



**RECOMMENDATIONS FOR USE OF
IRRADIATED BLOOD COMPONENTS IN CANADA**

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BACKGROUND:

The National Advisory Committee on Blood and Blood Products (NAC) is an interprovincial medical and technical advisory body to the provincial and territorial health ministries and Canadian Blood Services (CBS). The NAC mandate is to:

- Provide advice on matters pertaining to blood supply, including those directly affecting the practice of transfusion medicine in hospitals;
- Share information about blood and blood product utilization and utilization management efforts, and play a supportive role in the development of guidelines and recommendations for product use;
- Identify opportunities to optimize transfusion medicine practices; and
- On a jurisdictional level, provide leadership in the identification, design and implementation of blood utilization management initiatives for the optimization of patient care.

The CBS Provincial Territorial Blood Liaison Committee (CBS PT BLC) requested that NAC develop recommendations and guidelines for the use of irradiated blood products for Canadian patients. NAC assembled an Irradiation working group to review current standards, published guidelines and recent literature on the indications for irradiated components and the quality of irradiated red cell components (RCCs) to facilitate recommendations for best practices. NAC's Irradiation working group also engaged representatives of Quebec's National Advisory Committee on Transfusion Medicine (CCNMT) and consulted with Canadian experts in transfusion medicine.

This work was informed by guidelines published by the British Committee for Standards in Hematology (BCSH 2010) and the Australian and New Zealand Society of Blood Transfusion (ANZSBT 2011) as well as the Canadian Standards Association (CSA) and the Canadian Society for Transfusion Medicine (CSTM) standards, Council of Europe (COE) standards, and recent publications on the quality of stored red cells post irradiation.

Upon review of the best-available information, the Irradiation working group has compiled recommendations regarding which patients should receive irradiated components, the age of the components at the time of irradiation and the length of storage post-irradiation. The latter recommendations are consistent with the COE standards and more restrictive than current American Association of Blood Banks (AABB), CSA and CSTM standards.

Irradiation of blood components is a well-established intervention for the prevention of transfusion-associated graft-versus-host disease (TA-GVHD). There is a system cost of providing irradiated blood components to patients that includes higher production costs, time delays and damage to transfused red blood cells. In particular, recent publications have emphasized the importance of considering the age of a RCC at the time of irradiation and the length of storage post-irradiation. The working group has emphasized the importance of managing hospital inventories such that provision of irradiated RCCs is limited, to the extent feasible, to those



patients who have specific clinical indications for irradiated RCCs. Thereby minimizing exposure of the general patient population to irradiated RCCs.

Data provided by CBS demonstrates some trends in irradiation practice in Canada over the past ten years. There has been a national increase in the percentage of irradiated RCCs from 4.5% (2004-2005) to 6.7% (2015-2016). There is considerable regional variation. The percentage irradiated RCC issued by CBS ranges from 2-18%, depending on the province. The percentage of irradiated RCC issued by Héma-Québec, in 2015-2016, was 6.04.

TA-GVHD is a rare, usually fatal, complication of transfusion resulting from the engraftment of transfused, immunocompetent, donor lymphocytes and subsequent damage to recipient tissues which are perceived as foreign by the engrafted lymphocytes. Patients at most risk include those who are severely immunocompromised and those who fail to recognize the transfused lymphocytes as foreign, due to HLA homology. Defining immunocompromised patient groups who should receive irradiated blood has been largely based on observational evidence, case reports, reviews and attempts to predict the degree of immunosuppression. As such, there is a lack of consistency in text books, publications and guidelines as to which patients must receive irradiated blood. Many authors address the lack of certainty by including a category of patients where there is uncertainty regarding the need for irradiated blood.

In view of our growing knowledge of the poor quality of post-irradiation stored blood it behoves us to be thoughtful about our lists of clinical indications and avoid over stocking pre-storage irradiated blood. Finding a balance is difficult; however, recent observational evidence suggests that pre-storage leukoreduction reduces the risk of TA-GVHD and that the length of time since donation is relevant to the risk of TA-GVHD.

In a recent systematic review of reported cases of TA-GVHD the authors report that greater than 94% of cases of TA-GVHD occur when the blood is less than 10 days old (Kopolovic *et al*, 2015). In a review of 290 cases referred to the Japanese Red Cross (JRC), from 1992-1999, 66 were deemed definite TA-GVHD, by microsatellite DNA analysis. The oldest blood transfused in these cases was 10 days for whole blood, 11 days for non-additive RCC and 14 days for RCC with added mannitol, adenine and phosphate (Uchida *et al*, 2013). In another report from the JRC, 96% of 51 cases received blood less than 96 hours old (Jawa *et al*, 2013 2015). Thus, transfusion of blood stored for more than 14 days represents a potential risk mitigation strategy for patients in whom there is uncertainty regarding the degree of immune compromise.

The potential risk mitigation afforded by leukoreduction is suggested by data from the Serious Hazards of Transfusion (SHOT) surveillance system in the United Kingdom (UK) where there have been no cases of TA-GVHD since the introduction of universal pre-storage leukoreduction in 2001. It should be noted, however, that 2 of 13 cases between 1996 and 2001 occurred in patients who received leukoreduced components. Furthermore, subsequent to the 2001 terrorist attacks a decision was made in the UK to increase blood stocks. The mean age of blood issued to hospitals after 2002 went from eight (8) days to 12-14 days and this may have contributed to reduced risk of TA-GVHD (Williamson *et al*, 2007). Nonetheless, universal pre-storage leukoreduction is thought to afford some reduction in the risk of TA-GVHD.



In defining patients who should receive irradiated cellular components, NAC has chosen to support the recommendations contained in the BCSH 2010 and ANZSBT 2011 guidelines while maintaining a cautious approach for top-up transfusions in neonates less than 1200 grams and neonatal exchange transfusion.

For patient groups where the risk of TA-GVHD is uncertain, NAC has suggested the option of choosing pre-storage leukoreduced RCCs that are greater than 14 days post collection as a risk mitigation strategy in the absence of on-site irradiation. It is expected that this approach will reduce the need to maintain excessive stocks of irradiated blood in facilities that do not have an irradiator and minimize transfusion of irradiated stock RCCs to the general patient population.

GENERAL RECOMMENDATIONS

NAC supports the following general recommendations pertaining to the type of blood component that requires irradiation, information sharing and communications of a patient's requirement for irradiated blood components. In addition, NAC recommends voluntary alignment with the COE standards for the age of the units and post-irradiation storage conditions.

Blood components that should be irradiated

Recommendation: For at-risk patients, all red cell, platelet and granulocyte components should be irradiated, except cryopreserved red cells after deglycerolization. It is not necessary to irradiate fresh frozen plasma, cryoprecipitate or fractionated plasma. (Grade 1 recommendation; level B evidence, BCSH 2010)

Age of the Units and Post-Irradiation Storage Conditions

Recent evidence has shown that the age of RCCs at the time of irradiation is important and that prolonged storage of pre-irradiated units is associated with high potassium levels, in vitro hemolysis and decreased post-transfusion recovery. This has implications for patient safety as well as hospital inventory management practices.

NAC is recommending voluntary alignment with the COE standards (17th edition) which are more restrictive than the current North American standards (AABB, CSA and CSTM) and regulations (Health Canada and FDA). Current North American standards and regulations specify that RCCs shall have a maximum expiration time of 28 days after irradiation or shall retain the original outdate, whichever is shorter. There is no limit on the age of RCC at the time of irradiation. Contrariwise, the COE standards restrict the age of RCCs at the time of irradiation and the length of storage thereafter.

Recommendation: Red cell components may be irradiated up to 28 days after collection. Irradiated cells must be transfused as soon as possible, but no later than 14 days after irradiation, and, in any case, no later than 28 days after collection. (Council of Europe Standards, 17th edition, 2013)



Patient awareness

Recommendation: The most responsible health care practitioner shall inform patients at risk of TA-GVHD of their need for irradiated blood components.
(Grade 2 recommendation; level C evidence, BCSH 2010)

Communication

Recommendation: To ensure consistency of patient care across jurisdictions, particularly between hospital facilities that participate in the shared care of patients, a communications process facilitating sharing details of special transfusion requirements should be implemented and maintained.

INVENTORY MANAGEMENT RECOMMENDATIONS

As stated, prolonged storage of pre-irradiated units is associated with high potassium levels, in-vitro hemolysis and decreased post-transfusion recovery. Maintaining large inventories of irradiated red cells results in potentially harmful transfusion of irradiated red cells to patients who do not require irradiated cellular blood components.

Proactive inventory management must take into consideration the perceived risk of TA-GVHD in the local patient population, the risks of transfusing irradiated red cells to patients who do not require irradiated cellular components and the logistics of providing irradiated components for elective transfusions.

Recommendation: For elective transfusions reliance on a regional hub site for on-demand irradiation or pre-irradiated stock is recommended.

Recommendation: Overstocking of pre-irradiated units for emergency transfusion is not recommended.

- If storage of pre-irradiated inventory is absolutely necessary, then obtain red cells that have been irradiated within 14 days of collection if possible.

As described above, observational evidence from UK SHOT data (Williamson *et al*, 2007), a recent systematic review of 348 cases of TA-GVHD (Kopolovic *et al*, 2015) and three reviews of Japanese Red Cross data has provided some evidence for the risk mitigating effect of universal pre-storage leukoreduction and the transfusion of older RCCs with reduced lymphocyte viability (>14 days post donation) (Uchida *et al*, 2013) (Jawa *et al*, 2013 2015).

Recommendation: In the event of emergency transfusion in the absence of on-site irradiation or pre-storage irradiated inventory, pre-storage leukoreduced red cells that have been stored for more than 14 days should be provided.



CLINICAL RECOMMENDATIONS

To arrive at the following clinical recommendations NAC has drawn upon the BCSH 2010 and ANZSBT 2011 guidelines and a survey of current practices at Canadian hospitals with level three (3) neonatal intensive care units.

See Appendix A for a quick reference of the clinical indications.

Acquired immunodeficiency states

Recommendation: There is no indication for irradiation of cellular blood components for adults or infants and children who are HIV antibody positive or who have AIDS.
(Grade 2 recommendation; level B evidence, BCSH 2010; ANZSBT 2011)

Acute leukemia

Recommendation: It is not necessary to irradiate red cells or platelets for adults or children, except for HLA-selected platelets or donations from first- or second-degree relatives.
(Grade 1 recommendation; level B evidence, BCSH 2010; ANZSBT 2011)

Allogeneic bone marrow or peripheral blood stem cell transplantation

Recommendation: All recipients of allogeneic hemopoietic stem cell transplantation (HSCT) must receive irradiated blood components from the time of initiation of conditioning chemoradiotherapy.
(Grade 1 recommendation; level B evidence, BCSH 2010; ANZSBT 2011)

Recommendation: Irradiated blood components should be continued while the patient continues to receive graft-versus-host disease (GVHD) prophylaxis, i.e. usually for 6 months post-transplant, or until the lymphocyte count is greater than $1 \times 10^9/L$. If chronic GVHD is present or if continued immunosuppressive treatment is required, irradiated blood components should be given indefinitely.
(Grade 2 recommendation; level C evidence, BCSH 2010)

Recommendation: Allogeneic blood transfused to bone marrow and peripheral blood stem cell donors seven (7) days prior to or during the harvest should also be irradiated.
(Grade 2 recommendation; level C evidence, BCSH 2010; ANZSBT 2011)

Aplastic anemia

Recommendation: In view of the recent switch from horse anti-thymocyte globulin (ATG) to the more immunosuppressive rabbit ATG, we now recommend use of irradiated blood components for aplastic anemia patients receiving immunosuppressive therapy with ATG (and/or alemtuzumab).
(Grade 2 recommendation; level C evidence, BCSH 2010; ANZSBT 2011)



Recommendation: We cannot make a firm recommendation as to how long irradiated blood components should continue to be used after ATG administration.

Autologous bone marrow or peripheral blood hemopoietic stem cell transplantation

Recommendation: Patients undergoing bone marrow or peripheral blood stem cell 'harvesting' for future autologous re-infusion should receive irradiated cellular blood components during and for seven (7) days before the bone marrow/stem cell harvest to prevent the collection of viable allogeneic T lymphocytes, which can potentially withstand cryopreservation.

(Grade 2 recommendation; level C evidence, BCSH 2010; ANZSBT 2011)

Recommendation: All patients undergoing autologous bone marrow transplant or peripheral blood stem cell transplant should receive irradiated cellular components from initiation of conditioning chemo/radiotherapy until three (3) months post-transplant (six months if total body irradiation was used in conditioning).

(Grade 2 recommendation; level C evidence, BCSH 2010; ANZSBT 2011)

Donations from family members and HLA-selected donors

Recommendation: All transfusions from first- or second-degree relatives should be irradiated, even if the patient is immunocompetent.

(Grade 1 recommendation; level B evidence, BCSH 2010)

Recommendation: All HLA-selected platelets should be irradiated, even if the patient is immunocompetent.

(Grade 2 recommendation; level C evidence, BCSH 2010)

Lymphoma

Recommendation: All adults and children with Hodgkin lymphoma at any stage of the disease should have irradiated red cells and platelets for life.

(Grade 1 recommendation; level B evidence, BCSH 2010; ANZSBT 2011)

Recommendation: All patients with non-Hodgkins lymphoma on purine analogues and related drugs (see appendix A) should receive irradiated cellular blood components indefinitely (Grade 1 recommendation; level B evidence, BCSH 2010) (ANZSBT 2011)

Local practices may be dictated by the ability of hospital transfusion medicine services to obtain the patient's drug history. The recommendation encourages the pharmacy to provide the patient's drug utilization information.



Neonatal Transfusions

A survey was completed to better understand current practices in Canada regarding the use of irradiated blood components specifically for neonatal populations to inform NAC's recommendations. The survey focused on three clinical scenarios, namely, intrauterine transfusions, top-up transfusions and exchange transfusions in neonates. The survey was sent to the medical directors of transfusion medicine in level three (3) neonatal intensive care nurseries (according to the Neonatal Classification Tool developed in British Columbia). See Appendix B for the survey questions and Appendix C for survey results.

The recommendations for neonatal transfusions are as follows:

Intra-Uterine Transfusions (IUT):

Recommendation: All components for IUT must be irradiated. To minimize the effect of potassium load, red cells for IUT must be used within five (5) days of donation and within 24 hours of irradiation.

(Grade 1 recommendation; level B evidence, BCSH 2010) (ANZSBT 2011)

Exchange Transfusion:

Recommendation: Blood for neonatal exchange transfusion must be irradiated if there has been a previous IUT or if the donation comes from a first- or second-degree relative. (Grade 1 recommendation; level B evidence, BCSH 2010) (ANZSBT 2011)

For other neonatal exchange transfusions, irradiation is recommended provided this does not unduly delay transfusion.

(Grade 1 recommendation; level C evidence, BCSH 2010)

Neonatal Top-up Transfusions:

Recommendation: Irradiated cellular components are recommended for neonates who have received an IUT.

(BCSH 2010) (ANZSBT 2011)

Recommendation: Irradiated cellular components are recommended for top-up transfusions given to neonates less than four (4) months of age with very low birth weights of less than 1200 grams.

(survey results; NAC working group and ANZSBT 2011)

For top-up transfusions in neonates, NAC recognizes a lack of certainty in published guidelines and recommends that deviations from the aforementioned recommendation may be reflected in local policies that have been developed in consultation with neonatologists.



For facilities with on-site irradiators, aliquots of irradiated red cells should be irradiated at the time of issue. An alternative approach is recommended for those facilities without on-site irradiation. That is, the use of a single, sterile docked, adult unit for multiple neonates. This unit can be irradiated by the supplier or another hub-site hospital and should be rotated on a weekly basis. This is a practice that is evolving in pediatric centres where the concerns regarding donor exposure are thought to be subordinate to the risks of older blood irradiated prior to storage (Dr. Nancy Robitaille, CCNMT, personal communication). In these facilities, a neonatologist may request a dedicated unit when it is anticipated that the neonate will require many red blood cell transfusions. If that is the case and on-site irradiation is not available, consideration should be given to a procedure for saline replacement of the supernatant of aliquots that are prepared more than seven (7) days post irradiation of the parent unit.

Recommendation: Where the patient is at particular risk from hyperkalemia, e.g. intrauterine or neonatal exchange transfusion, it is recommended that red cells be transfused within 24 hours of irradiation or that cells are washed. (BCSH 2010) (ANZSBT 2011)

Emergency Transfusions:

Recommendation: For emergency transfusions of unmatched group O, D-negative red cells for neonatal resuscitation due to obstetrical complications and/or accidents, irradiated cellular components are NOT required (survey results; NAC working group).

Congenital Cardiac Abnormalities:

Recommendation: All neonates with complex cardiac abnormalities should receive irradiated cellular components until 22q11.2 deletion associated with immunodeficiency states, which include DiGeorge Syndrome, have been excluded. If 22q11.2 deletion is confirmed, irradiated cellular components should be provided for life (survey results; NAC working group).

Purine analogue drugs and other potent immunosuppressive drugs

Recommendation: Patients treated with purine analogue drugs (fludarabine, cladribine and deoxycoformicin) should receive irradiated blood components indefinitely. (Grade 1 recommendation; level B evidence, BCSH 2010; ANZSBT 2011)

Recommendation: The situation with other purine antagonists and new or related agents, such as bendamustine and clofarabine, is unclear, but use of irradiated blood components is recommended as these agents have a similar mode of action. Irradiated blood components should be used after alemtuzumab (anti-CD52) therapy. Their use after rituximab (anti-CD20) is not recommended at this time. As new potent immunosuppressive drugs and biological agents are introduced into practice there is a need for regular review of these recommendations.



(Grade 2 recommendation; level C evidence, BCSH 2010)

Recommendation: Where there is concern about the immunosuppressive potency of new drugs and uncertainty about the risk of TA-GVHD, in the absence of on-site irradiation or pre-storage irradiated inventory, pre-storage leukoreduced red cells that have been stored for more than 14 days should be provided.

Routine surgery, solid tumors, organ transplantation, autoimmune disorders, acquired immunodeficiency

Recommendation: It is not necessary to irradiate blood components for patients undergoing routine surgery, those with solid tumours, HIV infection, autoimmune diseases or after solid organ transplantation (unless alemtuzumab (anti-CD52) has been used in the conditioning regimen). The effects of new regimens of chemo- and immunotherapy entering clinical practice must continue to be monitored.

(Grade 2 recommendation; level C evidence, BCSH 2010)

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APPENDIX A

Quick Reference of Indications for Irradiated Blood Components

| Patient Category | Condition | Irradiated |
|------------------|--|-------------------|
| Pregnancy | Intrauterine, fetal transfusion | Yes |
| Neonates | Neonatal exchange transfusion: <ul style="list-style-type: none"> • Previous IUT • All neonatal exchange transfusions provided it does not unduly delay transfusion | Yes Yes |
| | Neonatal top-up transfusions <ul style="list-style-type: none"> • Previous IUT • Less than 4 months of age with very low birth weights (< 1200g) • Consult local policies in uncertain situations | Yes Yes Yes |
| | Neonatal emergency transfusions: <ul style="list-style-type: none"> • NOT required for unmatched group O, D-negative red cells | No |
| | Congenital cardiac abnormalities: <ul style="list-style-type: none"> • Until 22q11.2 deletion has been excluded • Confirmed 22q11.2 deletion | Yes Yes |
| Hematology | Acute leukemia ONLY in these situations: <ul style="list-style-type: none"> • HLA-selected platelets • Donations from first- or second- degree relatives | Yes Yes |
| | Aplastic Anemia <ul style="list-style-type: none"> • Patients receiving immunosuppressive therapy with ATG (and/or alemtuzumab) | Yes |
| | Hodgkin's Lymphoma at any stage | Yes |
| | Non-Hodgkin's Lymphoma and being treated with purine analogues and related drugs | Yes |
| Transplant | Allogeneic haematopoietic stem cell or bone marrow transplant recipients, <ul style="list-style-type: none"> • from the time of initiation of conditioning chemotherapy • while the patient continues to receive GVHD prophylaxis, i.e. usually 6 months post transplant or until the lymphocyte count is greater than $1 \times 10^9/L$. | Yes Yes |



| | | |
|---------------|---|-----|
| | <ul style="list-style-type: none"> indefinitely if chronic GVHD is present or if continued immunosuppressive therapy is required | Yes |
| | Allogeneic blood transfused to stem cell or bone marrow transplant donors for 7 days prior to and during the harvest | Yes |
| | Autologous stem cell or bone marrow transplant recipients from the initiation of conditioning chemo/radiation therapy to 3 months post-transplant | Yes |
| | Patients undergoing harvesting for future autologous re-infusion | Yes |
| Miscellaneous | Patients known to have received potent immunosuppressive drugs. See table below. | Yes |
| | Directed Donation (from first- and second- degree relatives) | Yes |
| | HLA matched platelets | Yes |
| | Granulocyte transfusion | Yes |

Potent Immunosuppressive drugs thought to increase risk of GVHD

| GENERIC Name | TRADE Name |
|-------------------------|---|
| Fludarbine | Fludara |
| Cladribine or 2-CDA | Leustatin |
| Deoxycoformicin | Pentostatin or Nipent |
| Alemtuzumab (anti-CD52) | Campath |
| Bendamustine | Treakisym, Ribomustin, Levact and Treanda |
| Clofarabine | Clolar |



APPENDIX B Survey Questions

1. Please provide us with some information on your hospital.

Note: Please answer the following questions for each hospital that you oversee. For example, if you are responsible for two hospitals, please complete this survey twice with responses specific to each institution.

1a. Name of institution.

1b. Level of care provided in your neonatal intensive care unit?

Level 1 Level 2 Level 3

Use the BC NICU ClassificationTool_Perinatal Services BC.pdf classification scheme when determining your Level of Care.

1c. Which of the following types of transfusions are performed in your institution? (select all that apply)

- Intrauterine transfusion
- Neonatal exchange transfusion
- Neonatal top-up transfusion
- Emergency unmatched for neonatal resuscitation

2. Is there a policy requiring provision of irradiated cellular blood components for any of the following:

2a. Intrauterine transfusion?

Yes No Not performed at our hospital

2b. Top-up transfusion in neonates who (select all that apply)

Have received intrauterine transfusion:

- Are less than 1200 grams at birth
- Are less than 1500 grams at birth
- All neonates (0-4 months) regardless of birth weight
- Not performed at our hospital

2c. Exchange transfusion in neonates who (select all that apply)

Have received an intrauterine transfusion:

- Are less than 1200 grams at birth
- Are less than 1500 grams at birth
- All neonates (0-4 months) regardless of birth weight
- Not performed at our hospital

3. Is irradiation of cellular components for neonates done on site at your hospital?



Yes No

3a. If not, is there a manipulation of the red cell component to reduce the levels of potassium?

Yes No

3b. If not, are there rules restricting: (select all that apply)

- The age of the blood prior to irradiation
- The length of storage time post irradiation

4. To your knowledge, has there been a case of neonatal transfusion-associated graft-versus-host disease (TA-GVHD) at your hospital?

Yes No

5. To your knowledge, have there been complications related to hyperkalemia in neonates receiving irradiated red cells?

Yes No

5a. In the context of a top-up transfusion?

Yes No

5b. In the context of a large volume transfusion (e.g. cardiac surgery) or multiple top-up transfusions in succession?

Yes No

6. Prolonged storage of pre-irradiated red cells is associated with high potassium levels and in-vitro hemolysis. UK SHOT data report only a single case of TA-GVHD since the introduction of universal pre-storage leukocyte reduction in 1999. With this in mind:

6a. Would you agree with abandonment of the irradiation requirement for top up transfusions in neonates, who:

Yes No

6b. Would you agree with abandonment of the irradiation requirement for neonatal exchange transfusion?

Yes No



7. Do you agree with the following statement: *For emergency transfusions of unmatched group O, D negative red cells for neonatal resuscitation due to obstetric complications and / or accidents, irradiated cellular components are NOT required?*

Yes No

8. Do you agree with the following statement: *Although 22q11.2 deletion syndrome (encompasses DiGeorge Syndrome) is most commonly associated with conotruncal lesions, the variety of heart defects described in patients with this syndrome is extensive. In order to avoid missing a neonate or young infant with immunodeficiency, it is recommended that neonates and young infants with congenital heart defects receive irradiated cellular components up to 6 months of age, at which time those suspected of having 22q11.2 deletion syndrome should have been tested for this disorder.*

Yes No

8a. Please indicate your comments, if any:

9. Do you think additional information is needed to improve strategies for preventing TA-GVHD and the usage of irradiation?

Yes No

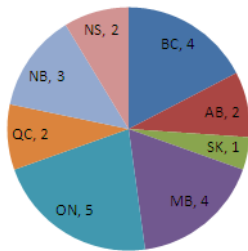
9a. If yes, please indicate your suggestions (randomized controlled trials, systematic reviews, consensus conference, etc.)



APPENDIX C

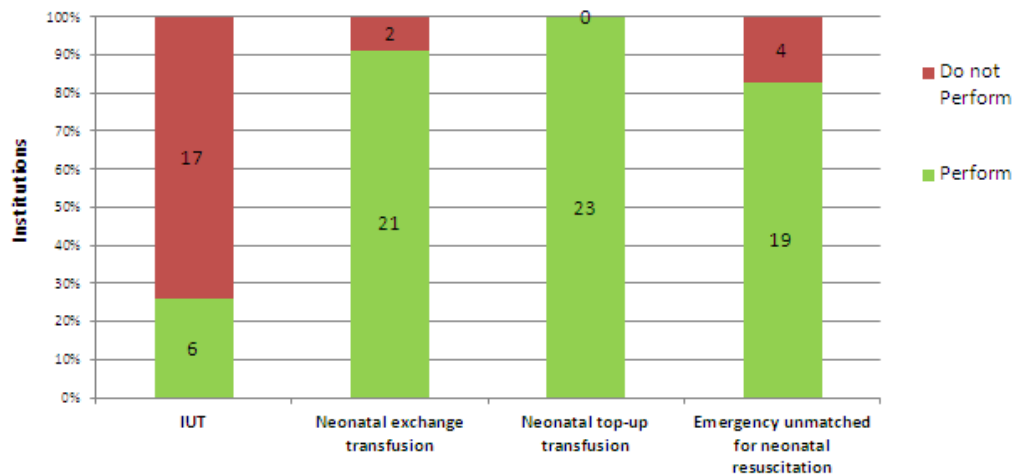
NAC - 2016 National Survey Results - Irradiation Practices in Neonatal Transfusion

Number of Institutions Responding to Survey



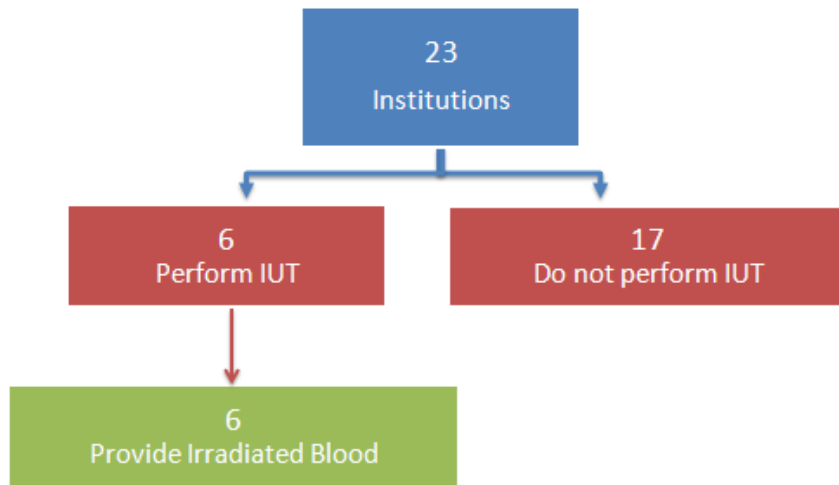
22 – Level 3
1 – Level 2 (in MB)
23 – Total

Type of Transfusions Performed

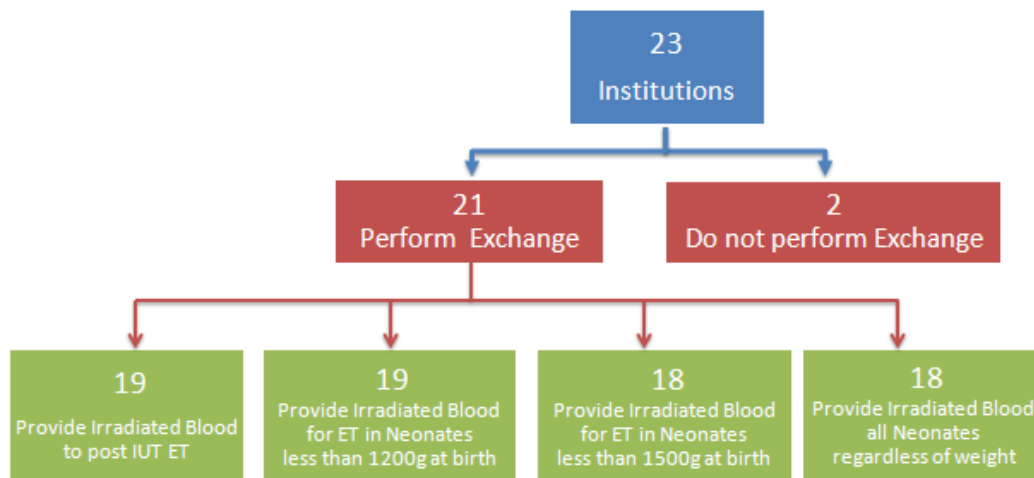




Intrauterine Transfusions



Neonatal Exchange Transfusions





Top-up transfusions - Assumption

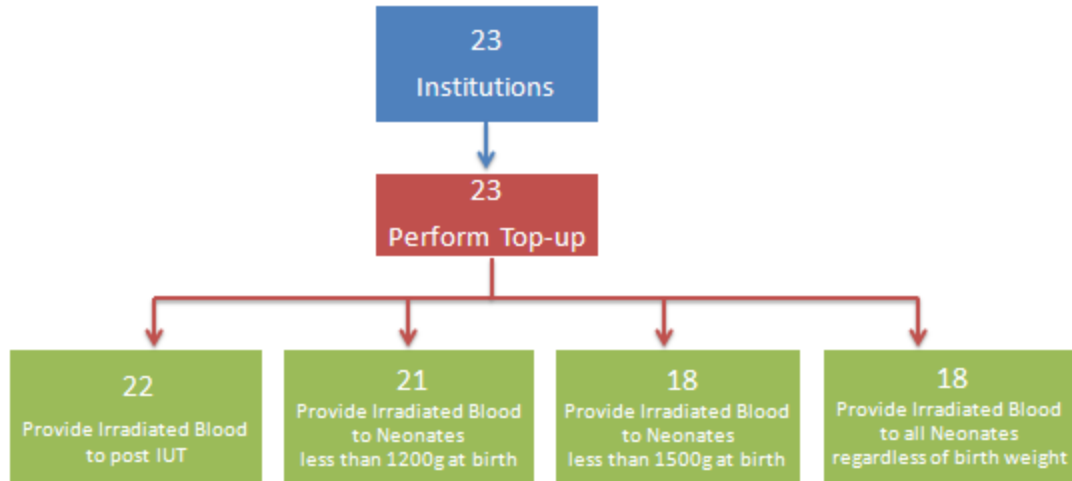
2. Is there a policy requiring provision of irradiated cellular blood components for any of the following:

2b. Top-up transfusion in neonates who (select all that apply)

- Have received intrauterine transfusion
- Are less than 1200 grams at birth
- are less than 1500 grams at birth
- All neonates (0-4 months) regardless of birth weight *
- Not performed at our hospital

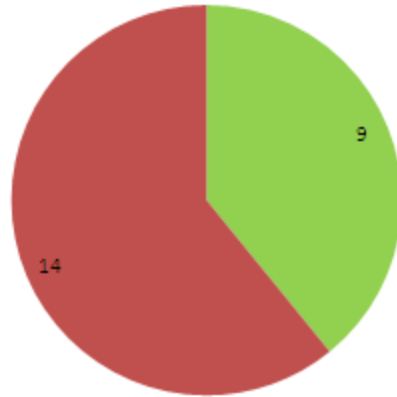
* Applies to all the options above

Neonatal Top - Up Transfusions

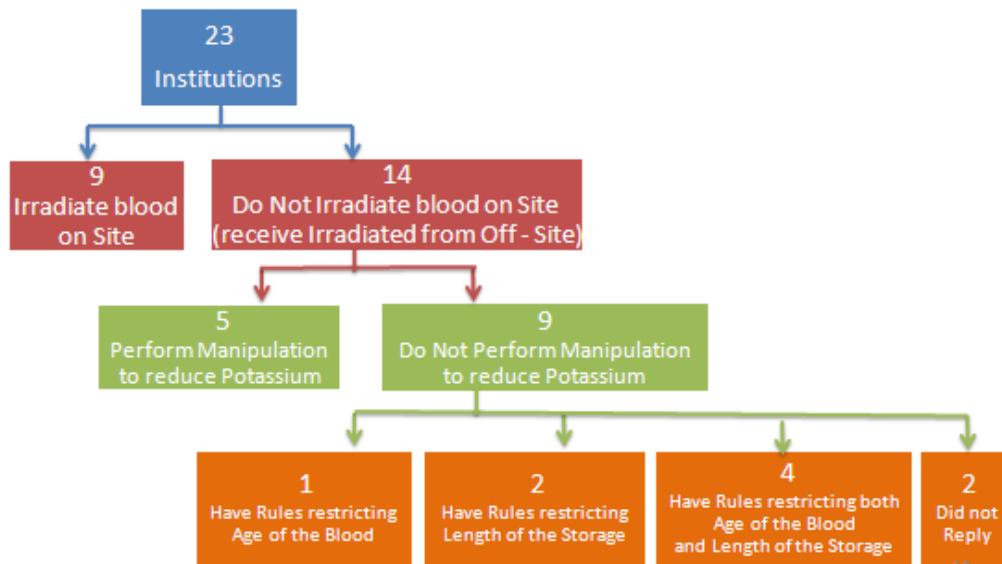




Institutions with Irradiators on Site

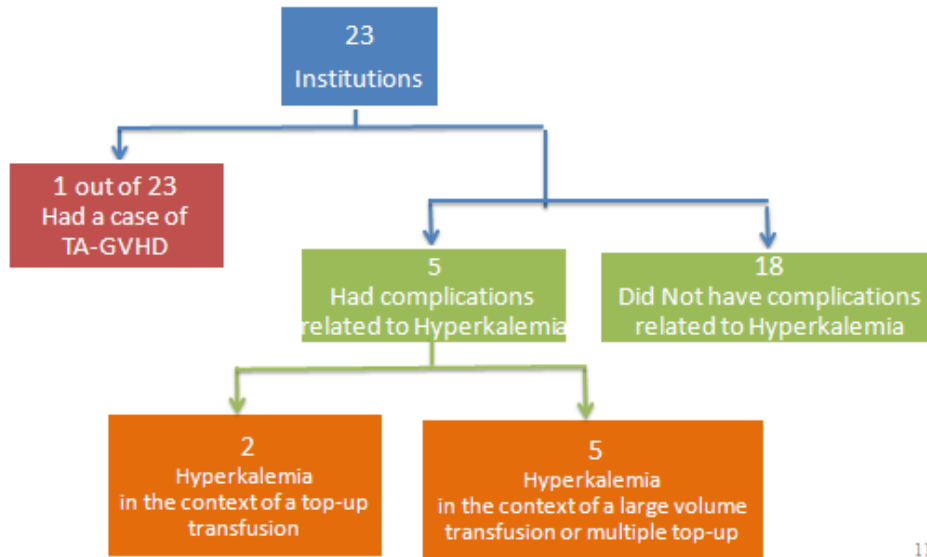


■ Yes (3 in BC, 1 in AB, 3 in ON, 2 in QC) ■ No (14 out of 23 Institutions surveyed)

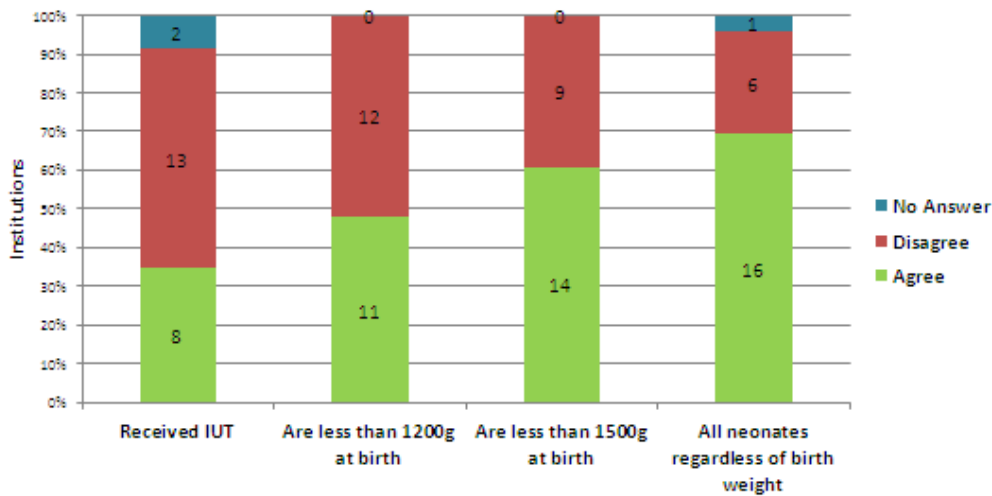




Irradiation related Complications

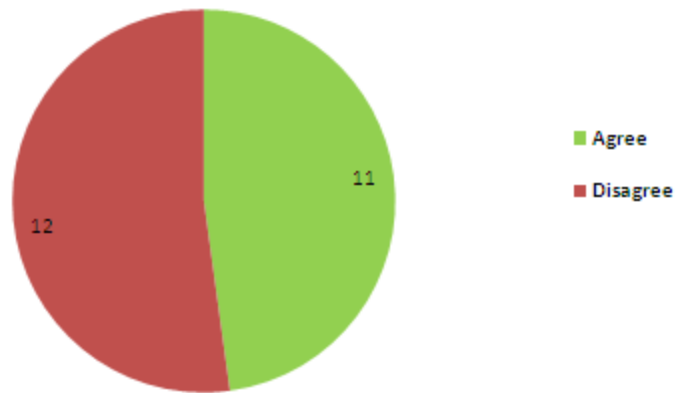


Abandon Irradiation for Top - Up Transfusion in Neonates who





Abandon Irradiation for Exchange transfusion in Neonates



Irradiated blood is NOT required for Emergency Transfusions of unmatched group O RBC





Neonates with congenital heart defects should receive irradiated blood until 6 months?

Di George Syndrome - testing for 22q11.2 deletion

