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CHILDREN'S HOSPITAL

Rational Use of Blood Component

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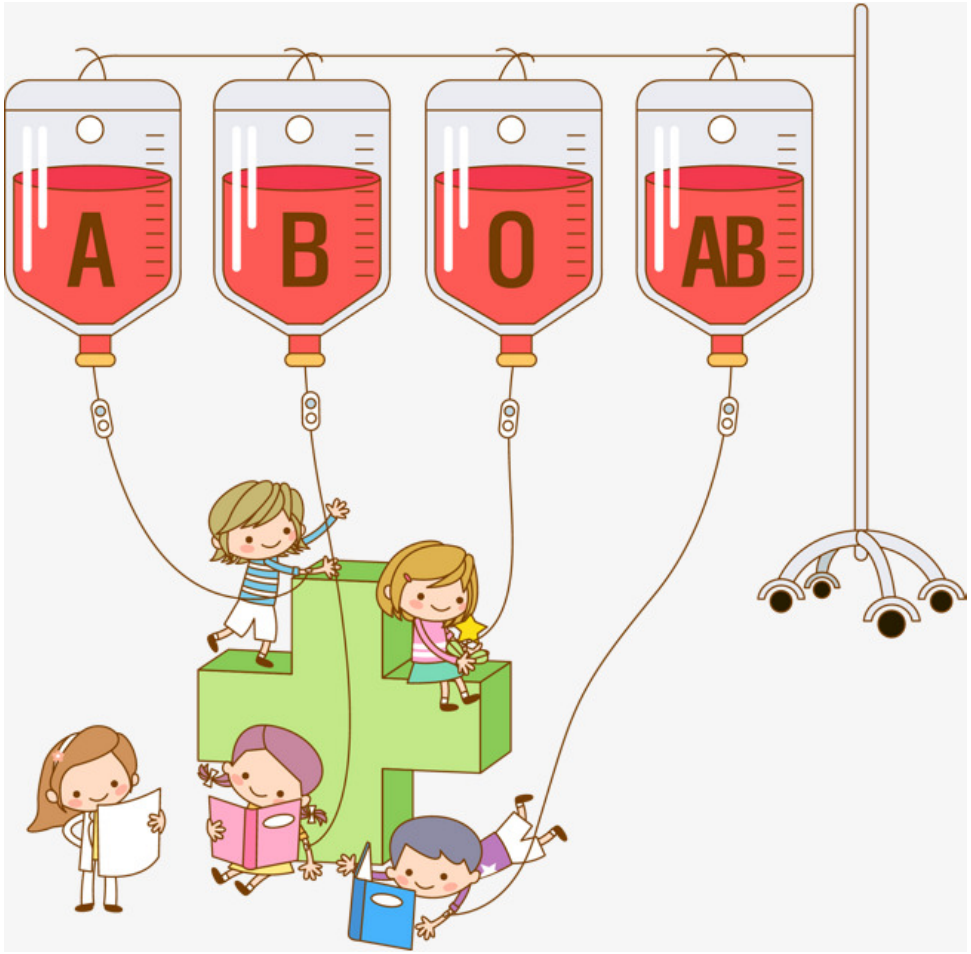
The Rationale Behind The Rational Use of Blood

- Economy: Scarcity of resource
- Safety: Inherent risk involved in transfusion therapy
- Scientifically appropriate
  - Nutritional anemia

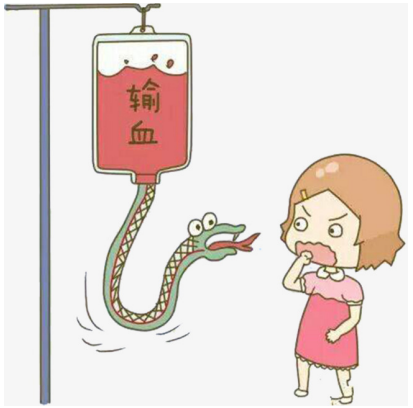
Rational Use of Blood

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



Guideline For Promoting Component Therapy

- Definite indication: A blood transfusion should never be ordered unless it is worth the risk
- Single unit transfusion: had no significant therapeutic benefit
- Use of fresh blood: should be avoided because of increased risk of infection



1. Give only what you needed

- Red cells : Anemia
- Platelet: Thrombocytopenia
- Fresh Frozen Plasma (FFP): Multiple clotting factor deficiency
- Cryopicipitate: Hemophilia A

2. Different Storage Conditions

Components	Storage temperature	Shelf life
RBC (WB,PRC,LDRC)	1-6°C	CDP- 21days CDP-A1 – 35days AS – 42days
Platelet (Random-donor)	20-24°C With agitation	5days
FFP	- 18 °C -65 °C	1year 7years
Thawed FFP	1-6°C	5days after thawed
FP	- 18 °C	5years
Cryoprecipitate	- 18 °C or colder	1year
Thawed cryo	20-24°C	4hr

3. Conservation of Scarce Resource

- Separation of Whole blood in 3-4 components
- Benefits more than one patient at a time

Whole Blood

- ✧Contains: Hb 12g/dl, HCT 35-45% , not function platelet, no labile coagulation factor (V,VIII)
- ✧Indication:
  - Volume deficit: Acute or active blood loss with hypovolemia
  - Exchange transfusion in neonate
- ✧Contraindication: Risk of volume over load: chronic anemia
- ✧Administration:
  - ABO and Rh compatible
  - Never add medication to a unit of blood
  - Drip within 4hrs/unit

Why Not Use Whole Blood

- Whole blood = one patient

- Component therapy= 4 patients
  - PRC=Thalassemia
  - PC=Thrombocytopenia
  - FFP= Coagulopathy
  - Cryoprecipitate = Hemophilia

Packed red cells or red blood cell concentrate(RBC)

✧1 unit contain:

- RC 150-200ml , Hb 35-45 g/unit
- Hct 65 – 80%
- Plasma 20-35%

✧Indication:

- Acute blood loss
- Chronic anemia

Leukocyte poor red cell (LPRC)

- ✧WBC < 1.2 X 10^9 cell/unit
- ✧HCT 50-70% , Hb 40g/unit
- ✧Prevention of FNHTR

Leukocyte depleted PRC

- Leukocyte filtration (pre-storage and post storage)
- WBC < 5 x 10^6 cell/unit (USA)
- WBC < 1 x 10^6 cell/unit (Europe)
- Prevention:
  - FNHTR
  - HLA alloimmunization
  - Reduces the transmission cytomegalovirus (CMV)

Indications

- Patients who have experienced febrile nonhemolytic transfusion reactions, to prevent recurrence
- Patients who may require frequent transfusions (eg, those with aplastic anemia, leukemia, or future transplant candidates), to reduce the risk of HLA alloimmunization
- Patients at risk for CMV related disease
- Patients undergoing cardiopulmonary bypass, to prevent lung injury

Roseff SD, Luban NL, Manno CS. Guidelines for assessing appropriateness of pediatric transfusion. Transfusion 2002; 42:1398.

General RBC transfusion

More than 4 months of age

- ✧Hb <7 g/dL in general patient
- ✧Hb <10g/dL in patient with ischemic heart disease
- ✧Hgb 7-10 g/dL, the decision to transfuse is dependent upon the clinical situation..
- ✧No transfusion is required for Hb>10 g/dL.

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Patient who should not be transfused

- Nutritional Anemia
- Autoimmune Hemolytic Anemia
- Patient with high peripheral blast count

Red blood cell 10-15ml/kg
increase HCT 10-15%
(Hb 2-3g/dl)

PLATELET TRANSFUSION

Platelet concentrates

- ✧Platelet 5.5 x 10^{10} cell/unit in plasma 50-60ml
- ✧RBC < 1.2 X 10^{9} /unit
- ✧WBC < 0.12 x 10^{9} /unit
- ✧Shelf life 5days
- ✧If more than 5days have risk for bacteria contamination

Indication For Platelet Transfusion

- ✧ Actively bleeding patient cause of Thrombocytopenia or Platelet Dysfunction
- ✧ Preparation for an invasive procedure or prophylactically in thrombocytopenia patient
- ✧ Prevent spontaneous bleeding

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Actively bleeding patients

- ✧ Thrombocytopenia should be transfused with platelets immediately:
  - Keep platelet counts > 50,000/microL in most bleeding situations
  - > 100,000/microL if there is disseminated intravascular coagulation or central nervous system bleeding
- ✧ Other factors contributing to bleeding include:
  - Surgical or anatomic defect
  - Fever
  - Infection or inflammation
  - Coagulopathy
  - Acquired or inherited platelet function defect

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Preparation for an invasive procedure

- ✧Neurosurgery or ocular surgery > 100,000/microL
- ✧Most other major surgery > 50,000/microL
- ✧Central line placement > 20,000/microL
- ✧Lumbar puncture > 10,000-20,000/microL in patients with hematologic malignancies and > 40,000-50,000 in patients without hematologic malignancies, but lower in patients with immune thrombocytopenia (ITP)

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Prevention of spontaneous bleeding

- There are no ideal tests for predicting who will bleed spontaneously
- Bleeding is much more likely at platelet counts less than 5000/microL
- afebrile patients with platelet counts below 10,000/microL
- 30,000-50,000/microL in patients who are febrile or septic. Patients with acute promyelocytic leukemia (APL)

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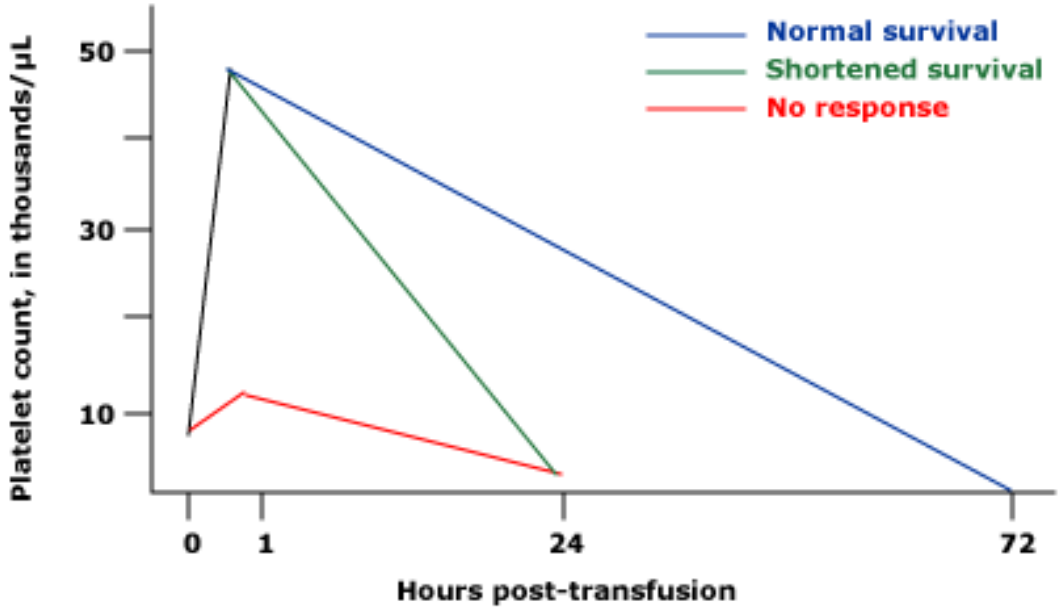
Platelet Contraindicate

- Immune Thrombocytopenia (ITP)
- Thrombotic Thrombocytopenia Purpura
- Disseminated intravascular coagulation without bleeding
- Hypersplenism

Platelet concentrate 0.2unit/kg increase platelet 20,000-40,000/mm^3

(Maximum 6unit)

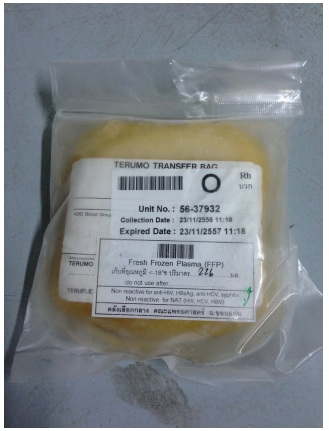
Patterns of response to platelet transfusion



Two patterns can be seen in refractory patients. A normal increment at one hour following transfusion with return to the baseline count within 24 hours (green curve) is typical of the shortening of platelet survival seen with sepsis, hematopoietic cell transplantation, disseminated intravascular coagulation, and possibly in bleeding patients and those taking medications that interfere with platelet survival. The second pattern consists of little or no increment in platelet count, even within one hour of transfusion (red curve); this pattern is seen with alloimmunization.

Fresh frozen plasma

Fresh frozen plasma



- Volume 250-300ml
- Thawed 30-37 ºC use immediately
- Use same group, no cross match
- Indication
  - Bleeding and Multiple acquire coagulation factor deficiency (DIC, liver disease)
  - Rapid reversal of warfarin effect
  - TTP
  - Congenital coagulation defect

Contraindication and caution

- Hypovolemia
- High volume with rapid transfusion can cause allergic reaction and Anaphylaxis

FFP 10ml/kg increase all factor 10-15% except factor IX increase 7-10%

(15ml/kg= 1 Therapeutic dose)

Cryoprecipitate

- ✧ Prepared from FFP
- ✧ Shelf life 1 year
- ✧ Factor VIII 80-100 IU/unit
- ✧ Fibrinogen 150-300 mg/unit
- ✧ vWF variable amounts
- ✧ FXIII

Cryoprecipitate

- Indication
  - Alternative to factor concentrates in vWD, Hemophilia A, factor XIII deficiency
  - As a source of fibrinogen in acquire coagulopathies: DIC

Cryoprecipitate 0.2unit/kg increase factor VIII 20%, fibrinogen 80-100 mg/dl

- Questions?
- Comments?