Rational Use of Blood and Blood Components

Red Blood Cells	Fresh Frozen Plasma	Concentrate of Platelets	Cryoprecipitate
To increase the amount of red blood cells after trauma or surgery or to treat severe anemia.	To correct a deficiency in coagulation factors or to treat shock due to plasma loss from burns or massive bleeding.	To treat or prevent bleeding due to lowplatelet levels. To correct functional platenet problems	To treat fibrinogen deficiencies:
STORAGE PERIOD			
42 days in the refrigerator or 10 years in the freezer	1 year in the freezer	5 days at room temperature	1 year in the freezer

Best Transfusion is

"No Transfusion"

Why Avoid Blood Transfusion?

- Infection Risk
  - HIV, Hepatitis
- Other Complications
  - Febrile reactions
  - Allergic, urticarial reactions
- Clerical Errors
  - ABO mismatch
- Immunologic Issues
  - TA-GvHD
  - Immunosuppression
- Religious Reasons

Misconceptions and Myths

- Whole blood
- “Fresh” Blood
- Empirical Transfusion
    - Nutritional Anemia
    - Pre Surgical
    - Wound Healing
    - Enhancement of well being

Why whole blood not rational

- **Maximize blood resource**

one unit of whole blood → **Thalassemia**, **Bleeding**, **Aplastic anemia**, **Hemophilia**

- **Better patient management**
    - concentrated dose of required component
    - avoid circulatory overload
    - minimize reactions
- **Specific storage requirements of components**
    - Red Blood cells +2-6^0 C
    - Platelets +22^0 C
    - Fresh frozen plasma - 30^0 C
- **Decrease cost of management**
    - except for the cost of bag, other expenses remain same

Whole Blood Vs Packed Red Cells

Parameter	Whole blood	Packed red cells
Volume	350 – 450 ml	200 – 240 ml
Increment in Hb	1 -1.5 gm/dl	1 -1.5 gm/dl
Red cell mass /ml	Same as PRBC	Same as WB
Viable platelets	No	No
Labile factors	No	No
Plasma citrate	++++	+
Allergic reactions	++++	+
FNHTR	++++	+
Risk of TTI	++++	+
Waste of components	Yes	No

“Fresh blood” – misconception.

❖ **What is “fresh blood”?**

- varying definition
- any unit kept at 4^{o}C for 4 hours is no longer “fresh”

❖ **Increased disease transmission**

- Intracellular pathogens (CMV, HTLV) survive in leukocyte in fresh blood
- Syphils transmission- tryponema can’t survive > 96 hours in stored blood (JAMA,95)
- Malaria transmission- malaria parasite cannot survive > 72 hours in stored blood (Mollison)

"Fresh blood" – misconception.

- **Immunological complication due to WBCs in fresh blood**
  - Transfusion Associated-Graft vs Host Disease – 90% fatality
  - TA-immunomodulation
  - Alloimmunization- Red cell / platelet
- **Logistics**
  - no time for component preparation
  - less time for infection screening
  - storage lesions in different constituents due to storage temp

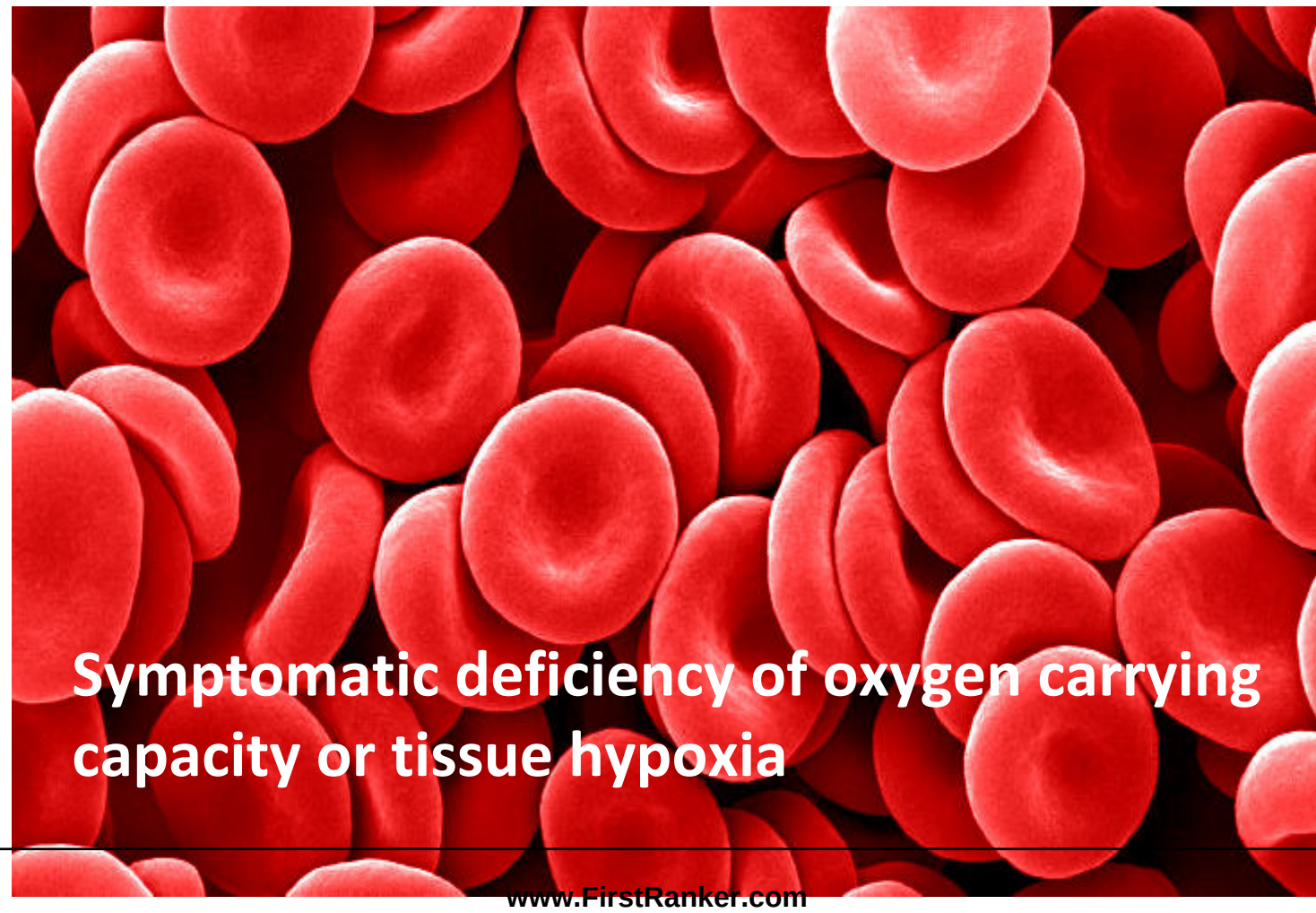
Rational Use of Blood

- **Right product**
- **Right dose**
- **Right time**
- **Right reasons**

Answer 4 Qs before transfusion

- **Why to transfuse ?**
  - benefit > risk
  - patients symptoms Vs lab levels
  - prophylactic Vs therapeutic
- **What to transfuse ?**
  - whole blood NO
  - components / fractions
- **How much to transfuse ?**
  - Single unit NO
- **How to transfuse ?**
  - use of filter
  - rate of transfusion
  - warming

Packed Red Cells (PRBC)



Appropriate use of Packed red cells

- Should be ABO and Rh compatible
- Clinical judgment- a vital role
- Co-existing conditions – age, general health, cause of anemia, its severity and chronicity
- Not for conditions like Iron/ B12/ Folate deficiency

PRBC - Triggers

- **Preoperative / peri-procedural** : Hb< 6g/dl
  Hb 6- 10 g/dl
  (bleeding, cardio resp. disease)
- **Symptomatic chronic anemia** : Hb < 6 g/dl

- **Acute blood loss** : > 40% blood loss
  > 30% continued blood loss or on respiratory support

Neonates

- **Hemoglobin**
  - <12g/dl in first 24 hrs
  - <12 g/dl with intensive support care
  - <11 g/dl with chronic oxygen need
  - < 7 g/dl in a stable infant
- **Blood loss**
  - Stable infant > 10% loss of estimated volume
  - Unstable infant > 5% loss of estimated blood volume

PRBC - Dosing

- One unit of compatible RBC –1 g/dl or Hct by 3%
- Neonates

  Dose – 10- 15 ml/kg

  Increase Hb - 2-3 g/dl

Issues in red cell transfusion

One unit of PRBC

- Vol 250 ml
- Hct 65%
- Raise Hb by 1 gm/dl
- 200 mg iron
- 70% post transfusion survival

Age of blood

- concerns regarding K level
- decreased post transfusion survival

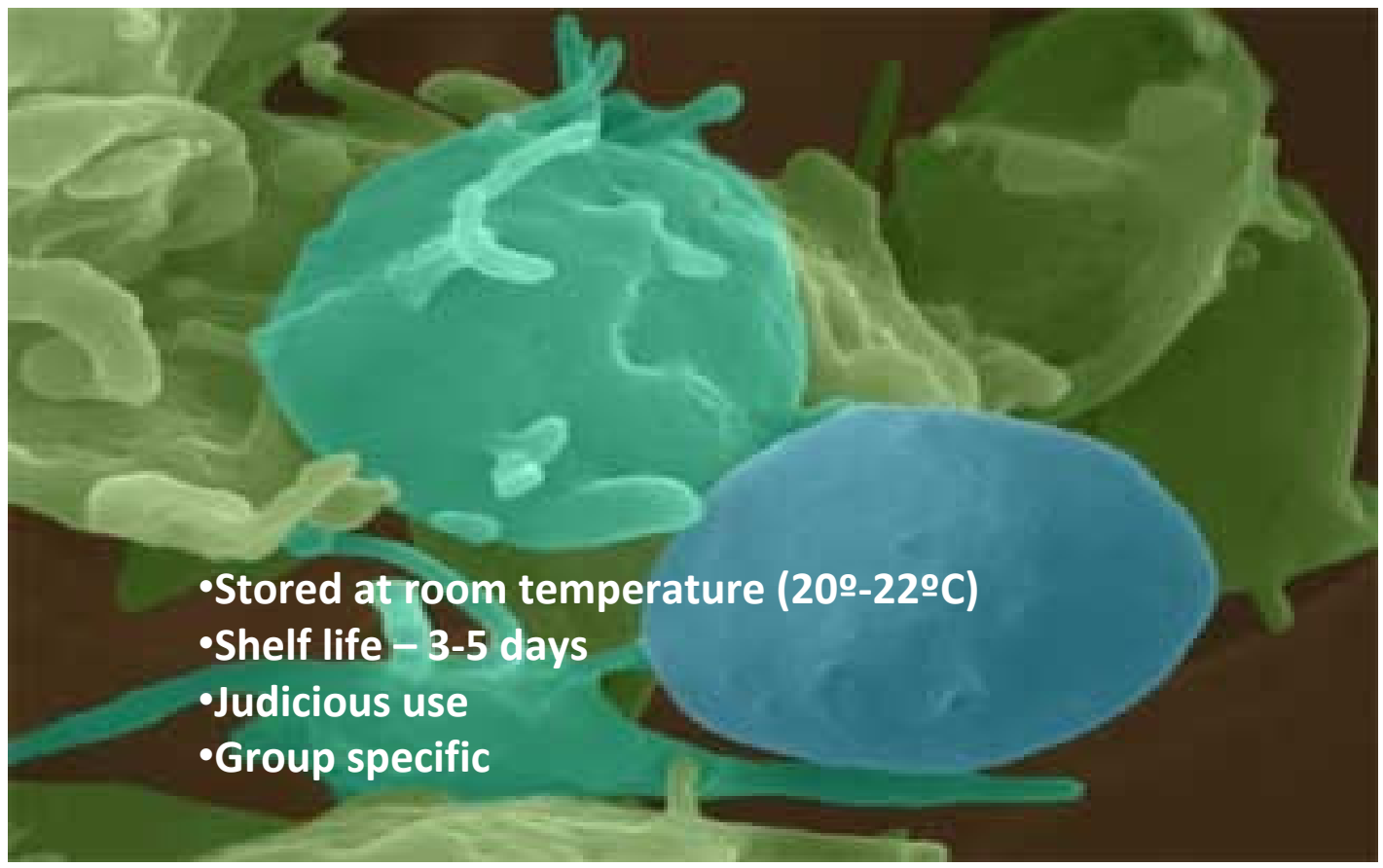
Specific conditions

- intrauterine transfusion < 3 days old
- thalassemics < 5 days
- open heart surgery < 10 days

Cardinal principles in red cell transfusion in chronic anemia

- Evaluate etiology of anemia - **AIHA, IDA**
- Do not transfuse just on the basis of given Hb level
- Try to establish whether Signs / Symptoms are due to anemia
- Determine if Signs / Symptoms of anemia are alleviated by transfusion
- Determine that temporary relief of symptoms warrants continued transfusion

Platelets



Appropriate Transfusion of Platelets

- **Symptomatic platelet problems**

  Number related – eg. Aplastic anemia

  Function related – eg. Glanzmann's thrombasthenia

- **Do not treat the number in isolation –**

  eg Chronic ITP with no bleeds

- **Prophylactic in specific situations**

  CNS, eye surgery, other major surgeries, acute leukemia, patients on chemoradiotherapy

Dose: 1 RDP/10 Kg

Platelet- Triggers

Condition	Platelet count
Prophylaxis against bleeding	< 10,000/µl
Bedside invasive procedures	< 50,000/µl
Neurosurgical procedures, Ophthalamic surgeries	< 100000/µl
Massive Transfusion	< 50,000/µl

Neonates – Prophylactic Platelet Triggers

Term Neonates

- Clinically stable - 20,000/µl
- Clinically sick - 30,000/µl

Preterm Neonates

- Clinically stable - 30,000/µl
- Clinically sick - 50,000/µl

Contraindications

- Thrombotic Thrombocytopenic purpura
- Heparin induced thrombocytopenia
- Immune Thrombocytopenic purpura

Fresh Frozen Plasma

Appropriate Transfusion of FFP

- Replacement of multiple factors: DIC, liver disease, warfarin reversal, snake bite
- PT/ INR should be determined
- Dose: 10-15 ml/kg
- Not for volume expansion
- Not for nutritional support/ hypoproteinemia

Cryoprecipitate

- Out of group can be transfused but preferably ABO compatible
- RhD type need not be considered
- Thawed Cryoprecipitate transfused within 6 hours
- Indicated for bleeding associated with fibrinogen deficiency and factor XIII deficiency

- Hemophilia A or von Willebrand disease when appropriate substitute not available

- Bleeding with fibrinogen levels< 100mg/dl

- **Dose** - **one unit/10 kg body weight**

- Raises fibrinogen concentration by **50 mg/dl**

Choice for ABO Blood Groups

Patient type	Donor PRBC	Donor FFP	Donor PC
O Positive	O	O,B,A,AB	O,B,A,AB
A Positive	A,O	A,AB	A,AB,O,B
B Positive	B,O	B,AB	B,AB,O,A
AB Positive	AB,B,A,O	AB	AB,B,A,O

Choice for Rh Blood group

- **Rh (D) negative patient transfused with Rh (D) positive components**

PRBC	Only as a life saving measure and with consent from treating physician & patient's relative
FFP	No anti-D immunoprophylaxis required
PC	Anti D immunoprophylaxis required (300 µg anti-D gives protection for 7 plateletpheresis units or 30 Rh (D) positive platelet concentrates for 6 weeks)

Cross matching: Special Circumstances

Clinical urgency

- Immediate → Group O Rh neg Packed RBCs
- Minutes → ABO & Rh D type
  - Group specific blood (5-10 min)
  - Immediate spin crossmatch (15-20) min)
- Within an hour → ABO & Rh D type → Complete crossmatch

If units are issued without X match – written consent of physician to be taken, -complete X match protocols followed after issue

Take Home Messages

- **No place for Whole Blood in clinical medicine**
- **Component preparation and use is the demand of time**
- **Best Transfusion is “No Transfusion”**
- **Promotion of judicious use of blood / components**

- Audit of transfusion practices
- CME on use of components
- Promote autologous use of blood
- Discourage single unit / fresh blood

Thank You