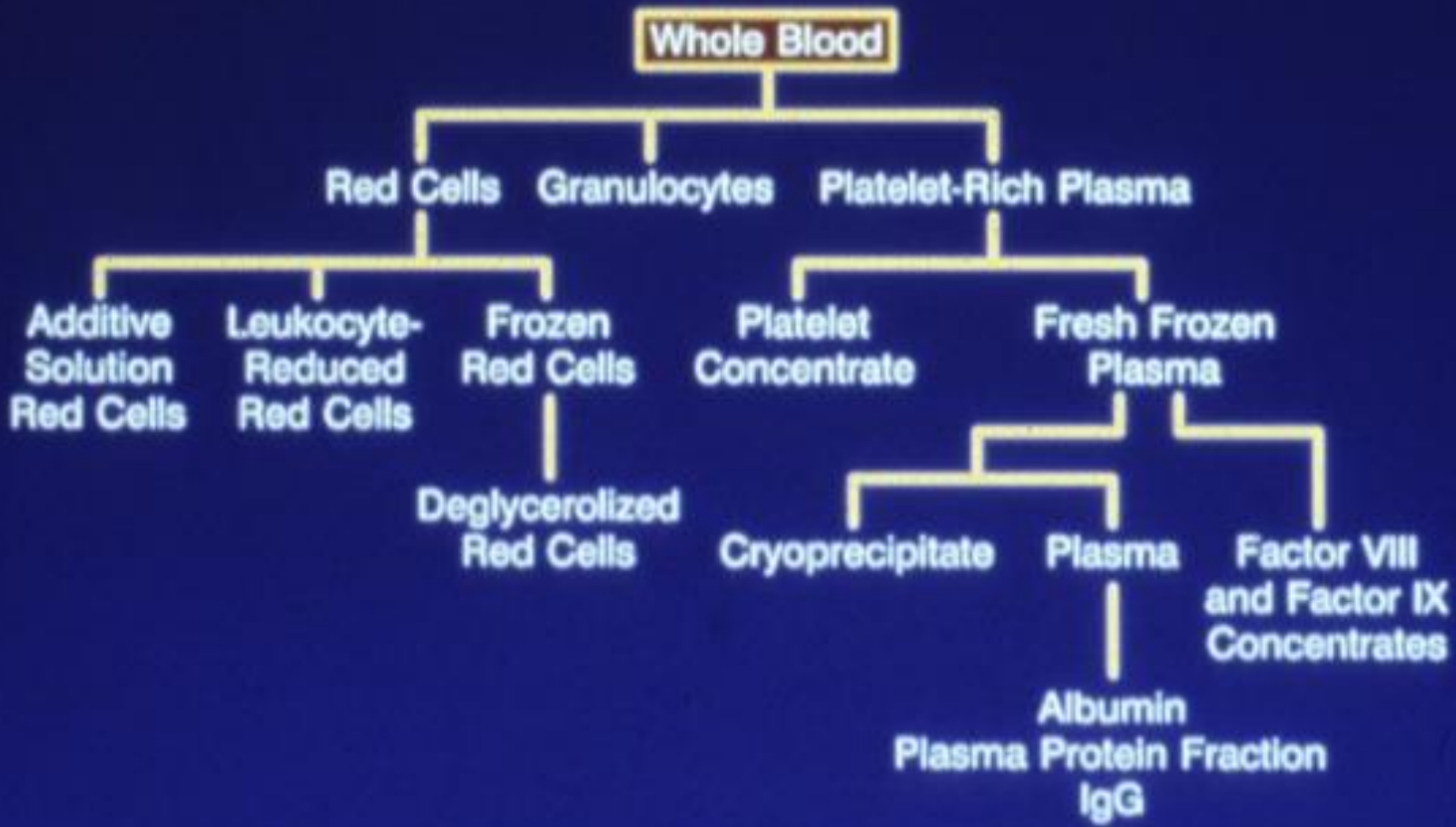
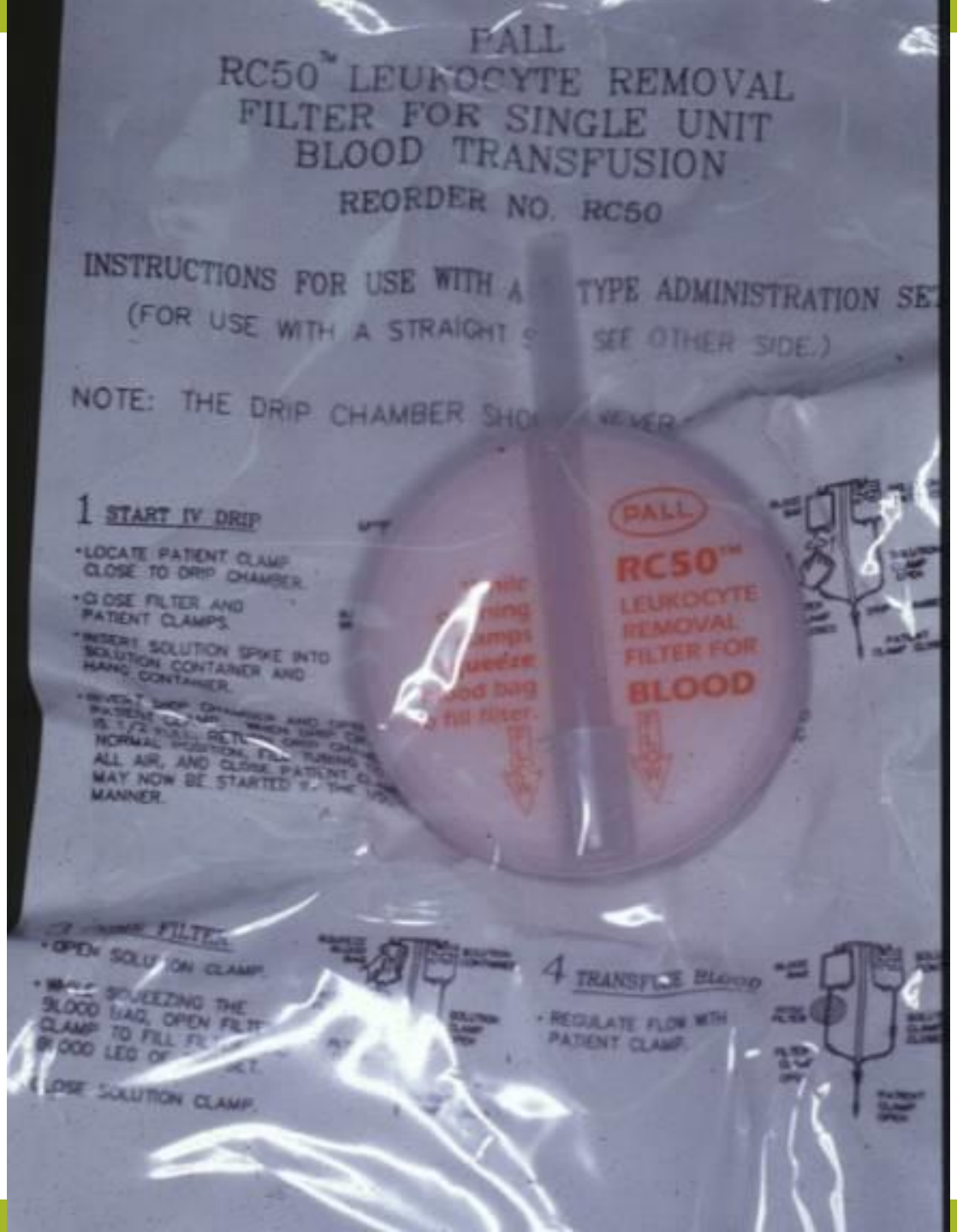
بسم الله الرحمان الرحيم

Concept of Component Therapy



Leukocyte-Reduced Red Blood Cells

To Decrease Risk of:	Minimal WBC $\log_{10}$ Removal Required
Febrile Reactions	~1-2 $\log_{10}$ (80-99%)
CMV Transmission	>2-3 $\log_{10}$ (99-99.9%)
HLA Alloimmunization	≥3 $\log_{10}$ (99.9%)


PALL
RC50™ LEUKOCYTE REMOVAL
FILTER FOR SINGLE UNIT
BLOOD TRANSFUSION
REORDER NO. RC50
INSTRUCTIONS FOR USE WITH A TYPE ADMINISTRATION SE
(FOR USE WITH A STRAIGHT SEE OTHER SIDE.)
NOTE: THE DRIP CHAMBER SHO NEVER
1 START IV DRIP
•LOCATE PATIENT CLAMP CLOSE TO DRIP CHAMBER.
•CLOSE FILTER AND PATIENT CLAMPS.
•INSERT SOLUTION SPIKE INTO SOLUTION CONTAINER AND HANG CONTAINER.
PALL
RC50™
LEUKOCYTE REMOVAL FILTER FOR
BLOOD
4 TRANSFUSE BLOOD
•REGULATE FLOW WITH PATIENT CLAMP.

Therapeutic Apheresis

Type	Rationale	Example
Plasma	Remove Immunoglobulins or Pathogenic Substances	Myeloma with Hyperviscosity Myasthenia Gravis TTP
Platelet	Reduce Risk of Hemorrhage or Thrombosis	Essential Thrombocythemia
Leukocyte	Reduce Leukostasis	Leukemia
Red Cell	Exchange Abnormal Cells	Sickle Cell Crisis

Guidelines for Pediatrics RBCs Transfusions

CHIIDREN AND ADOLESCENTS

- Acute loss of>25% a circulating blood volume
- Hemoglobin of <8 g/dL in the perioperative period
- Hemoglobin of <13 g/dL and severe cardiopulmonary disease
- Hemoglobin of <8 gl dL and symptomatic chronic anemia
- Hemoglobin of <8 g/dL and marrow failure

INTANTS WITHIN THE FIRST 4 MO OF LIFE

- Hemoglobin of <13 q/dL and severe pulmonary disease
- Hemoqlobin of <10 gl/dL and moderote pulmonary disease
- Hemoglobin of<13 g/dL and sereve cardiac disease
- Hemoglobin of <10 g/dL and major surgery
- hemoglobin of <8 gl/dl and symptomatic anenta

Guidelines for Pediatrics PLT Transfusions

CHIIDREN AND ADOLTSCENTS

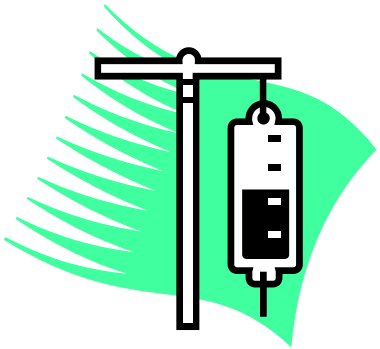
- PLTs < 50 x 10^9/L *and bleeding*
- PLTs < 50 x l0^9/L *and an invasive procedure*
- PLTs < 20 x 10^9/L *and marrow failure with hemorrhagic risk factor*
- PLTs < 10 x 10^9/L *and marrow failure without hemorrhagic risk factor*
- PLTs at any count, *but with PLT dysfunction plus bleeding or an invasive procedure*

INFANTS WITHIN THE FIRST 4 MO OF LIFE

- PLTs < 100 x 10^9/L *and bleeding*
- PLTs < 50 x 10^9/L *and an invasive procedure*
- PLTs < 20 x 10^9/L *and clinically stable*
- PLTs < 100 x 10^9/L *and clinically unstable*
- PLIs at any count, *but with PLI dysfuntion plus bleedlng or an invasive procedure*

Selection of Platelets

*consult if child or 1st choice not available



Group	Ist	2nd	3rd
O	O	A,B,AB	---
A	A	AB,B	O
B	B	AB,A	O
AB	AB	A,B	O

Calculating Posttransfusion Platelet Increments

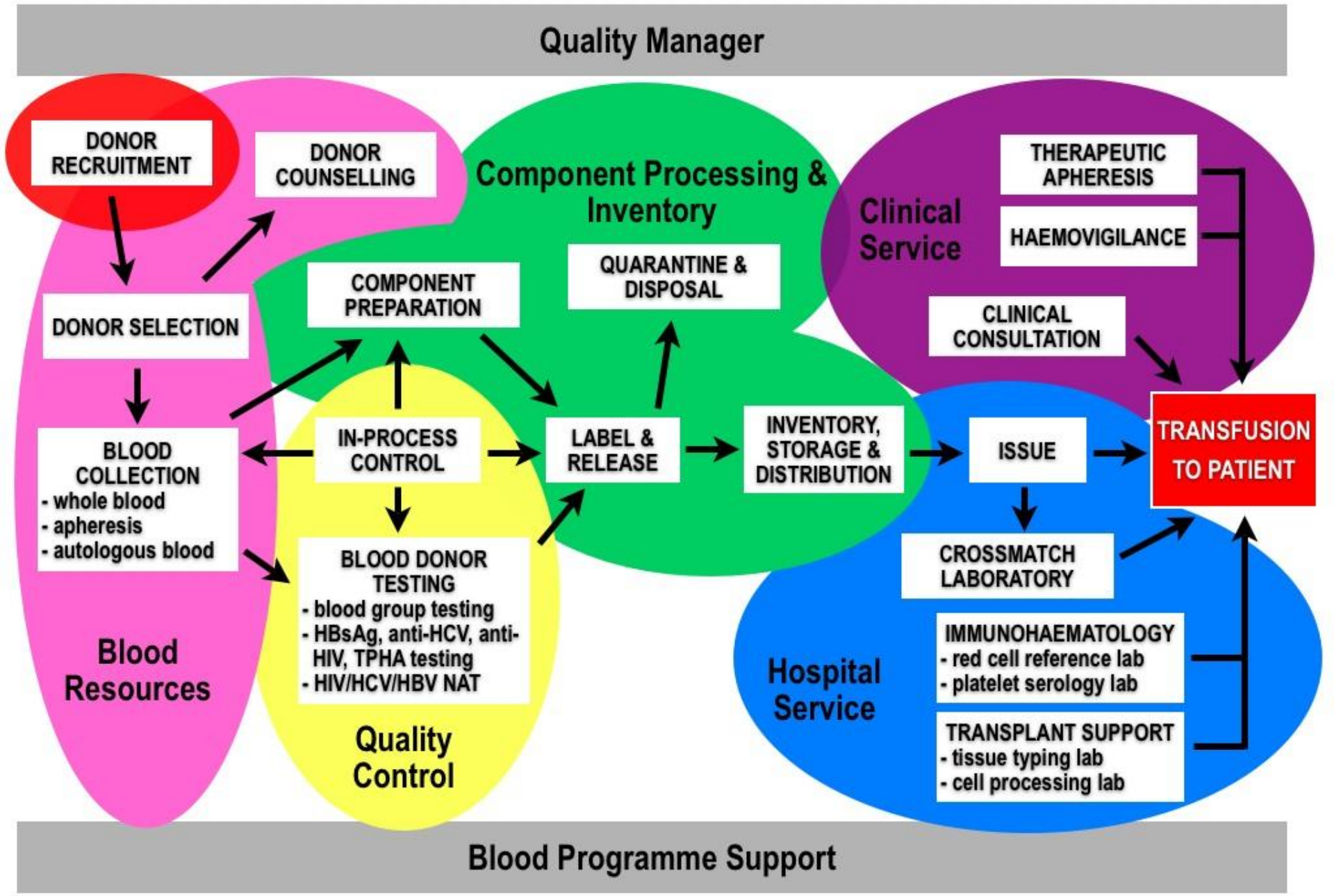
$$CCI = \frac{\text{Posttransfusion - Pretransfusion Platelet Count}/\mu L}{\text{Number of Platelets Transfused} \times 10^{11}} \times BSA\ (m^2)$$

CCI = Corrected Count Increment
BSA = Body Surface Area

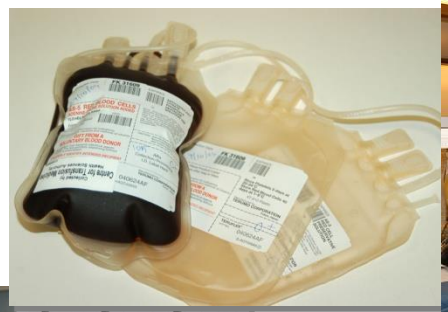
Patient and donor plasma selection by ABO

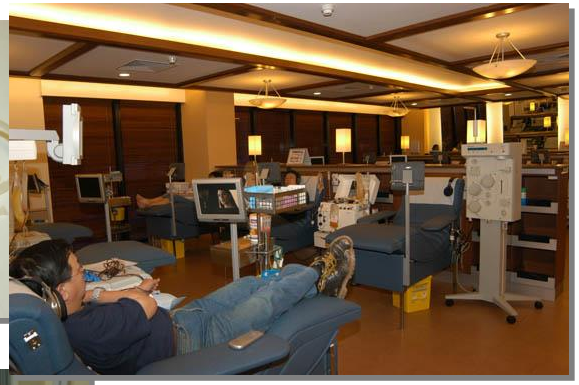
Recipient	Donor
O	O, A, B, AB
A	A, AB
B	B, AB
AB	AB

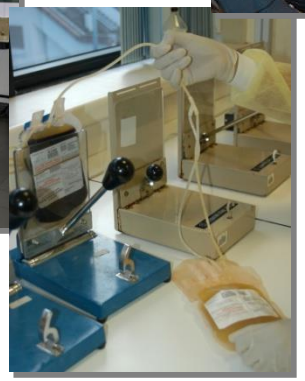
VEIN TO VEIN ORGANISATION



Blood Component Therapy







Random Donor Platelets
Single Donor Platelets

Cryoprecipitated AHF
Fresh Frozen Plasma
Fibrinogen Concentrate
Liquid Plasma
Plasma Derivatives

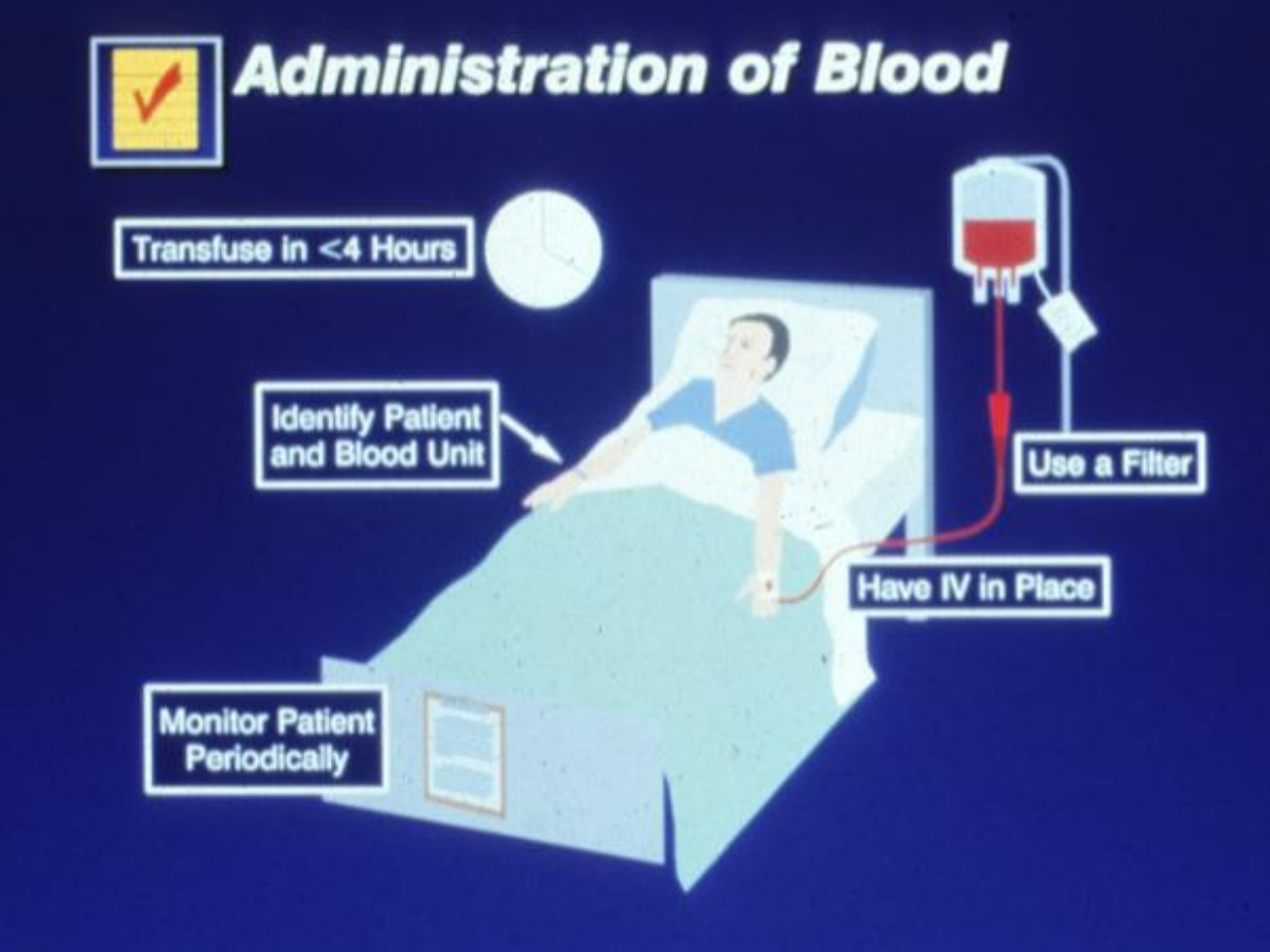
Red Cells
Leucocyte-Reduced Red Cells
Irradiated Blood
Washed Blood
Frozen Cellular Components

Preoperative Autologous Donation

Donor Eligibility Criteria

- An Identifiable Future Need for Transfusion
- Physician Must Request Phlebotomy
- Hemoglobin Must Be ≥110 g/L (≥11 g/dL) or the Hematocrit Must Be ≥0.33 (≥33%)
- No Evidence of Infection
- No Active Cardiovascular Disease

Administration of Blood



COMPLICATIONS OF BLOOD TRANSFUSION: *AN OVERVIEW*

Complications of Transfusion

- Transfusion reactions occur in 2% of units or within 24 hours of use.
- Most common adverse side effects are usually mild and non-life-threatening
- Two categories:

  Infectious complications:

  i.e HIV and HCV → 1 transmission/2 million transfusion

  Non-infectious complications

Non-infectious Complications of Transfusions

Technical Manual

- Acute (< 24°)
  - Immunologic
  - Non-immunologic
- Delayed (> 24°)
  - Immunologic
  - Non-immunologic

Acute Immunologic Reactions:

- Hemolytic
- Fever/chills, non-hemolytic
- Urticarial/Allergic
- Anaphylactic

Acute Non-Immunologic Reactions:

- Hypotension associated with ACE inhibition
- Transfusion-related acute lung injury (TRALI)
- Circulatory overload
- Nonimmune hemolysis
- Air embolus
- Hypocalcemia
- Hypothermia

Hemolytic Transfusion Reactions

- **Acute Hemolytic Reactions(AHTR):**

  Hemolysis *of donor RBCs,within 24 hrs of transfusion,by alloantibodies in recipient circulation(Anti-A,Anti-B,AntiA,B).*

  Most commonly due to ***ABO-incompatible*** *blood transfusion.*

  Acute intravascular hemolysis(may be only 10-15 mL incompatible blood).

  Fever *is the most common initial manifestation of AHTR and frequently is accompanied by chills.*

  Signs and symptoms of AHTR: ***Fever,Chills,Back pain,Utricaria,Dyspnea,Generalysed oozing,DIC,Hemoglobinuria,Chest pain,Hypotention,Hypertention,Anuria,Anemia,Tachycardia***

  Incidence *of AHTR 1:38000 to 1:70000*

  The risk of fatal AHTR is 1:160000

  Prevention: *Pretransfusion compatibility testing(Cell type and Back type) and most common errors resulting in AHTR is misidentification of samples.*

  Sometimes due to minor blood groups

Management of AHTR

- ***Early recognition*** *of the clinical manifestations of AHTR*
- ***Stop the transfusion*** *and shoud be kept open a iv Line*
- *Adequete perfusion of the kidneys(****normal saline,diuretics****)*
- *Management of* ***DIC****(if present)*
- ***Recrossmatch***
- *Keep in mind of Human errors(****misidentification****)*
- *Perform of computerized records*
- *Use of appropriate protocols such as* ***AABB standards***

Fevers/chills, non-hemolytic (FNHTR)

- *Defined as a rise in temperature of 1°C or greater.*
- *Incidence*
  - *43-75% of all transfusion rxn.*
  - *PRBCs 0.5-6%*
  - *Plts 1-38%*
- *Signs/Symptoms*
  - *Chills/rigor*
  - *HA*
  - *Vomitting*

- *Etiology*
  - *Reaction…*
    - *Between recipient WBC antibodies (HLA, WBC antigens) against transfused WBC in product*
    - *Cytokines that accumulates in blood bag during storage*
- *Differential Diagnosis:*
  - *Other causes of fever ruled out*
    - *Hemolytic*
    - *Bacterial/Septic*
- *Treatment/Prevention*
  - *Discontinue transfusion?*
  - *Acetaminophen/meperidine*
  - *Leukoreduced blood component*

Uritcarial/Allergic

- *Etiology*
  - *Circulating aby against soluable material in the blood*
    - *Proteins in donor plasma*
  - *Binds to preformed IgE aby on mast cells*
    - *Release of histamine*
  - *Vasoactive substances*
    - *C3a, C5a, leukotrienes*
- *Differential Diagnosis:*
  - *Hemolytic*
  - *Bacterial*
  - *TRALI*
- *Treatment/Prevention*
  - *Discontinue transfusion*
  - *Antihistamine/steroids*
  - *Washing of blood products, pretreatment,leukoreduction?*
- *Continuum*
  - *Mild – urticarial*
  - *"Anaphylactoid"*
  - *Severe – anaphylactic*
- *Incidence*
  - *1-3% of all transfusion rxn.*
- *Signs/Symptoms*
  - *Uriticarial/hives – upper trunk and neck*
  - *Fever*
  - *Pulmonary signs (10%) – hoarseness, stridor, "lump in throat", bronchoconstriction*
    - *No cutaneous involvement*
  - *GI – N/V, abd. pain, diarrhea*
  - *Circulatory – tachycardia, hypotension*

Anaphylactic

- **Etiology**
  - *IgA aby (IgE, IgG, IgM) in IgA deficiency*
    - *Serum IgA < 5 mg/dL*
    - *Estimated 1 in 342 blood donors*
  - *C4 aby*
  - *Aby against nonbiologic origin*
  - *Haptoglobin deficiency (IgG or IgE anti-haptoglobin)*
- **Differential Diagnosis:**
  - *Hemolytic*
  - *Bacterial*
  - *TRALI*
  - *Circulatory overload*
- **Rare**
- **Incidence**
  - *1:18,000 to 170,000*
  - *Plt 1:1598-9630*
  - *FFP 1:28,831*
  - *RBCs 1:23,148-57,869*
- **Signs/Symptoms**
  - *In addition to uritcarial/allergic…*
    - *Cardiovascular instability*
      - *Cardiac arrhythmia*
      - *Shock*
      - *Cardiac arrest*
    - *More pronounced respiratory involvement*

Transfusion-related acute lung injury (TRALI)

- **What Is TRALI?**
  - *Transfusion related noncardiogenic pulmonary edema*
  - *Differential Diagnosis*
    - *Circulatory overload (TACO)*
    - *Allergic/Anaphylactic*
    - *Bacterial*
    - *Acute hemolytic reaction*
  - **Clinical presentation ("classic", severe form)**
    - *Acute respiratory distress*
    - *Pulmonary edema*
    - *Hypoxemia*
    - *Hypotension*
    - *Transfusion usually within 6 hours (majority of cases during transfusion or within 2 hours of transfusion)*

- **Clinical Course**
  - *100% TRALI patients require O_2 and 72% require ventilation support*
  - *81% resolves within 4 days and 17% resolve within 7 days*
    - *Most pts. recover with 72 hours*
  - *Mortality rate 6% (subsequent series up to 14-25%)*
  - *No long term sequela*

- **Treatment**
  - *Respiratory support*
  - *No role for treatment w/ steroids or diuretics*

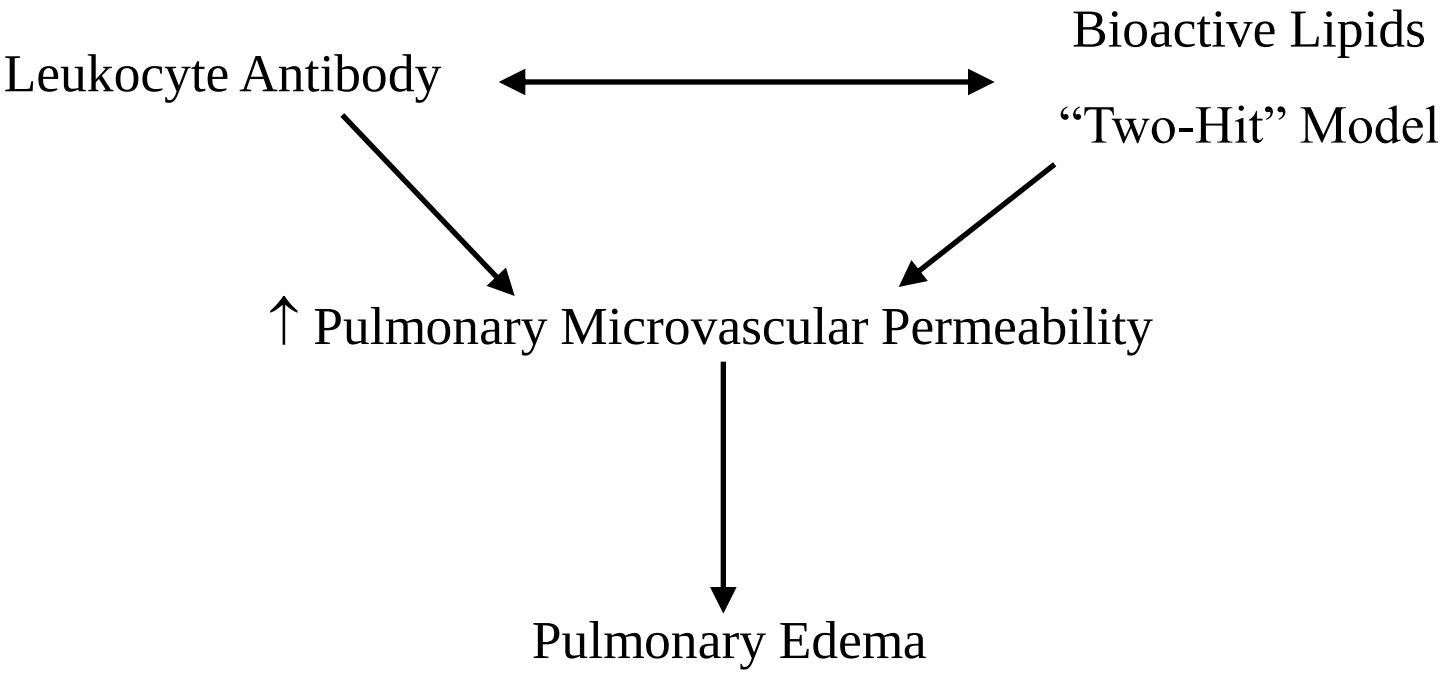
TRALI

- *Implicated Blood Products*
  - *RBCs, FFP, apheresis platelets, platelet concentrates*
  - *Rare cases of IVIG, cryo-*
  - *No cases of albumin reported*

- *Why Is TRALI Important?*
  - *Between 2001 – 2003, FDA report on causes of transfusion related deaths*
    - *TRALI 16.3%*
    - *ABO/Hemolytic transfusion reaction 14.3%*
    - *Bacterial contamination 14.1%*
  - *UK SHOT Data 7 years experience (from 1996)*
    - *Total 155 cases*
      - *32 Deaths*

TRALI

- Pathogenesis
  - Two current working model hypothesis
  - Both models are directed against increase in pulmonary microvascular permeability



Air embolus

- *Air infusion via line*
- *Rare*
- *Cough, dyspnea, chest pain, shock*
- *If suspected…*
  - *Pt. placed on left side with head down*
    - *Displace air bubble from pulmonary valve*

Hypocalcemia

- *Large volumes of FFP, whole blood, plts. transfused rapidly → plasma citrate levels may rise → binds iCa+2*
  - *Citrate rapidly metabolized → manifestations transient*
  - *Prolonged apheresis*
- *Periorbal/peripheral tingling paresthesias, shivering, lightheadedness, tetanic sxs., hyperventilation, depressed cardiac function*
- *Ca+2 replacement*

Hypothermia

- *Rapid infusion of large volumes of cold blood*
  - *Ventricular arrhythmias*
  - *More likely via central catheters*
  - *Increased toxicity of hypocalcemia and hyperkalemia*
  - *Impaired hemostasis*
  - *Increase caloric requirement*
- *Blood warmer*

Post-transfusion Purpura (PTP)

- *Characterized by abrupt onset of severe throbocytopenia*
  - *Average of 9 days (range 1-24 days)*
  - *PRBCs or whole blood*
  - *Reported in plts., plasma, frozen deglycerolized PRBCs*
- *Incidence*
  - *Rare*
  - *Over 200 cases published*
  - *Male:Female 1:5*
  - *Median age 51 years (range 16-83)*
- *Clinical course*
  - *Usually self-limited, recovery w/in 21 days*
  - *10-15% mortality*
    - *Intracranial hemorrhage*
- *Signs/Symptoms*
  - *Profound thrombocytopenia*
  - *Purpura*
  - *Bleeding*
  - *Fever (reported)*
- *Etiology*
  - *Plt. specific IgG aby that are auto-aby*
    - *All HPA implicated but HPA-1a most common*
  - *3 mechanisms*
    - *Immune complex – pt. aby and donor antigen*
    - *Concersion of antigen- autologous plts. to aby targets to antigen in transfused components*
    - *Cross-reactivity of pts. autoaby w/ autologous plts.*

PTP

- *Differential diagnosis*
  - *ITP*
  - *TTP*
  - *Alloimmunization*
  - *Sepsis*
  - *DIC*
  - *BM failure*
  - *Drug-induced*
- *Treatment/Prevention*
  - *Steroids – controversial*
  - *Plasma exchange – achieves plts. counts to 20K in 1-2 days (up to 12 days)*
  - *IGIV – recovery of plts. Counts of 100K w/in 3-5 days*
    - *Block aby-mediated clearance*
  - *Splenectomy – refractory pts., high risk of life-threatening hemorrhage*
  - *Plts. transfusion not effective*
  - *Antigen-negative blood product*

Disease Transmission

- **Hepatitis(**HAV,HBV,HCV)---------*nucleic acid screening assay methods*

  estimated risk per unit transfused for HBV:1/63,000

  estimated risk per unit transfused for HCV:1/1,600,000

- **HIV-1,HIV-2----------**-----------*nucleic acid testing*

  estimated risk per unit trandfused:1/1,900,000

- **HTLV-1,HTLV-2----------**----------nucleic acid sceening

  estimated risk per unit transfused:1/641,000

- **CMV**

  estimated risk:<1% of units which are positive for CMV antibidies

- **Malaria**

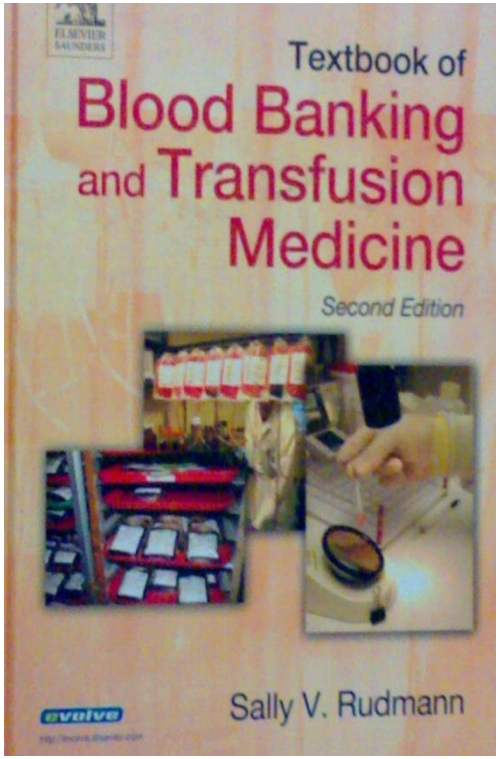
  0-5 per million

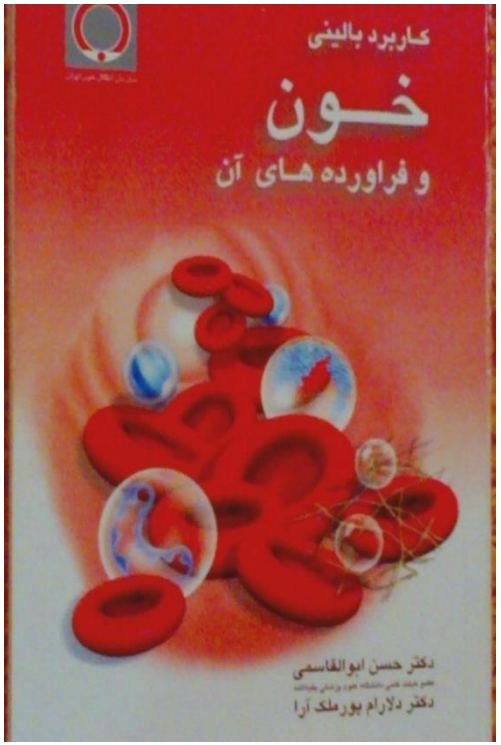
- **Babesiosis**

  very rare,no serologic assay for blood of donors

- **Syphilis**
- **Chagas‘ disease**
- **vCJD**
- **SEN-V**
- **West Nile virus**

منابع استفاده شده :





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