

# Apheresis: Transfusion Indications

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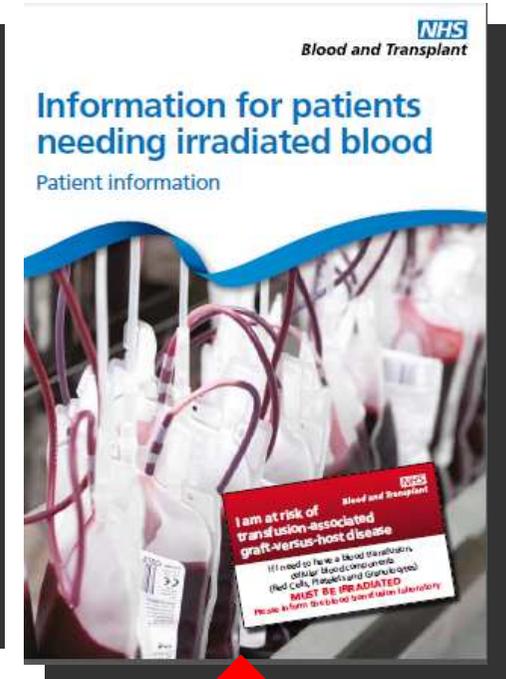
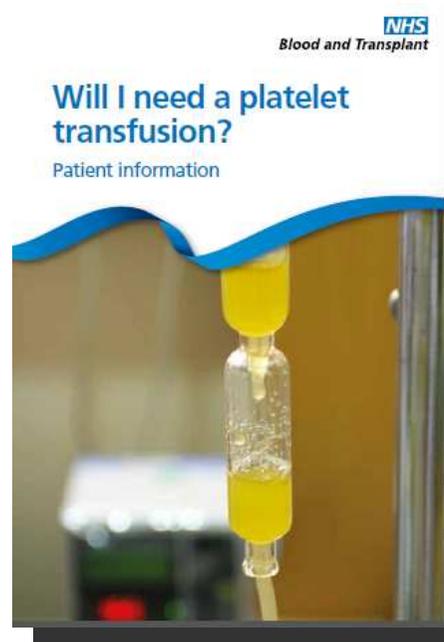
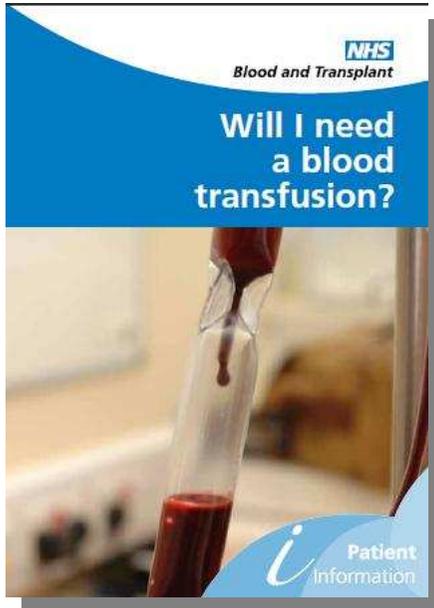
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# Apheresis: Transfusion Indications



- Focus of talk will be blood component transfusion in the context of apheresis procedures:
- Special Requirements for transfusion.
- Automated Red cell exchange: requirements in sickle cell disease.

# PATIENT INFORMATION



## NICE Quality statement (QS138) – Dec 16

People who may need or who have had a blood transfusion are given verbal and written information about blood transfusion.

Since May 2017 All Red Cells + Platelets HEV negative

Contains card for patient to carry and they can present at other hospitals.

# QUALITY OF TRANSFUSION CHECKING PROCEDURE: 78% OF SHOT REPORTS RELATE TO ERRORS



## ESTIMATING RISK



GOOD EXAMPLE OF A BRAIN STUDY. IF YOU CAN READ THIS YOU HAVE A STRONG MIND.

7H15 M3554G3  
53RV35 7O PR0V3  
H0W 0UR M1ND5 C4N  
D0 4M4Z1NG 7H1NG5!  
1MPR3551V3 7H1NG5!  
1N 7H3 B3G1NN1NG  
17 WA5 H4RD BU7  
N0W, 0N 7H15 LIN3  
YOUR M1ND 1S  
R34D1NG 17  
4U70M471C4LLY  
W17H 0U7 3V3N  
7H1NK1NG 4B0U7 17,  
B3 PROUD! ONLY  
C3R741N P30PL3 C4N  
R3AD 7H15.  
PL3453 5H4R3 1F  
U C4N R34D 7H15.

PENGUIN CLASSICS  
FYODOR DOSTOYEVSKY  
THE DOUBLE



RED	BLUE	PURPLE
GRAY	GREEN	WHITE
YELLOW	FUSHIA	BLACK
PINK	ORANGE	BROWN



# PBSC Considerations

Patients undergoing peripheral blood stem cell ‘harvesting’ for future autologous re-infusion should receive irradiated cellular blood components **during** and for **7 days before** the stem cell collection to prevent the collection of viable allogeneic T lymphocytes which can potentially withstand cryopreservation (BCSH 2010).

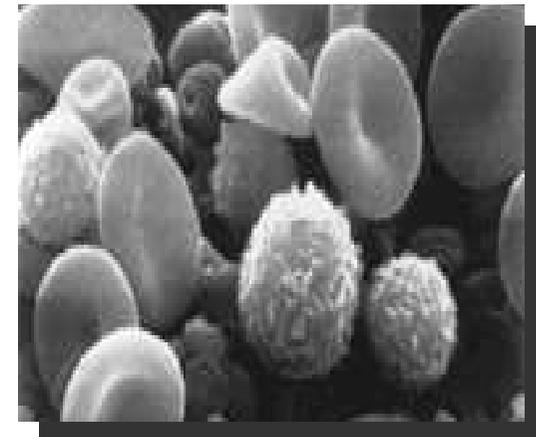
**S**Communication with shared care units.

**S**Blood prime – irradiated blood.

**S**Transfusion of RBC or platelets before or in-between collections.

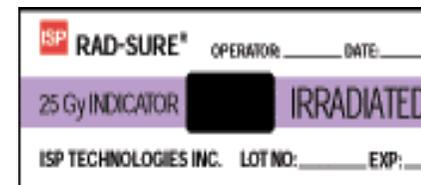
**S**Timing in relation to auto-PBSC transplant:  
> post collection requirements.

**S**Donor



# Transfusion Associated Graft-versus-Host Disease

- S** Graft-versus-host-disease associated with transfusions (TA-GVHD) is a very rare but almost always fatal disease. **It is prevented by irradiation of cellular blood components.**
- S** Pre-storage leucodepletion has significantly reduced the risk of TA-GvHD – Implemented in the UK 1999.
- S** One case of TA-GvHD was reported in 2012. This was the first confirmed report since the 2000/2001 SHOT report.
- S** In a normal recipient, immune cells will far outnumber donor-derived T cells from transfusion, which are therefore eliminated by a host-versus-graft reaction.
- S** As well as the classical skin, gut and liver involvement seen in GvHD occurring after allogeneic stem cell transplantation, TA-GvHD is characterized by profound marrow hypoplasia and mortality in excess of 90% (BCSH 2014).

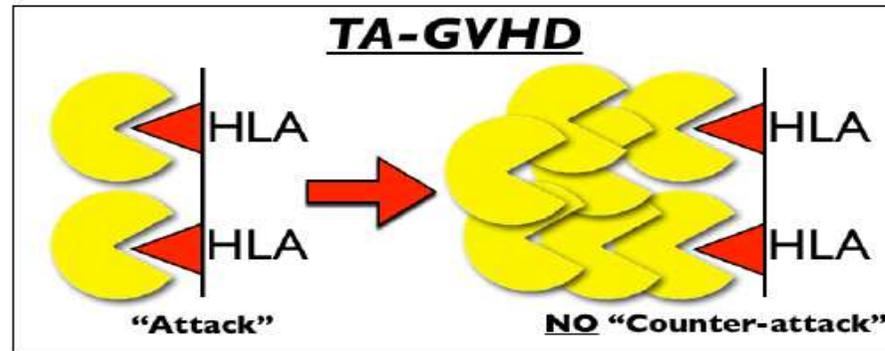
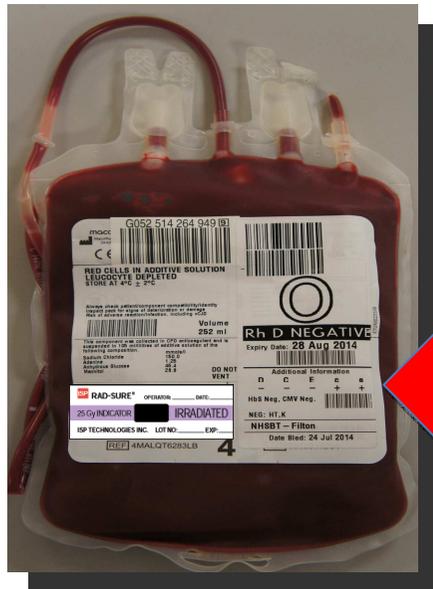


# Indications for irradiated cellular blood components

- S Lymphomas:** Virtually all the cases of TA-GVHD associated with lymphomas have been associated with Hodgkin's lymphoma (HL). The stage or treatment modality does not change the risk. Immune deficiency has been shown to persist in some long-term survivors of HL.
- S Hodgkin's lymphoma,** is associated with T cell dysfunction. A long-term absence of the normal immune response to a particular antigen (or allergen) and measurable defects in T-cell function have been observed (Levy & Kaplan, 1974): **HL Patients should receive irradiated blood products for life (BCSH 2014).**
- S Therapy induced T cell dysfunction:** Purine analogues: Cladribine, deoxycoformycin and fludarabine. **Patients should receive irradiated blood products indefinitely.** [?]

# Indications for irradiated cellular blood components

- S** The effects of bendamustine, clofarabine are less clear. Alemtuzumab (Campath) and antithymocyte globulin (ATG) horse and rabbit) appear to carry a risk of TA-GVHD – **Irradiation is recommended.**
- S** All severe T lymphocyte immunodeficiency syndromes should be considered as indications for irradiation of cellular blood components.
- S** **SABTO** – Leucodepletion effective for prevention of CMV transmission in BMT/ PBSC – local policies.



**S** Blood expiry will be 14 days > date of irradiation.  
**S** Will need ordering from NHSBT if hospital not a blood establishment.



## Leucodepletion: High White Cell Count

- S** Blood transfusions prior to leukapheresis can increase viscosity and may worsen hyperviscosity and symptoms of leukostasis.
- S** The main clinical symptoms of leukostasis and causes of early death are related to involvement of the central nervous system (approximately 40 percent) and lungs (approximately 30 percent).
- S** Patients presenting with acute leukaemia, particularly of the myeloid lineage, with WBC counts exceeding  $100 \times 10^9/L$  are often considered for leukapheresis, especially if they are experiencing symptoms of leukostasis.
- S** Careful balancing of **risk v benefit** required e.g. in severely anaemic patients / paediatric patients.
- S** FBC > procedure to determine need for RBC and Plts.



## Red cell exchange: Sickle Cell Disease

- S** In addition to the potential complications of red blood cell (RBC) transfusions common to all recipients, there are special issues for SCD patients.
- S** **Alloimmunization to red cell (blood group) antigens.** Due to the diversity of RBC antigenic make-up among different individuals, multi-transfused patients are likely to be exposed to many allogeneic (donor) RBC antigens – leading to > potential for atypical red cell antibody formation.
- S** 30 human blood group system genes have been identified, representing over 300 antigens. (ISBT); some more immunogenic than others.
- S** Automated Red cell exchange – exposure to multiple donors (10 – 12 units in adults).
- S** Exposure to foreign RBC antigens is more likely when there is variance in the inherited blood types, between donor and recipient.
- S** Difference in distribution amongst different ethnicities and nationalities.
- S** U antigen exists in 99% of black population and nearly 100% in Caucasians.



# Red cell exchange

## Blood selection:

**S**ABO and K compatible red cell units that are also matched for Rh groups D, C, E, c, e will be selected. There is a significant reduction in alloimmunisation (atypical red cell antibody formation) rate by providing blood matched for Kell and Rh – Est. in 1 study 53% reduction.

**S**If clinically significant RBC antibodies are present, antigen negative units /crossmatch compatible units, will be selected in line with national guidelines.

**S**Where possible, red cell survival post-transfusion should be maximised by selection of ‘fresh’ red cells, less than 7-days old for exchange transfusion.

**S**RBC’s <7 days may not be possible where the patient has multiple red cell alloantibodies. In such situations freshest available suitable units may be transfused.<sup>9</sup>

**S**Transfusion history + communication between hospitals is critical.

**S**Work closely with BT lab + give enough notice for NHSBT.

**S**Rare blood types + multiple antibodies present a challenge!



# Red cell exchange

## Extended RBC phenotyping in SCD:

**S**Blood group A (A antigen) = phenotype. Phenotype is expression of the genotype (inherited genes which determine blood types).

**S**Extended RBC (serological) phenotyping should be done prior to initiating the transfusion regime. Patients should be tested for the RBC antigens:

C, c, D, E, e, M, N, S, s, Lua, Lub, K, k, Kpa, Kpb, Fya, Fyb, Jka and Jkb.

**S**Extended genotype (inherited genes) in SCD, if prior transfusion:

RhD, c, C, E, e, V, VS, K/k, Jka /Jkb , Fya /Fyb , Fyx , MN, S/s, U-/ Uvar, Doa /Dob , Jsa /Jsb , Kpa /Kpb , Lua /Lub , Coa /Cob , Dia /Dib , Sc1/ Sc2, LWa /LWb

**S**Genotyping gives essential information, predicting the phenotype of red cell antigens when serological testing is not possible because of reagent limitations or in pre-transfused patients.

**S**Aids transfusion management going forward – NHSBT can't prospectively supply antigen negative for all groups.



# Red cell exchange

- S** The main goal of exchange transfusion in SCD patients is to reduce the Hb S level. This would not be achieved effectively if the unit transfused was from an Hb AS donor.
- S** Therefore, only RBC units that are screened and found to be negative for HbS should be used for transfusion to SCD patients.
- S** This therefore for practical reasons excludes donations from those with sickle trait = heterozygous for HbS.
- S** This avoids replacement RBC's that may sickle under stressful physiological conditio

**Hb S NEG**

0  
Rh D NEGATIVE  
Expiry Date: 28 Aug 2014  
NOT IT  
Additional Information  
D C E c e  
- - - + +  
HbS Neg, CMV Neg.  
NEG: HT, K

**Other Rh antigens**



## TPE: Plasma and ABO Rh D grouping

**S** Plasma components should be compatible with the ABO group of the recipient to avoid potential haemolysis caused by donor anti-A or anti-B.

**S** Group AB individuals have neither anti-A nor anti-B antibodies in their plasma. Group AB plasma can therefore be given to patients of any ABO blood group and is often referred to as the universal plasma donor.

**S** Octaplas and Octaplas LG are ABO typed but are not labelled for Rh D group.

**S** FFP and MBFFP may contain small amounts of red cell stroma, sensitization following the administration of Rh D-positive FFP to Rh D-negative patients is most unlikely as stroma is less immunogenic than intact red cells (Mollison, 1972).

**S** The 10th edition of the Council of Europe Guidelines do not require FFP packs to be labelled according to their Rh status (Council of Europe, 2004). (BCSH 2010).

**S** No anti-D prophylaxis is required if Rh D-negative patients receive Rh D-positive FFP (BCSH)



## Red Cell Priming

- S** The extracorporeal blood volume (ECV) and extracorporeal red cell volume may be too great for paediatric patients without procedure modifications (Rogers & Cooling, 2003; Kim, 2010; Wong & Balogun, 2012).
- S** Most apheresis machines will not accurately calculate total blood volume (TBV) below a weight of 30 kg and TBV will need to be calculated manually to allow safe treatment below this weight.
- S** Priming of circuits with red cell units is indicated where the extracorporeal blood volume is greater than 15% of TBV
- S** In practise, this means that red cell priming is always required for children less than 20 kg, and often required for children up to 30 kg depending on haemoglobin concentration.
- S** A prime with 5% albumin (rather than red cells) may be considered where ECV is between 10 and 15% of TBV (Wong & Balogun, 2012).