

BLOOD TRANSFUSION

DR.MOHAMED BILAL DELVI

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What is blood?

A highly specialised circulating tissue which has several types of cells suspended in liquid medium called plasma.

- Origins from Greek 'haima'
- Blood is a life sustaining fluid
- Blood is an amazing fluid!
- Keeps us warm
- Provides nutrients for cells, tissues and organs
- Removes waste products from various sites .

Blood components:

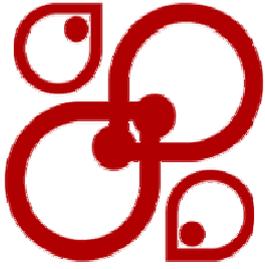
- Packed red cells
- Platelets
- Fresh Frozen Plasma
- Frozen plasma
- Cryoprecipitate
- Albumin
- Immunoglobulins .

Indications for Blood Transfusions:

- Massive blood loss
- Different types of anaemia
- Haemophilia & other clotting factor deficiency
- Cancer patients
- For surgeries

Historical Aspects:

- ✓ 15th century- unsuccessful attempts.
- ✓ 1666- dog to dog transfusion

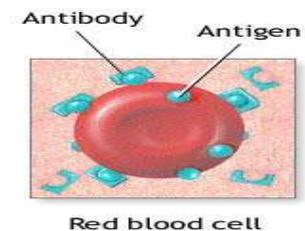


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- ✓ 1667–animal to human
- ✓ 1818– human to human
- ✓ 1901– major breakthrough– discovery of A,B,O groups.
- ✓ 1907– cross matching
- ✓ 1914– anticoagulant discovered
- ✓ 1936– first blood bank
- ✓ 1939/40– Rh factor discovery
- ✓ 1950– plastic blood containers.



An antigen is a substance that induces the formation of antibodies because it is recognized by the immune system as a threat

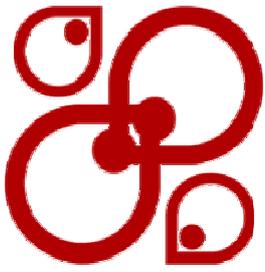
ADAM

Theoretical Yield of components:

- 1 unit of blood theoretically gives
 - ✓ 1 unit FFP
 - ✓ 1 unit PRBC's
 - ✓ 1 single donor unit cryoprecipitate, single donor unit platelets

Plasma for Ig and albumin BLOOD GROUP SYSTEMS :

- ✓ ABO System Most studied & important
- ✓ Rh system from clinical point of view.
- ✓ Lewis
- ✓ Kell
- ✓ Duffy
- ✓ MNSs
- ✓ Lutheran
- ✓ P
- ✓ li
- ✓ Kid

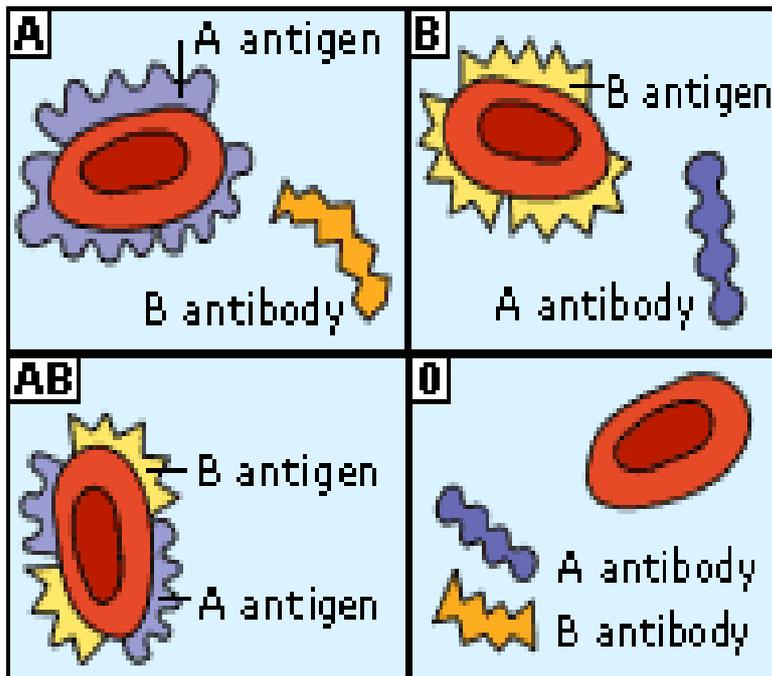


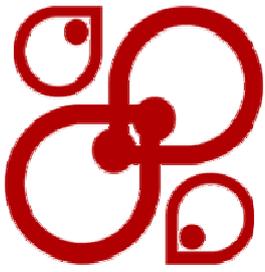
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Different Blood Groups :





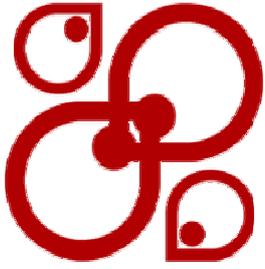
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	Group A	Group B	Group AB	Group O
Red blood cell type				
Antibodies present	 Anti-B	 Anti A	None	 Anti-A and Anti-B
Antigens present	A antigen	B antigen	A and B antigens	No antigens

Blood group	Antigen	Antibody
A	A	Anti-B
B	B	Anti-A
AB	A,B	None
O	H	Anti-A Anti-b
Bombay group	None	Anti-A ,Anti-B ,Anti-H



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Blood Donation Criteria :

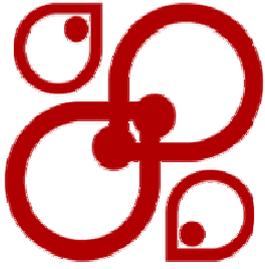
- ✓ Good general condition.
- ✓ age- 18 to 60 years.
- ✓ Weight- >45kg for 350ml,
>55kg for 450ml.
- ✓ BP: syst. 100-180mmHg
diast. 50-100mmHg.
- ✓ Pulse: 60 to 100beats/min.
- ✓ Temp. >37.5deg.C
- ✓ Hb. >12.5gm%
- ✓ Jaundice
- ✓ Malaria
- ✓ High risk behaviour
- ✓ Pregnancy
- ✓ Surgeries
- ✓ Last blood donation
- ✓ Tattooing
- ✓ Chronic diseases
- ✓ Last blood transfusion

Instructions For Donors After Donation :

- ✓ More fluids than usual.
- ✓ Do not remain hungry.
- ✓ Do not smoke for 1 hour.
- ✓ Remove bandage after 6 hours.
- ✓ If bleeding from puncture site, apply pressure.
- ✓ If feeling faint/dizzy, lie down.

Misconceptions / Reasons for not donating blood :

- ✓ Fear of contracting some disease
- ✓ I do not have enough blood/ I will become weak.



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- ✓ I am too old
- ✓ I am too busy.

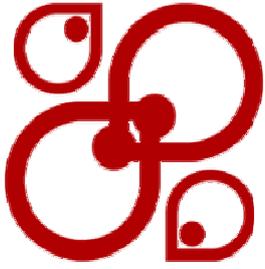
Reasons to donate blood :

- ✓ New blood formation .
- ✓ Regular health check up.
- ✓ Blood investigations done.
- ✓ Satisfaction of noble work.

Tests done in blood bank :

- ✓ Blood grouping & Rh typing
- ✓ Cross matching
- ✓ Tests for irregular antibodies
- ✓ HBsAg test
- ✓ HCV test
- ✓ HIV test
- ✓ Test for syphilis
- ✓ Test for malaria .

	Cells v Serum				Serum v Cells		
	Anti-A	Anti-B	Anti-AB		A cells	B cells	O cells
A							
B							
AB							
O							



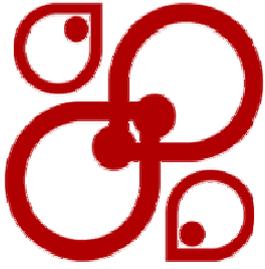
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Cell Grouping			Serum Grouping			interpretation
Anti-A	Anti-B	Anti-AB	A cell	B cell	O cell	
+	-	+	-	+	-	A
-	+	+	+	-	-	B
+	+	+	-	-	-	AB
-	-	-	+	+	-	O
-	-	-	+	+	+	Bombay Blood GP

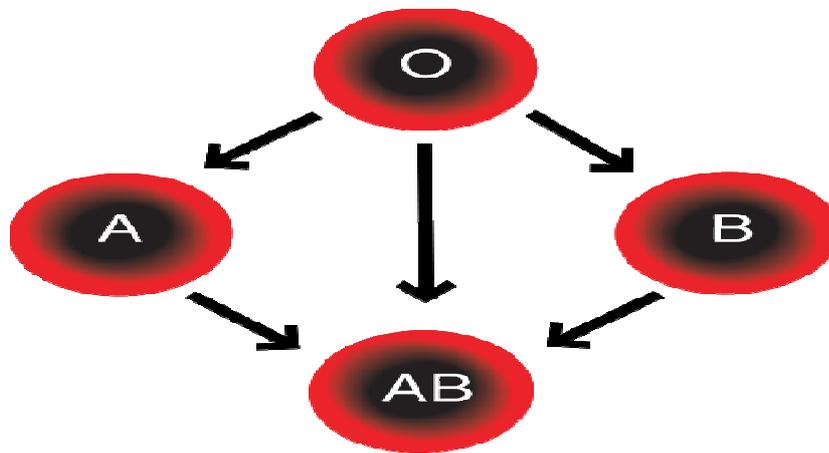
Blood GP	Antigen	Atibody	Can give To	Can receive blood from
A	A	Anti-b	A,AB	A,O
B	B	Anti-A	B,AB	B,O
AB	AB	None	AB	A,B,AB,O
O	H	Anti-A ,Anti-B	A,B,AB	O
Bombay GP	None	Anti-A,Anti-B, Anti-H	Bombay GP(Oh)	Bombay GP (Oh)



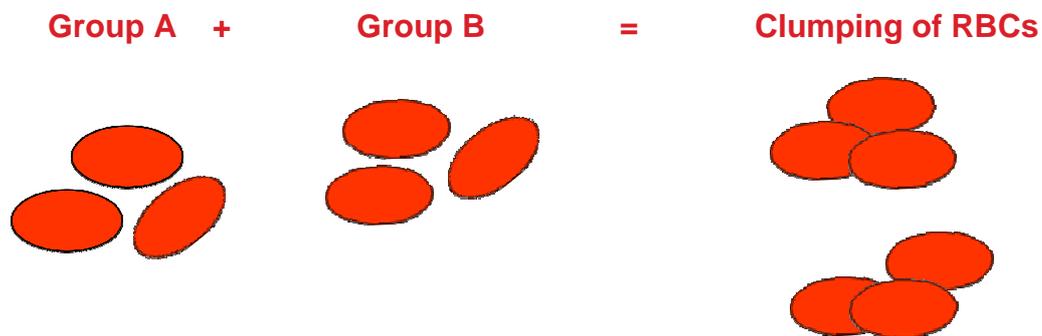
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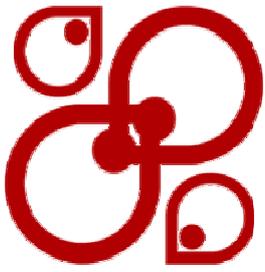


Mismatched Transfusion :



Autologous Donation Advantages:

- Self help is the best help.
- Planned gynaecological, orthopedic, plastic general surgeries
- Individuals with rare blood groups/ irregular
- antibodies/ infectious disease positive.
- Safest blood.
- Easy availability
- No risk of TTDs

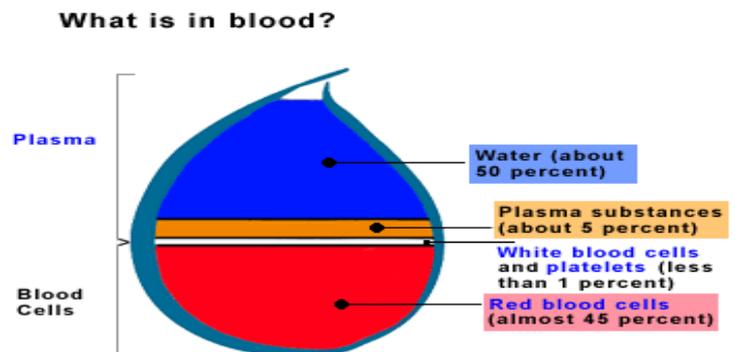
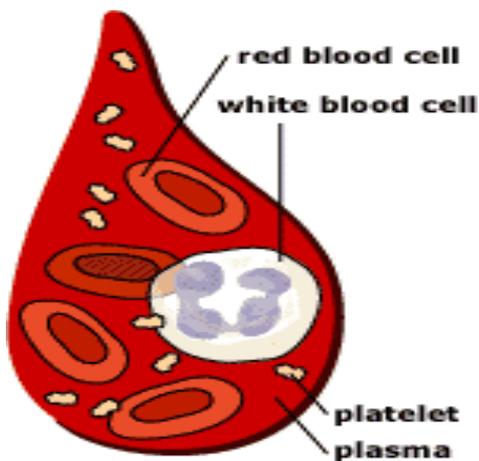


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- Best option in patients with irregular antibodies, rare blood groups, infectious disease positive.
- Blood scarcity can be reduced to some extent.



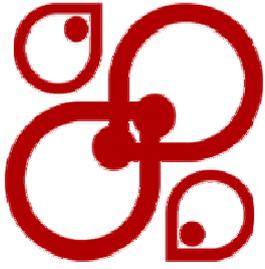
Blood Components :

Blood separated into different parts.

- 1) Packed red cells
- 2) Platelets
- 3) Fresh frozen plasma
- 4) Cryoprecipitate
- 5) Granulocytes
- 6) Factor IX conc.
- 7) Factor VIII conc.

Component Advantages:

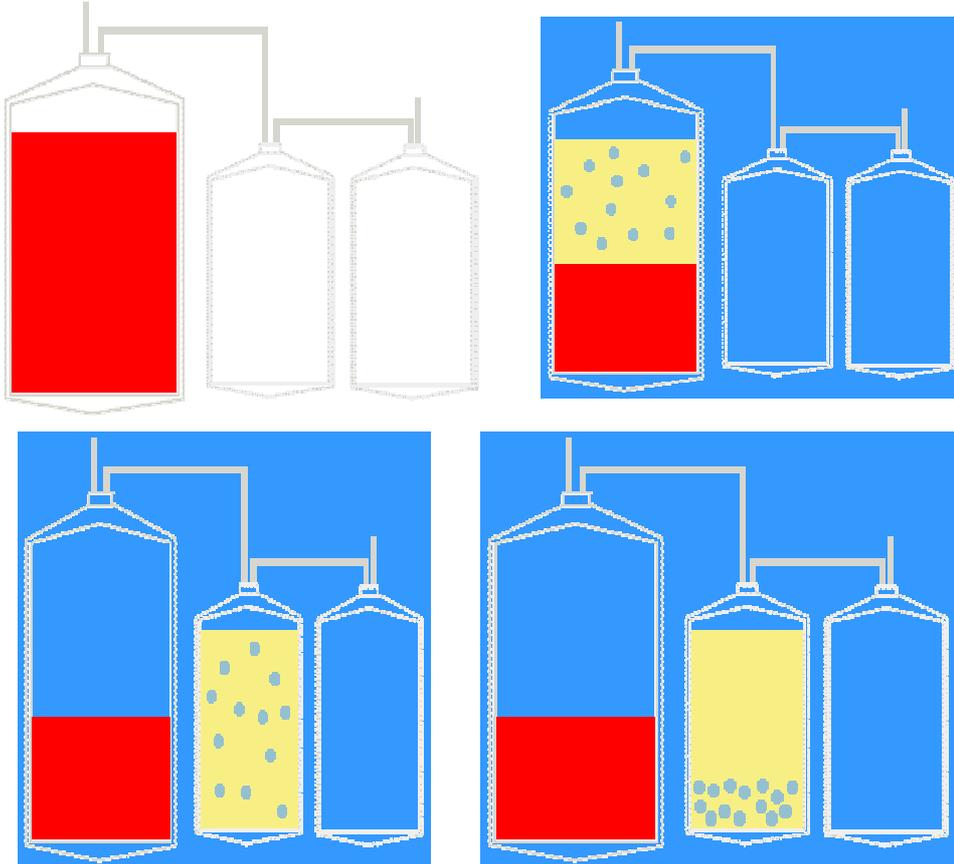
- ✓ Overload avoided.
- ✓ Better patient management.
- ✓ Greater shelf life than whole blood.
- ✓ Blood shortage can be overcome.



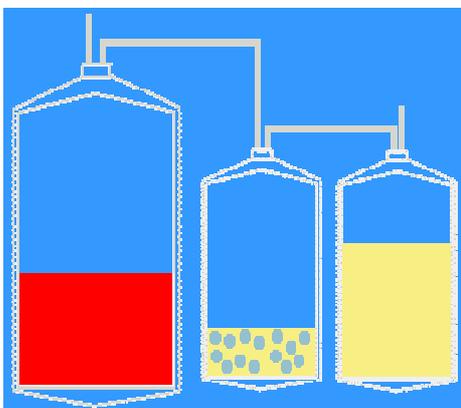
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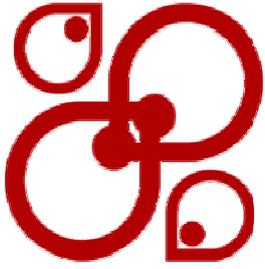
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FINAL PRODUCTS :





BLOOD TRANSFUSION

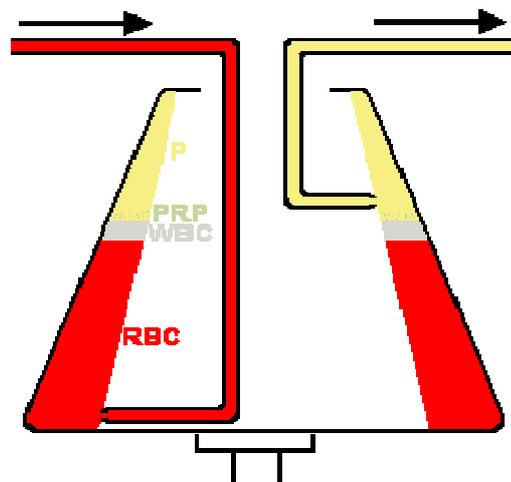
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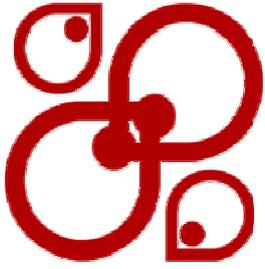
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Blood component	Content	Volume	Shelf life
Whole blood	Hct.35% RBCs WBCs 450 ml,63 ml	250 ml	35days at 4 DC
	CPDA1		
Red cells	Hct. 60%,RBCs,25ml plasma 100ml Adsol.	340ml	24 days at 4DC
Platelets	Platelets,few WBC, RBC 50 ml plasma	50ml	5 days at 22 DC
FFP	Pl.protien ,clot factors fibrinogen,factor8-9	225ml	1year at 18 DC
Cryoppt.		15ml	

APHERESIS

CELL SEPARATOR





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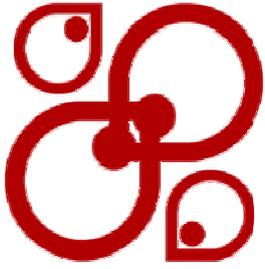
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Apheresis :

- ✓ Plasmapheresis: plasma is removed.
- ✓ Plateletapheresis: platelets are removed.
- ✓ Leukapheresis: leucocytes are removed.

Blood loose Signs, Symptoms and Indication for Transfusion :

Volume Lost		Clinical signs	Preparation of choice
mL	% of Total Blood Volume		
500	10	None	No transfusion or crystalloid solution
1000	20	tachycardia	crystalloid solution or colloids or RBC if necessary
1500	30	drop in BP	crystalloid solution plus RBC or colloids plus blood if available
2000	40	shock	crystalloid solution plus RBC or colloids plus blood if available



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Red cell transfusions Indication :

Whole blood :

- acute hypovolemia (hemorrhagic shock)
- massive transfusion
- exchange transfusion in infants for hemolytic anemia of the newborn

Packed red cells :

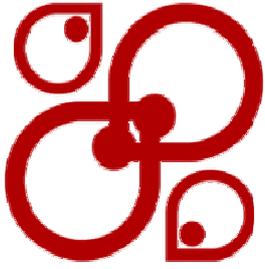
- ✓ 150–200 mls. of red cells with plasma removed
- ✓ Haemoglobin 20g/ 100 ml, PCV 55–75
- ✓ Expected rise in Hb with 1 unit of red cells is approximately 1g/dL

Indications for Packed Cells :

- ✓ Massive blood loss
- ✓ Anaemia of chronic disease
- ✓ Haemoglobinopathies
- ✓ Perioperative period to maintain Hb > 7g/dL
- ✓ No need for transfusion with Hb > 10

Platelets :

- ✓ 150–400 $\times 10^9$ /L
- ✓ Platelet units can be either
 - Single donor units
 - Apheresis units
- ✓ 1 single donor unit contains 55 $\times 10^9$
- ✓ 1 apheresis unit contains 240 $\times 10^9$
- ✓ Stored at room temperature
- ✓ Constantly agitated
- ✓ Only last for 5 days
- ✓ 1 dose of platelets should raise patient's counts by 30 $\times 10^9$ after



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1 hour

- ✓ Infused in 15 mins

Indications for platelet transfusion :

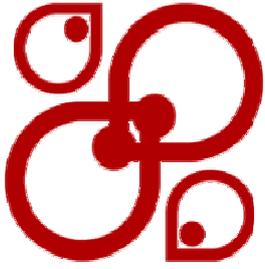
- ✓ BLEEDING due to thrombocytopenia
- ✓ Due to platelet dysfunction
- ✓ Prevention of spontaneous bleeding with counts < 20

Recommended counts to avoid bleeding :

Platelet count /ul	Clinical Condition
$> 100\ 000$	Major abdominal, chest or neurosurgery
$> 50\ 000$	Trauma, major surgery
$> 30\ 000$	Minor surgical procedures
$> 20\ 000$	Prevention/treatment of bleeding in pts with sepsis, leukemia, malignancy
$> 10\ 000$	Uncomplicated malignancy, leukemia
$> 5\ 000$	ITP patients at low risk

FFP:

- ✓ Fresh Frozen Plasma
- ✓ Plasma collected from single donor units or by apheresis
- ✓ Frozen within 8 hours of collection
- ✓ -18° to -30° C
- ✓ Can last for a year
- ✓ 1 unit is 250 ml
- ✓ Contains all plasma proteins



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❖ Indications:

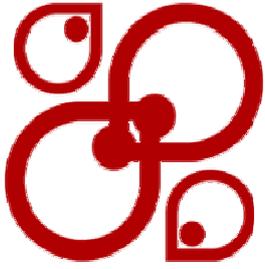
- Correction of bleeding due to excess warfarin, Vitamin K deficiency, liver disease
 - DIC, dilutional coagulopathy
 - Inherited factor XI deficiency
 - TTP .
- ✓ Dose: 15 mls/kg about 3–5 units
 - ✓ FFP and INR <2
 - ✓ Give at 1 ml/kg per hour in likely fluid overload patients
 - ✓ Given within 24 hours of thawing
 - ✓ Requesting FFP .

Frozen Plasma :

- ✓ Plasma frozen within 24 hours of collection
- ✓ Maintains level of plasma proteins except factor VIII
- ✓ Same indications as FFP

Cryoprecipitate :

- ✓ FFP thawed at 4°C and centrifuged
- ✓ Cryoprecipitate is the by-product
- ✓ Contains Fibrinogen, Factor VIII, Factor XIII, von Willebrand's Factor
- ✓ No longer indicated for Hemophilia*
- ✓ Source of Fibrinogen in acquired coagulopathies as in DIC; platelet dysfunction in uremia
- ✓ Indicated for bleeding in vWD, Factor XIII deficiency
- ✓ Infused as quickly as possible
- ✓ Give within 6 hours of thawing
- ✓ 10–15 mls; usually 10 units pooled
- ✓ 10 bags contain approx. 2gm of fibrinogen and should raise fibrinogen level to 70mg/dL.



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Appropriateness of transfusion :

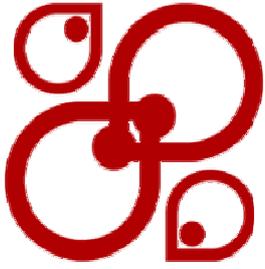
- ✓ May be life-saving
- ✓ May have acute or delayed complications
- ✓ Puts patient at risk unnecessarily
- ✓ The transfusion of safe blood products to treat any condition leading to significant morbidity or mortality, that cannot be managed by any other means'.

Inappropriateness of transfusion :

- ✓ Giving blood products for conditions that can otherwise be treated e.g. anaemia
- ✓ Using blood products when other fluids work just as well
- ✓ Blood is often unnecessarily given to raise a patient's haemoglobin level before surgery or to allow earlier discharge from hospital. These are rarely valid reasons for transfusion.
- ✓ Patients' transfusion requirements can often be minimized by good anaesthetic and surgical management.
- ✓ Blood not needed exposes patient unnecessarily .
- ✓ Blood is an expensive, scarce resource. Unnecessary transfusions may cause a shortage of blood products for patients in real need.

Problems faced :

- ✓ Too few donors
- ✓ Lack of equipment
- ✓ Insufficient products
- ✓ Insufficient reagent
- ✓ Infectious disease testing .



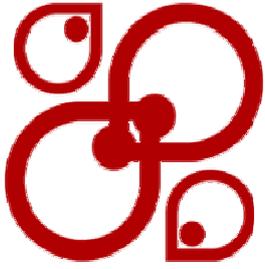
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Recommendations :

- ✓ Increase public awareness about need for blood and hence the number of voluntary donors.
- ✓ Continue to encourage relatives to donate for patients*
- ✓ Increase the number of mobile clinics.
- ✓ Extend the opening hours for blood collecting.
- ✓ Management of stocks of blood and blood products.
- ✓ Maintenance and replacement of equipment.
- ✓ On-going training of Haematology Lab Staff.
- ✓ Better management of reagents for- infectious disease testing, antigens etc.
- ✓ Improved record keeping .
- ✓ Move to electronic record keeping.
- ✓ View to reduce the need for allogeneic transfusions.
- ✓ Autologous transfusions.
- ✓ Blood saving devices in OR.
- ✓ Acute normovolemic haemodilution .
- ✓ Oxygen carrying compounds .



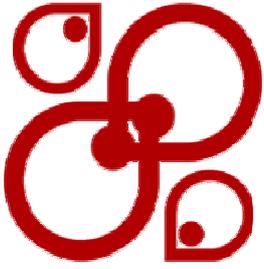
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