negative	B negative	O negative
AB positive	AB positive AB negative	A positive A negative	B positive B negative	O positive O negative

7.7 Select Kell negative red blood cells for the following patients as follows:

7.7.1 Females 45 years of age and younger who have a Kell negative phenotype except in emergency situations when Kell negative units are not available.

7.7.2 Any patient with (or a history of producing) anti-K.

7.8 Crossmatched red blood cells for females 45 years of age and younger must be group identical or compatible and should be Kell antigen negative whenever possible.

7.8.1 Selection of a group compatible, Kell negative unit is preferable to selection of a group identical unit with unknown Kell status for these patients.

7.9 Ensure the type and screen is in date unless emergency units are requested or autologous units will be issued.

7.10 Check the patient record for clinically significant antibodies.

7.10.1 When clinically significant red cell antibodies are found or the patient has a past history of such antibodies, select red blood cells that do not contain the corresponding antigen (i.e. antigen negative) for transfusion.

Release of Crossmatch Compatible and Uncrossmatched Red Blood Cells

7.11 Complete pre-transfusion testing prior to the release of red blood cells. In order of preference, red blood cells must be selected for issue as follows:

7.11.1 Crossmatch compatible (all pre-transfusion testing completed satisfactorily).

7.11.1.1 If crossmatch compatible red blood cells cannot be found, crossmatch incompatible red blood cells may be used if the need for transfusion outweighs the risk of transfusing incompatible units. In this situation, the treating physician/authorized health practitioner must contact the on-call Transfusion Medicine Physician for authorization.

7.11.2 Group identical uncrossmatched (testing for ABO/RhD complete on a current specimen, antibody detection tests incomplete).

7.11.3 Emergency uncrossmatched (urgency of the transfusion requirement prevents the initiation or completion of pre-transfusion testing). O RhD positive or O RhD negative uncrossmatched red blood cell units could be released.

Emergency Release

7.12 In emergency situations when pre-transfusion testing has not been initiated or completed, and the patient's blood group is unknown, select red blood cells as follows:

7.12.1 Uncrossmatched Group O RhD negative, Kell negative red blood cells for females 45 years of age and younger.

7.12.2 Uncrossmatched Group O RhD positive red blood cells for females 46 years of age or older.

7.12.3 Uncrossmatched Group O RhD negative red blood cells for males 16 years of age and younger.

7.12.4 Uncrossmatched Group O RhD positive for all other patients without anti-D.

7.12.5 Refer to Guideline SK 10 Emergency Release of Red Blood Cells and Plasma.

Platelet Compatibility:

7.13 Select ABO/RhD identical platelets if possible, but ABO/RhD non-identical platelets may be transfused when ABO/RhD identical platelets are not available.

7.14 If ABO identical platelets are not available, select ABO compatible platelets as outlined in the table below.

Patient's ABO	1st Choice	2nd Choice	3rd Choice	4th Choice
O	O	A	B	AB
A	A	AB	none	none
B	B	AB	none	none
AB	AB	none	none	none

7.15 If ABO identical or compatible platelets are not available, it is acceptable to transfuse ABO incompatible platelets if warranted by the patient's clinical condition. Contact the on-call Transfusion Medicine Physician for assistance when required.

7.16 RhD positive patients can receive either RhD positive or RhD negative platelets based on inventory.

7.16.1 RhD negative patients should receive RhD negative platelets when possible. Females 45 years of age and younger and males 16 years of age and younger should receive RhD negative platelets if they are RhD negative or unknown blood type.

7.16.2 If RhD positive platelets must be used, RhIg prophylaxis should be administered within 72 hours of platelet transfusion.

Plasma Compatibility:

7.17 Select ABO identical or compatible plasma for transfusion. RhD compatibility is not considered.

Patient's ABO	ABO
O	O, A, B or AB
A	A or AB
B	B or AB
AB	AB

7.18 In emergency situations when pre-transfusion testing has not been initiated or completed and the patient's blood group is unknown, select Group AB plasma.

7.18.1 If Group AB plasma is unavailable, contact the on-call Transfusion Medicine Physician for consideration of Group A plasma.

Cryoprecipitate Compatibility:

7.19 Select ABO cryoprecipitate for adults and children as outlined in the table below (the order list indicates the preferred choice ABO).

Patient's ABO	ABO
O	O, A, B (then AB)
A	A, B, O (then AB)
B	B, A, O (then AB)
AB	A*, AB
Unknown	A, B, O (then AB)

7.20 For patients with an unknown blood group, select group A cryoprecipitate. Group AB cryoprecipitate should be reserved for neonates only.

Note: *Group AB pediatric and adult patients should receive group A cryoprecipitate (to preserve group AB cryoprecipitate for neonates).

Special Transfusion Requirements:

7.21 Refer to the SaskBlood 'Special Requirements for Blood Components in Saskatchewan' for the list of eligible patients.

7.22 Submit orders for blood components with special transfusion requirements to CBS as required.

8.0 Reporting – N/A

9.0 Documentation – N/A

10.0 References

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11.0 Revision History

Date Revised: November 1, 2024	
Section Number	**Summary of Revisions**
Global	• Replacement of ‘females of childbearing age as less than 50 years of age’ with ‘females of childbearing age as 45 years of age and under’.
	• Replacement of ‘males less than 18 years of age’ with ‘males 16 years of age and under’.