

The What, When and How of Pediatric Transfusions

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Disclosures

- No conflict of interest to report

Objectives

1. To provide a laboratory perspective of pediatric transfusions.
 - a) The What – Product Selection
 - b) The When – Clinical Indications
 - c) The How- Product Manipulation

The When – Clinical Indications

- Optimize Oxygenation
 - apnea, tachycardia, tachypnea
- Anemia of Prematurity
- Secondary Anemia
 - iatrogenic blood loss
 - iron deficiency
 - sepsis
- Hemolytic Disease of the fetus and newborn

Blood Transfusion 2011;9:86-94

The What – Product Selection

- Red Cells
- Platelets
- Plasma
- Fibrinogen (Cryoprecipitate)
- Immunoglobulins
- Factor Replacement

Must also consider:

- 1. CMV Status**
- 2. Irradiation**

Seronegative vs CMV Safe

- To prevent Transfusion Associated Cytomegalovirus (TA-CMV)
- Associated risk of CMV transmission within RBC - 1%
- Sequelae
 - Age Dependent
 - Immune Status Dependent

At Risk Populations – TA-CMV

1. Immune Suppressed
 1. Fetus
 1. IUT/IVT
 2. Pregnancy (non-imminent delivery)
 2. Newborn (VLBW <1500g)
 3. Peri-BMTx (Malignancies, SCID)
 4. HIV

Irradiation

- TA-GvHD
 - Foreign immune system attacks recipient
 - Potential of being fatal
- DNA destroyed
 - Prevents cell division & engraftment
- Expiry shortened 28days



Energy breaks down the DNA

At Risk Population – TA-GvHD

1. HLA-Similar Product (directed related donation)
2. Immune Suppressed
 1. Fetus
 1. IUT/IVT
 2. Pregnancy (non-imminent delivery)
 2. Newborn (VLBW <1500g)
 3. Peri-BMTx (Malignancies, SCID)
 4. HIV
 5. Primary Immune Deficiencies (SCID, CID...)
 6. Secondary Immune Deficiencies
 1. Drug Induced
 1. Fludarabine Therapy (anti-pyrimidase agents)
 2. Myelosuppressive Chemotherapy

The How – Product Manipulation

Packed Red Blood Cells

- Aliquots – Neonates
- Concentrated
 - SRC
 - PRC

Concentrated Platelets

- Neonates
- Allergic Reaction History
- Minor Plasma Incompatibilities
- Volume restriction

Platelet Concentration



STERILE
CONNECTION



SOFT SPIN
6MIN @ 1900 RPM



1. Non-agitated on bench x 1hr
2. Resuspended on agitator x 30min
3. Issued

RBC unit content

- Plasma – Storage Lesion
 - **Potassium** can induce arrhythmias
- Preservative – SAGM - **Mannitol**
 - The solute load in the preservatives can cause diuresis which can alter the neonate's blood volume and potentially alter cerebral blood flow leading to intraventricular haemorrhage in extremely premature neonates
- Anticoagulant - CDP

Cur Opin Hematology 2002; **9**: 533-6
Paediatric transfusion. Vox Sang 2006; **90**: 1-9.

RBC Manipulation

No substantial risks to patient for small-volume transfusions(10 mL/kg)(Transfusion 1991; 31(3)229-235)

Those at Risk

- Fetus
- Premature Neonates
- Severe renal and/or hepatic insufficiency
- Massive Transfusion Settings
 - exchange transfusion, cardiac surgery, and ECMO

Summary of Red Cell Manipulation

1. Washing – performed by CBS
2. Supernatant-Reduced Cells (SRC)
3. Plasma-Removed Cells (PRC)
 - a) Plasma Removed-Saline Replaced
 - b) Plasma Removed-Plasma Replaced

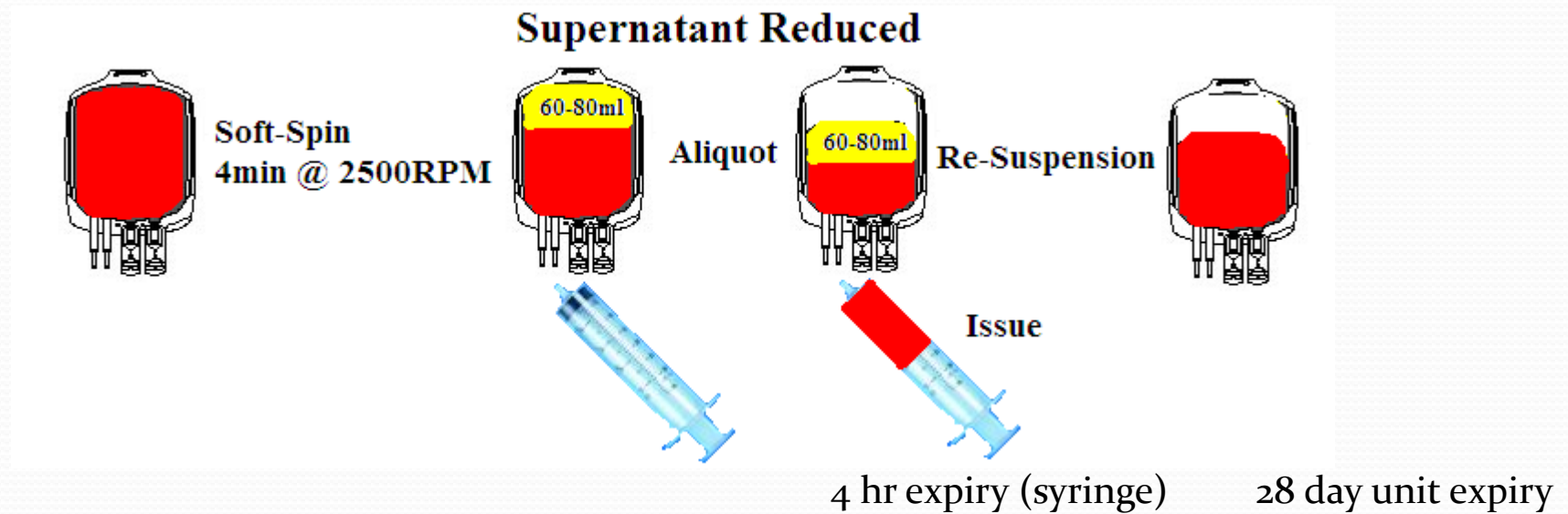
IWK Health Centre - History

- Prior to 2005
 - <4mths received washed pRBC
 - 43% discard rate (24hr expiry)
- Supernant Reduced Program – April 2005
 - 13% discard rate (irradiated -28 day expiry)
 - Target Hct 85%

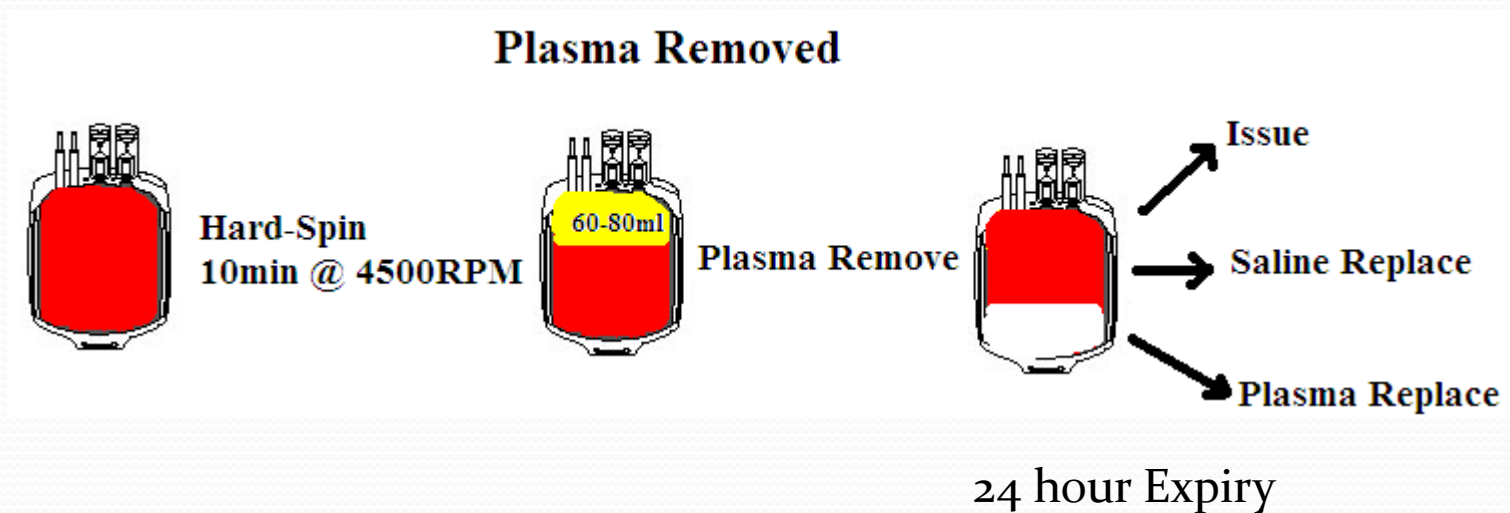
IWK - Current Practice

- All patients ≤1 year old have the plasma reduced or removed
- Reduced Supernatant (SRC) – NICU
 - syringe aliquot/dedicated units
- Removed Supernatant (PRC)– Massive Transfusion
 - Operating Room – not replaced, concentrated
 - Massive Transfusion - Saline Replaced
 - Exchange Transfusion – Plasma Replaced

pRBC Manipulation - SRC



pRBC Manipulation – PRC



Other Laboratory Considerations for Pediatric Transfusions

- No reverse antibodies until approximately 4 months of age; unable to confirm blood group
- Administration pumps – syringe compatibility
- DEHP – ??





Questions/Comments