

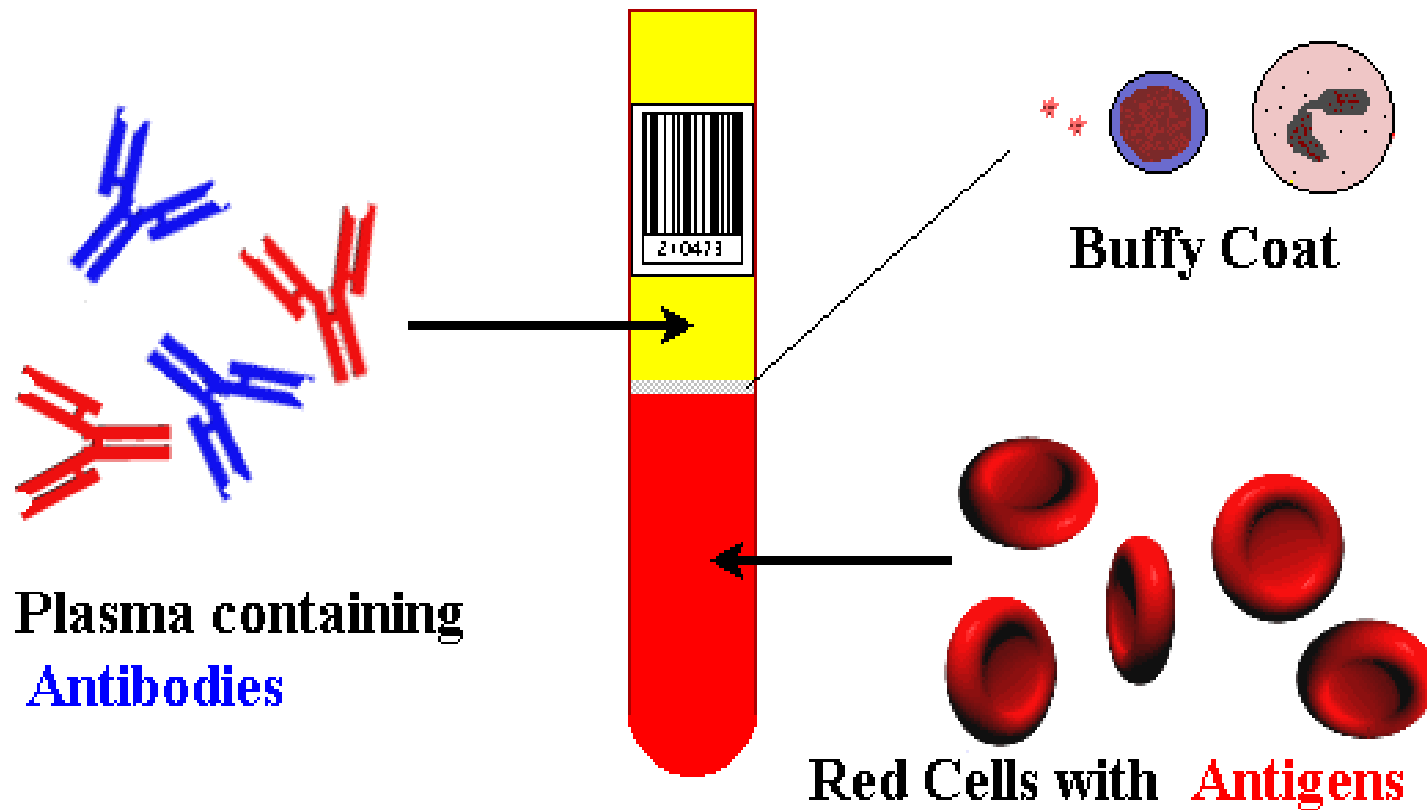


Blood Components and Blood Products

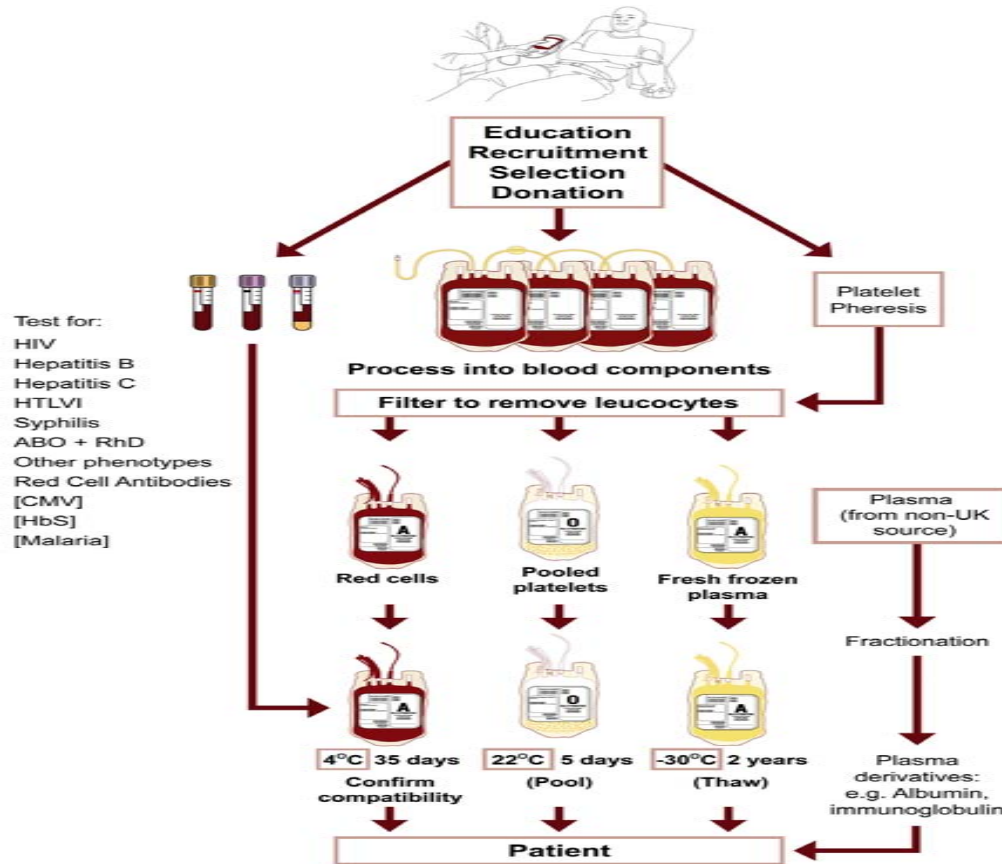
**Douglas Watson
Better Blood Transfusion
SNBTS**

Acute Care Day - January 2012

Blood Sample (centrifuged)



Preparation of Blood Components (donor to patient)



STPL1CRITICALCARE2005

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Blood Component Use in UK 2008/09

RBC's	2,209,153
Platelets	266,312
Fresh Frozen Plasma	306,740
Cryoprecipitate	121,555
Total	2,903,760



Background

- Pressure on supply (fewer donors)
- Demand reducing (38 units per 1000 population), but use likely to increase with ageing population
- Safety issues – enforced changes
- Regulation EU (BSQR)

Need to optimise blood use!!



Where is the evidence to support optimal use of blood?



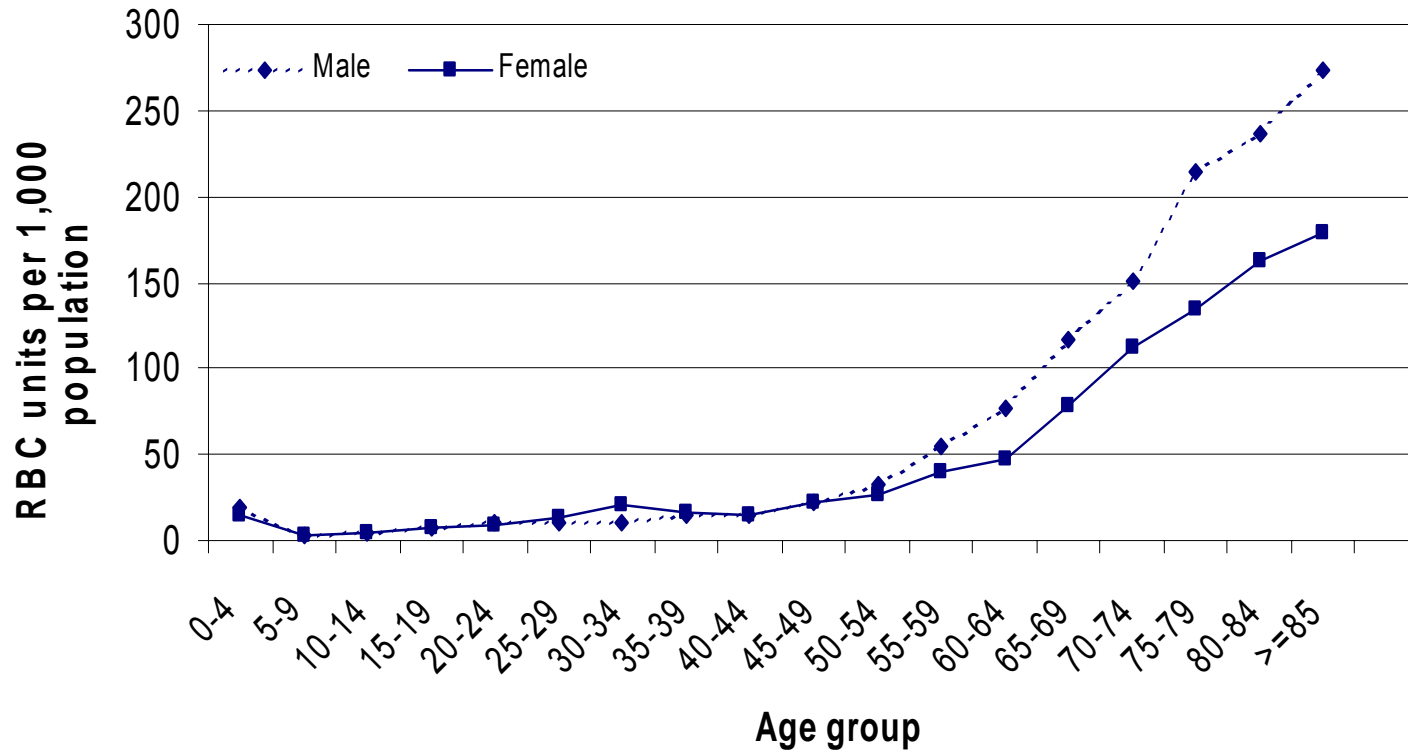
“Surprisingly, despite millions of units collected and administered, there is very little evidence on when and where RBCs are effective/ ineffective and what constitutes the optimal RBC product”

Dean Fergusson

Red Cell meeting, Edinburgh 2009

2005/06

RBC units transfused per 1,000 population by agegroup and sex (all Scotland , exluding FV)





Red Cells



Indication: to increase oxygen carrying capacity of blood

Product: leucocyte depleted CRC (SAG-M)

Volume 280+/- 60ml, >40g/unit Hb (mean 55),
HCT 57%

Shelf life – 35 days at $4 \pm 2^{\circ}\text{C}$

ABO/ RhD compatible

Special requirements e.g.

- CMV negative or irradiated
- fresh, washed, paedipacks etc



Red Cells required?

Symptoms: acute or chronic

Signs

Laboratory findings

Acute blood loss

Need for RBC based on estimate of lost circulating volume

15% loss (750ml): usually no need for Tx

15-30% loss (800-1500ml): Need crystalloid / colloid, unlikely to need RCCs

30-40% loss (1500-2000ml) Rapid volume replacement with crystalloid or synthetic colloid. RCC likely to be required

≥40% loss (≥2000ml): Rapid volume replacement including RCCs required

Guidelines for the clinical use of red cell transfusions. BCSH web page or BJHaem 2001, 113: 24 –31. (Also massive blood loss – 2006)

Platelets

2 sources:-

- Buffy Coat Derived i.e from 4 donors.
- Apheresis single donor ≥ 2 ADEs

Move towards apheresis only in UK –
current target 80% apheresis-derived

Most platelets are given as prophylaxis!!

What's in a bag of platelets?



Platelets ($>240 \times 10^9$ /unit)

Plasma

Anticoagulant

(Red Blood Cells)

Total

Volume

150-300 ml

Storage - $22 \pm 2^\circ\text{C}$, with gentle agitation

Shelf life - 5 days



Platelet Prescribing

Who?

- Certain thrombocytopenic patients; platelet dysfunction (? secondary to medication)

How?

- ABO + Rh Group compatible (Group O \pm Immune anti A &/or B)
- Platelet giving set (170-200 μ m filter)
- Do not infuse with drugs/solutions

Expected 24hr increment $\geq 20 \times 10^9/l$

Guidelines for the use of Platelet transfusions. BCSH web page or BJHaem 2003: 122, 10-23

Platelet Refractoriness

‘Repeated failure to obtain satisfactory responses to platelet transfusion’

- Causes:
- Immune
 - HLA alloimmunisation
 - Non immune
 - Consumption/bleeding, DIC, pyrexia

HLA antibodies (HPA antibodies rare in absence of HLA antibodies, 0 - 2% and do not always cause platelet refractoriness)



Fresh Frozen Plasma (FFP 1)



Plasma obtained from leucocyte depleted whole blood

Rapidly frozen to -30°C , separated from red cells before cooling

Can be treated to further reduce viral risk
e.g. MB FFP for children

Possible changes in sourcing of UK FFP

What's in a single unit of FFP?



Plasma

- Coagulation factors (Factor VIII > 0.7iu/ml)

Anticoagulant

Pack Volume 200-300ml



FFP (2)



- Storage $\leq -30^{\circ}\text{C}$, max 24 months
- Thaw before transfusing – remember in emergency!!!!
- Post thaw storage $4 \pm 2^{\circ}\text{C}$, max 24hrs
- Dose – 10 - 20ml/kg
- Transfuse by ABO Group (Rh irrelevant)
- Transfuse in 30-40mins



Cryoprecipitate



Manufactured by thawing FFP at 4°C then frozen

Coagulation Factors I, VIII, XIII

Pool of cryo, 4-5 donors – volume 100 - 250ml

Primarily used for hypofibrinogenaemia

? Fibrinogen concentrate

Pathogen reduced FFP and Cryoprecipitate

1. Methylene Blue Treated (MBT) + removed
 2. Solvent Detergent (S/D) treated
- Enveloped viruses – HBV, HCV, HIV, HTLV
∴ HAV & Parvovirus B19 survive

Imported Plasma (↓ vCJD risk) – USA for children
≤ 16 yrs old

Note \cong 30% less FVIII than standard FFP
ie. filtering does not just remove the “bad”!



Indications for transfusing FFP and Cryoprecipitate

- a) Multiple coagulation factor deficiencies- with bleeding and/or DIC
- b) Single Coagulation factor deficiency when virus – safe product e.g. F1 unavailable, FV deficiency
- b) TTP, plasma exchange (use SD plasma - Octaplas)

Often given where no bleeding and mild coagulopathy!!

*Guidelines for the use of FFP, cryoprecipitate & cryosupernatant.
BCSH web page or BJHaem 2004: 126: 11-28*



Risks associated with blood components

Blood transfusion can never be risk free

Transfuse only for sound clinical indications

Assess effectiveness of treatment

Report any transfusion - related adverse reaction (SABRE)

DOCUMENT!!!

Complications of Blood Component Transfusion

- Acute or Delayed
- Immune or Non-immune

Acute reactions to blood component transfusion

- Acute haemolytic transfusion reaction e.g. incorrect unit transfused
- Transfusion related acute lung injury (TRALI)
- Transfusion Associated Circulatory Overload (TACO)
- Bacterial contamination
- Allergic/ anaphylactic reactions

Delayed reactions to blood component transfusion

- Delayed haemolytic transfusion reaction
- Transfusion associated graft versus host disease (TaGVHD)
- Post transfusion purpura
- Infection - viral: Hepatitis A, B & C, HIV, HTLV,
- others: Malaria, vCJD
- Iron overload (> 20 units) – 250 mg iron in one unit – may need iron chelation therapy



Plasma / Blood Products



Manufactured from imported plasma - EU &/or USA (↓vCJD risk)

Examples:-

Intravenous immunoglobulin – PID; neuro; Haematology; Rheumatology – new Scottish guidelines - now available via Pharmacy

Albumin

Anti D immunoglobulin etc

Prescribing information – see product datasheets

Further Reading

1. Guidelines for the clinical use of red cell transfusions. BCSH web page or BJHaem 2001, 113: 24 –31.
2. Guidelines for the use of FFP, cryoprecipitate & cryosupernatant. BCSH web page or BJHaem 2004: 126: 11-28
3. Guidelines for the use of Platelet transfusions. BCSH web page or BJHaem 2003: 122, 10-23.
4. Handbook of Transfusion Medicine. The Stationery Office, 4th Edition 2007.

www.transfusionguidelines.org.uk