



**SIOP PODC Supportive Care Education (ICON 2016)**

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# Transfusion Guidelines in Pediatric Oncology

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# Disclosure

- No disclosures



# Outline/Objectives

At the end of this session participants should understand:

- The ABO's (+Ds) of blood products
  - The importance of ABO identical transfusion
- The current guidelines for transfusion
  - Red cells
  - Platelets



# NATIONAL BLOOD POLICY & STRATEGIC FRAMEWORK 2014-20



Implemented by **giz**



**Safe Blood Transfusion Programme, Pakistan**





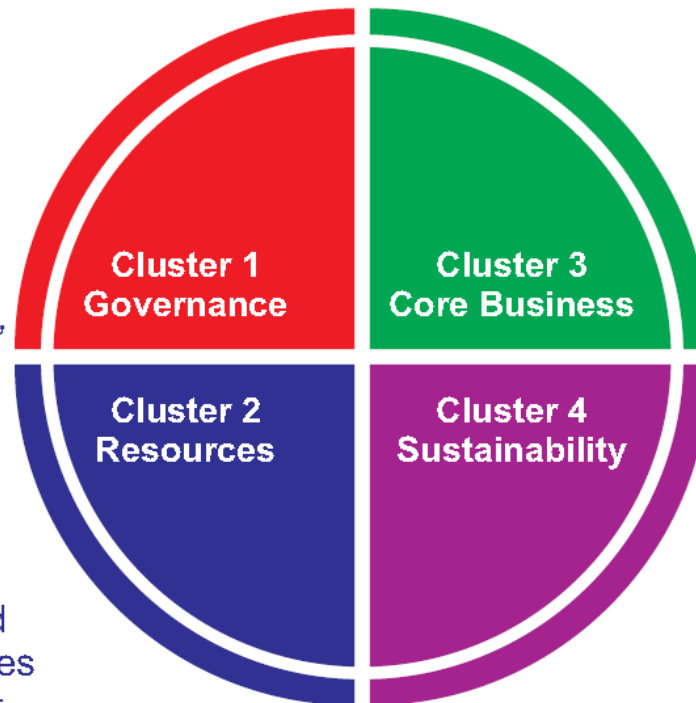
# Managerial Clusters

## Cluster 1:

- (1) Managerial and governing structure
- (2) Legal and regulatory affairs

## Cluster 2:

- (1) Facilities, equipments, consumables and lab reagents
- (2) Human capacity building
- (3) Quality systems & quality management
- (3) Financing, budget and health insurance issues
- (3) Disaster management
- (3) Data management and ICT



## Cluster 3:

- (1) Donor management including community interface
- (2) Screening for TTIs
- (3) Processing of blood-component production
- (4) Biosafety/waste management
- (5) Clinical interface; hospital transfusion chain; CUB; haemovigilance
- (5) Logistics (collection, supply, planning, cold chain)

## Cluster 4:

- (1) Monitoring and evaluation
- (2) Planning (short and long term)
- (3) Research and development



# Case 1

- 18 month old boy (10kg) with AML, day 25 induction 1
  - Hb 75 g/L, WBC 0.1, Platelets  $13 \times 10^9/L$
- Type and screen
  - A+, no unexpected antibodies
- Do you want to transfuse?



# Risks and Benefits

## Risks

- Hemolysis
- Infection
  - HIV, HepB, etc
- Febrile reaction
- TACO
- TRALI
- Allo-immunization

## Benefits

- ↓ bleeding
- ↓ risk of bleeding
- Symptom relief

# Red Cells







# Red Cells - questions

- At what hemoglobin level should a transfusion be considered in pediatric oncology?
- What dose should be transfused?
- Are there special product considerations?



# Transfusion “trigger”

- No specific pediatric oncology guidelines
- AABB Clinical Practice Guideline, 2012
  - Adhere to restrictive (7-8 g/L) in hospitalized, stable patients
  - In adult and pediatric ICU 7g/L or less
    - TRICC & TRIPICU trials
  - Post-op surgical patients 8g/dL
    - FOCUS trial
- Clinical situation is important!

TRICC, Hébert et al, NEJM, 1999;340:409-17

TRIPICU, Lacroix et al, NEJM, 2007;356:1609-19

FOCUS, Carson et al, NEJM, 2011;365:2453-62



# Red Cells - questions

- At what hemoglobin level should a transfusion be considered in pediatric oncology?
- What dose should be transfused?
- Are there special product considerations?



# RBC dosing - product

- Not all pRBCs are the same!

	<b>CPDA-1</b>	<b>AS</b>	<b>SAGM</b>
Shelf life	35 days	42 days	42 days
Hematocrit	65-80%	55-65%	55-65%
Volume	225-350mL	300-400mL	220-340mL
Residual Plasma	50-80mL	10-50mL	5-30mL
Additive Solution	No Additive	100-110mL	100-110mL
Components	Citrate, Sodium phosphate, Dextrose, Adenine, Citric acid	Dextrose, adenine, Sodium chloride, other depending on product	Saline, Adenine, Glucose, Mannitol



# RBC dosing - order

- Adults
  - 1 unit raises Hb by approximately 10g/L
- Pediatrics
  - 10-15mL/kg raises Hb by 20-35 g/L
    - $\text{Weight (in kg)} \times 4 \times \text{desired rise in Hb g/dL}$
    - $0.5 \times (\text{aim-current Hb}) \text{ g/L} \times \text{pt weight kg}$
- Prescription should be in mls up to ~ 20kg
- Order only 1 unit per transfusion



# Red Cells - questions

- At what hemoglobin level should a transfusion be considered in pediatric oncology?
- What dose should be transfused?
- Are there special product considerations?

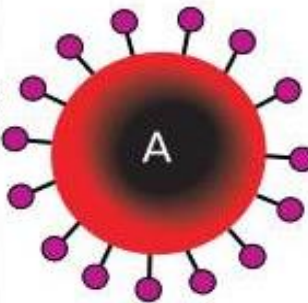
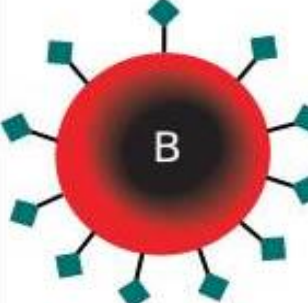
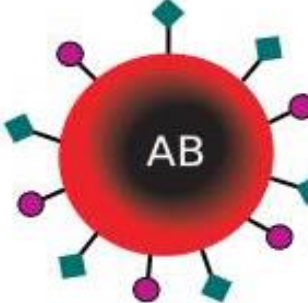
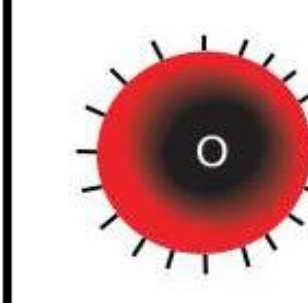








# The ABO's

- A and B antigens expressed on red cells
  - \*\*are also on platelets
- Anti-A and Anti-B are naturally occurring
- How does this affect transfusion of various components??
  - **P**lasma and platelets contain **P**lenty of antibody (anti-A, anti-B)
  - **R**ed cells contain **R**are antibody



# Red Cell Compatibility

	Group A	Group B	Group AB	Group O
Red blood cell type				
Antibodies present	 Anti-B	 Anti-A	None	 Anti-A and Anti-B
Antigens present	 A antigen	 B antigen	 A and B antigens	None



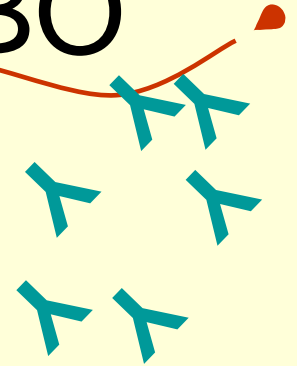
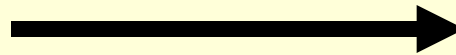


# Rh D

- Rh (Rhesus) includes other antigens..
- RhD antigen expressed on red cells
  - \*\*not on platelets
- Anti-D is not naturally occurring
- How does this affect transfusion of various components??
  - Plasma and platelets contain no ***antibody***
  - Platelets and Red cells contain ***antigen***



# Red Cell Compatibility-ABO

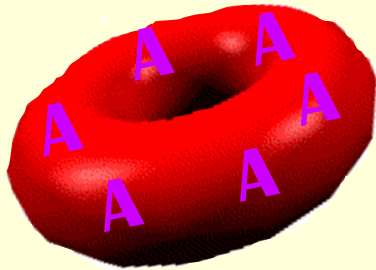


Group O

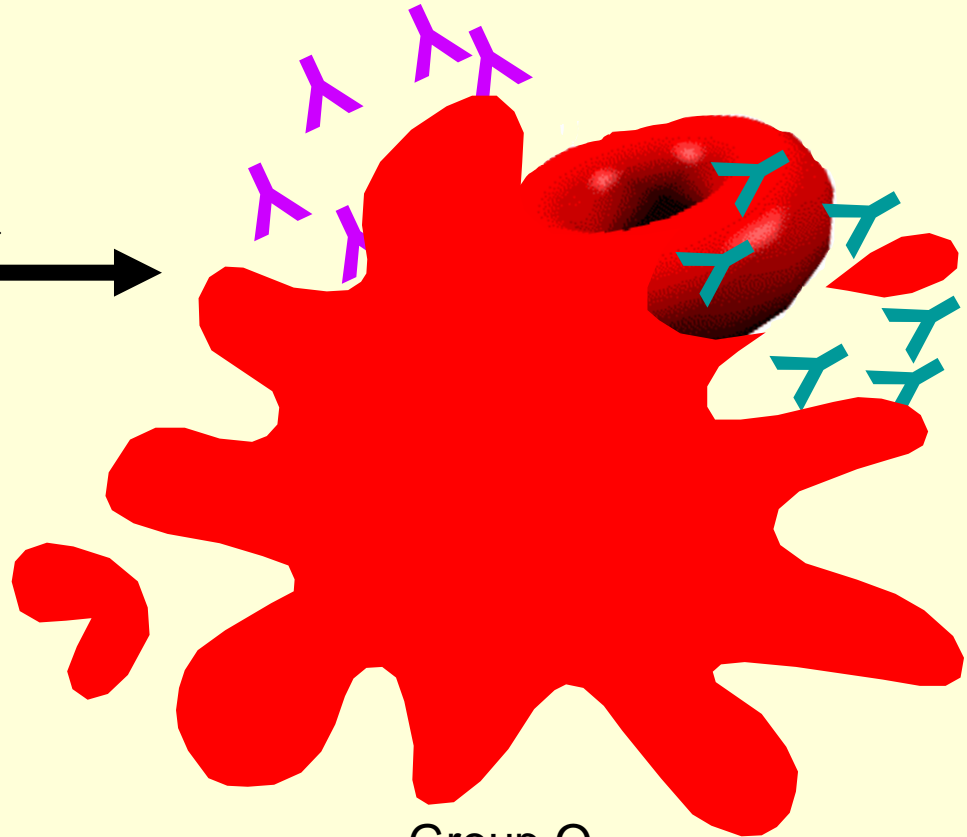
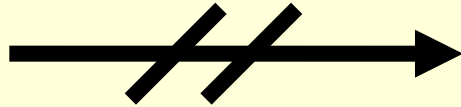
Group A



# Red Cell Compatibility-ABO



Group A



Group O



# Red Cell Compatibility – D1



Group O+

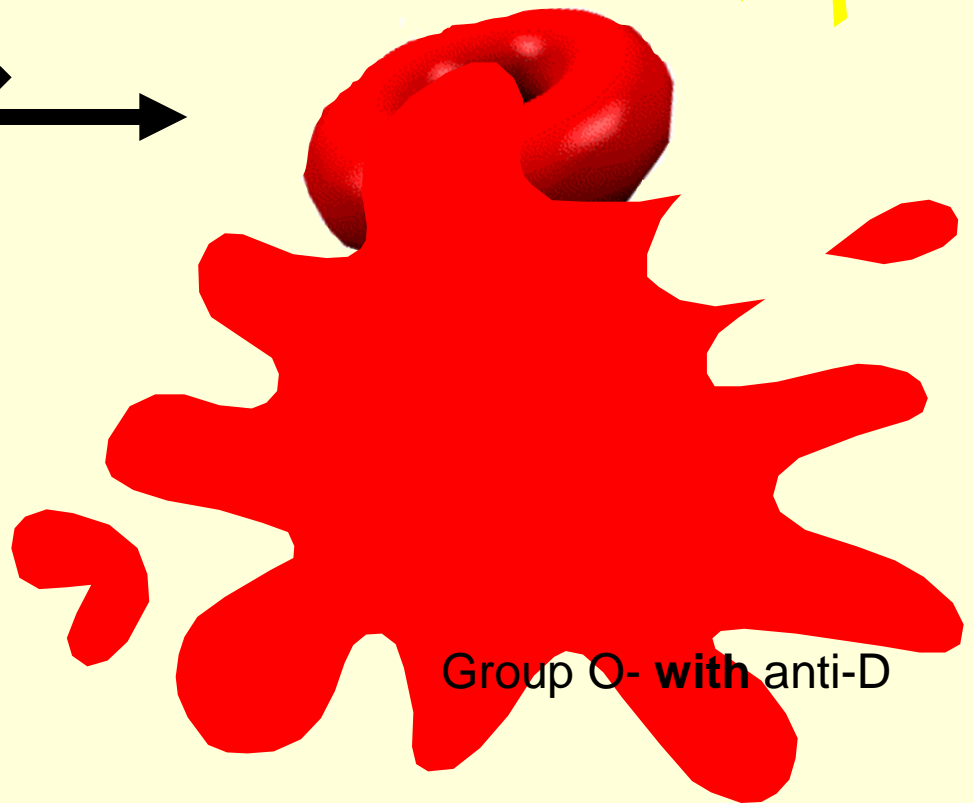
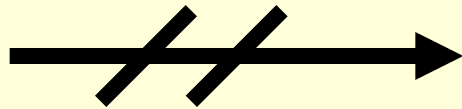
Group O-



# Red Cell Compatibility - D2



Group O+



Group O- with anti-D

# Red cell compatibility

		DONOR							
		O+	O-	A+	A-	B+	B-	AB+	AB-
R E C I P I E N T	O+	✓	✓						
	O-	*	✓						
	A+	✓	✓	✓	✓				
	A-	*	✓	*	✓				
	B+	✓	✓			✓	✓		
	B-	*	✓			*	✓		
	AB+	✓	✓					✓	✓
	AB-	*	✓					*	✓

\*Rh+ donors *can* donate to Rh- recipient but the recipient is likely to form anti-D antibody and when they have anti-D antibody they can no longer receive Rh+ blood.



# Platelets





# Platelets - questions

- At what platelet level should a transfusion be considered in pediatric oncology?
- What dose should be transfused?
- Are there special product considerations?





# Platelet Tx Guidelines

- ASCO Clinical Practice Guideline, 2001
- C17 adapted to ped Heme/Onc, 2011
  - Prophylactic transfusion recommended
    - Except if chronic alloimmune thrombocytopenia
- Triggers apply **only** to stable patients



# C17 Triggers

Patient Group	Trigger	Evidence



# Platelets

- At what platelet level should a transfusion be considered in pediatric oncology?
- **What dose should be transfused?**
- Are there special product considerations?



# Platelet dosing - Product

Product	Volume	Platelet Content
Random / Whole blood donor unit	50-70mL ( $> 40\text{mL per } 6 \times 10^{10})^*$	$7 \times 10^{10}$ ( $> 6 \times 10^{10})^*$
Pool of units (4-6 units)	180-250mL ( $> 40\text{mL per } 6 \times 10^{10})^*$	$3-4 \times 10^{11}$ ( $> 2 \times 10^{11})^*$
Single donor / Apheresis unit	250-350mL ( $> 40\text{mL per } 6 \times 10^{10})^*$	$3-6 \times 10^{11}$ ( $> 2 \times 10^{11})^*$

- Volume is mostly plasma
- Can be concentrated
  - Removes plasma
  - Sacrifice number of platelets



# Platelet dosing

- PLADO study
  - 1.1, 2.2 & 4.4 x 10<sup>11</sup> platelets/m<sup>2</sup>
  - No difference in bleeding between arms
  - Less total platelets in low arm, but more tx
  - Pediatric subgroup analysis, more bleeding with auto-sct but not related to platelet dose
- BCSH
  - 10-15mL/kg until 15kg, then 1 apheresis unit
- Consider donor exposures

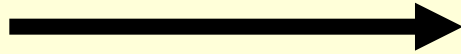
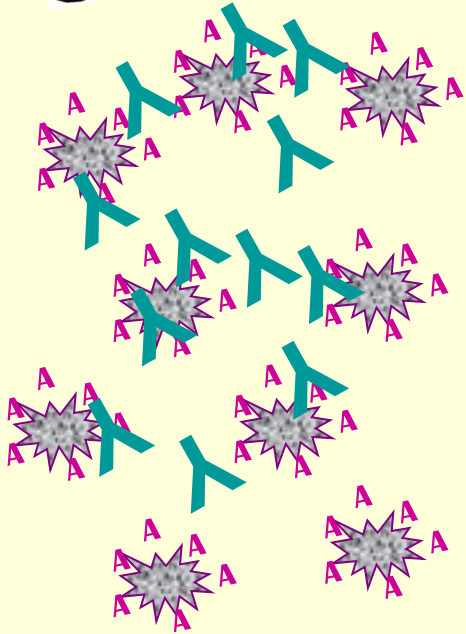


# Platelets

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# Platelet Compatibility

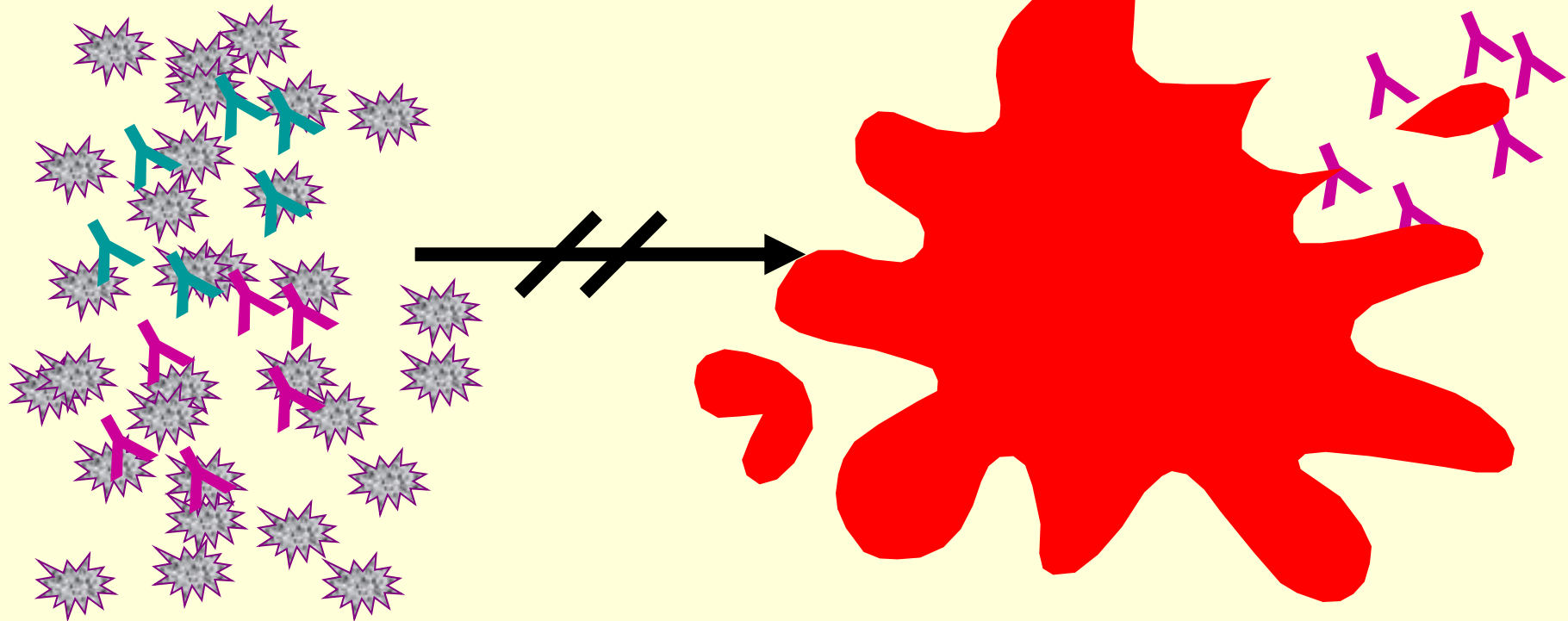


Group A

Group A



# Platelet Compatibility



Group O

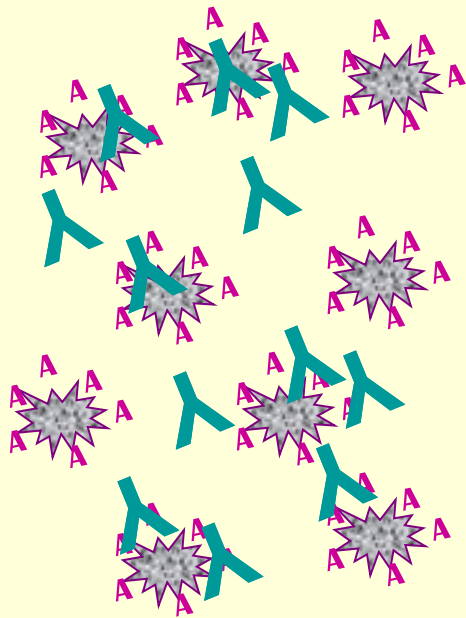
Minor Mismatch

Group A

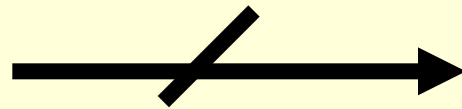




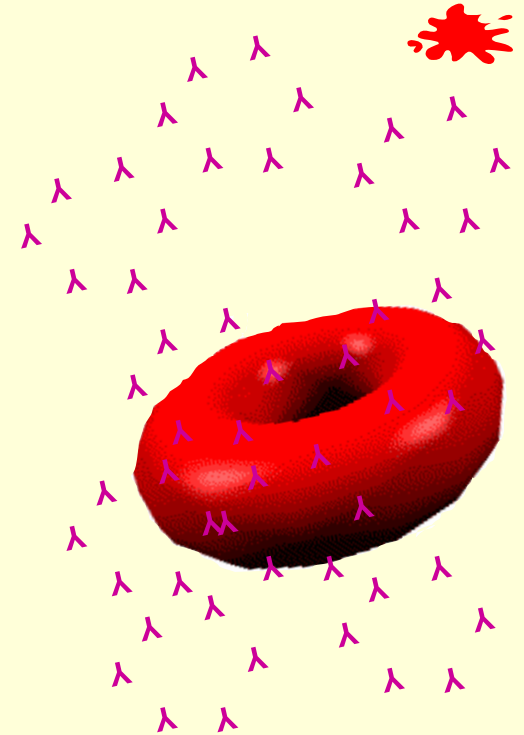
# Platelet compatibility 2



Group A



Major Mismatch



Group O



# Matching platelets

3 reasons to match platelets...

1. Anti-A, Anti-B in transfused plasma can cause hemolysis
2. Anti-A, Anti-B in recipient can decrease response to platelets
3. D antigen present on red cells in platelets can cause allo-immunization



# Platelets con't

- ABO & D Matching is highly recommended
- Not *always* possible...
  - Different circumstances different decisions..
- Strive to **only** give Rh neg to Rh neg
  - Anti-D Ig 250iu covers 5 adult doses (~1500mL) within 6 weeks
- Give blood bank as much notice as possible



# Controversy...

- Irradiation
- CMV



# Irradiation

- Patients with T lymphocyte immune deficiency syndrome
- HLA selected products
- Directed donations from 1<sup>st</sup> degree relative
- Granulocytes
- HSCT
  - Recipients from d1 conditioning until:
    - Allo: GvHD proph complete & lymphocytes >1 (indefinite if chronic GvH)
    - Auto: 3 months post transplant (6 months if TBI)
  - 7 days prior to collection of stem cells (allo or auto)
- Hodgkin lymphoma (for life)
- Purine analog, ATG and anti-CD52 recipients (indefinite)



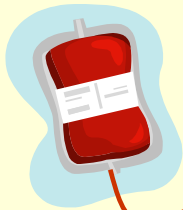
# CMV

- Leukoreduction  $\stackrel{?}{=}$  CMV seronegative
- AABB
  - Leukodepletion acceptable ( $5 \times 10^6$ /L residual WBC)
- European Council
  - Leukoreduction used for CMV safety



# CMV..ongoing debate

- BCSH guideline
  - Infants first year of life, under review
  - SCT recipients
  - patients with severe cellular immuno-deficiency
  - foetus (intra-uterine transfusion)
  - anti-CMV negative pregnant women
  - premature infants and neonates < 1.5kg



# Case 1

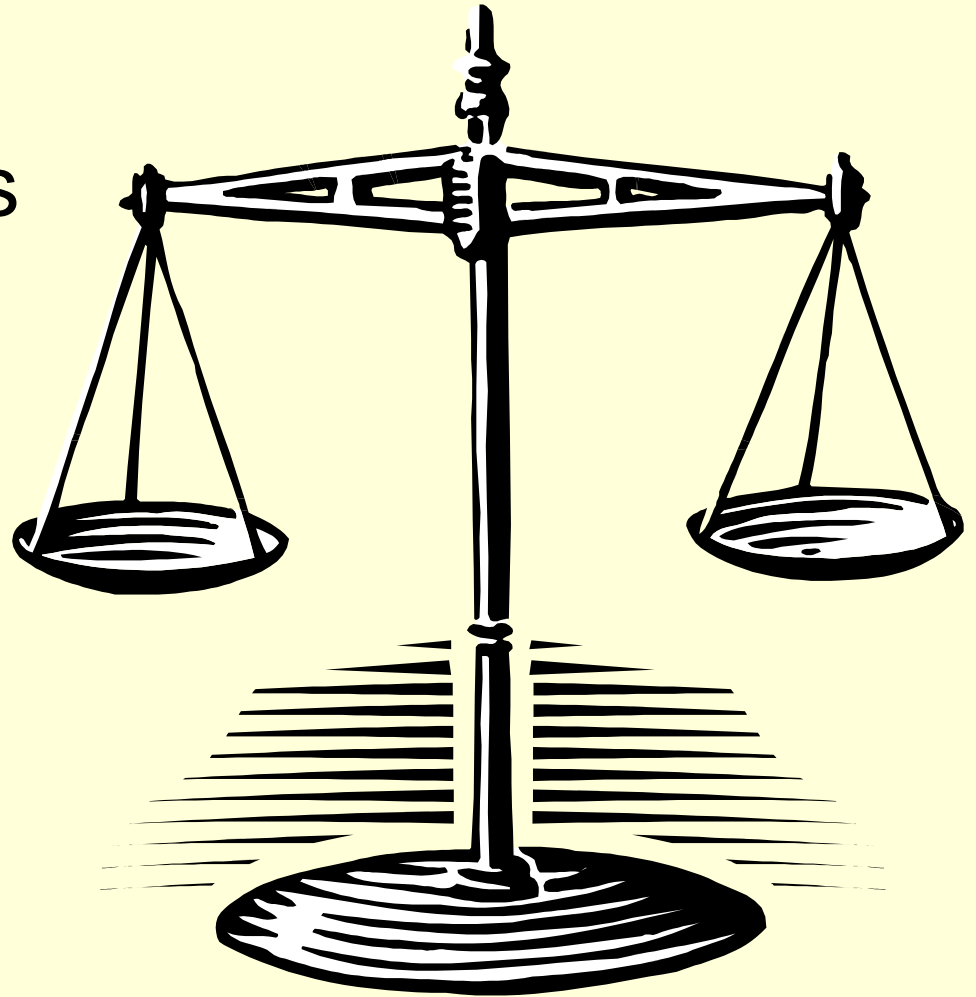
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  - Hb 75 g/L, WBC 0.1, Platelets  $13 \times 10^9/L$
- Type and screen
  - A+, no unexpected antibodies
- Will you transfuse?





# Balance

- Guidelines exist
- Risks and Benefits
- Product Choices





# Questions?

- [emcbride@sidra.org](mailto:emcbride@sidra.org)

