FRACP Transfusion Medicine Quiz
1. Blood products must be prescribed by a doctor. List 5 things that must be included in the medical order for blood
Medical Prescribing

- Blood product type, e.g. red cells
- Special requirements or modifications, e.g. irradiation, leucocyte depletion, use of a blood warmer
- The volume/dose required
- The rate of infusion
- The date and time of transfusion
- Any medication including premedication

2. Is consent required prior to blood transfusion at RCH?

Informed consent for transfusion means a conversation has occurred between the patient and the doctor. The significant risks benefits and alternatives to transfusion will have been discussed.

As a result of discussion the patient/carer should:
- Understand what medical action is recommended
- Be aware of the risks and benefits associated with the transfusion
- Appreciate the risks, and possible consequences of not receiving the recommended therapy
- Be given an opportunity to ask questions
- Give consent for transfusion

The consent shall be documented by a consent form or by documenting the discussed information in the patient's case notes.
3. James, red cell transfusion

Volume = Desired – actual Hb (g/L) x weight (kg) x 0.4

Is the patient bleeding?
Is there a normal marrow response to anaemia?
Are there co-morbidities?

James: 90-55 x 7 x 0.4 = 98 mLs
4. Sally- ascitic tap, mildly prolonged INR

- Do coagulation tests predict bleeding risk?
- What is the procedural risk?
- Can you observe and treat bleeding if it occurs?
- Risks of bleeding versus risk of FFP?
5. Anaemia following IVIG
What is IVIG?

- Intravenous immunoglobulin preparations are fractionated from a plasma pool collected from several thousand donors.
- IVIG contains immune antibodies and physiologic autoantibodies.
- Immune antibodies reflect the immunologic experience of the donor population.
Where does it come from?

- **Flebogamma 5% DIF(Instituto Grisfols)**
  - USA, renumerated donors
  - Contains Fructose (care neonates and infants, fructose intolerance)
- **Intragam P (CSL Bioplasma)**
  - Plasma from Australian volunteer donors
  - Manufactured by CSL Bioplasma in Australia
- **Octagam (Octapharma)**
  - Plasma from Northern hemisphere volunteer and renumerated donors
  - Manufactured by Octapharma in Europe
- **Sandoglobulin (CSL)**
  - Plasma from Northern hemisphere volunteer donors
  - Manufactured by CSL in Switzerland
How is it made?

• Plasma is pooled and undergoes fractionation
• Viral inactivation steps in processing (2 steps are current industry standard)
  • Intragram P
    – Pasteurisation (wet heat 60ºC for 10 hours) and incubation at low pH
  • Octagam
    – Solvent/detergent treatment and incubation at low pH
• Sandoglobulin
  – Nanofiltration and inactivation (pepsin/pH4)
How safe is it?

- Disease transmission - virus, prion
- Allergy/anaphylaxis
- Aseptic meningitis
- Haemolysis
- Renal dysfunction (sucrose containing IVIG)
- Falsely elevated glucose (with diabetic monitor Accu-chek)
- Headache, fatigue, flushing, urticaria, nausea.....
Haemolysis

- Anti-A, anti-B in group O donors affecting group A, B and AB recipients
- Anti-D in donors affecting Rh D positive recipients
- Uncommon
- Usually positive DAT only
- Occasionally spherocytic haemolysis
"We came up with a pill that cures everything...but I'm warning you, it's gonna be expensive."
6. Callum; ALL, thrombocytopenia

• Is a platelet transfusion required?
Platelet Transfusion in children

- Platelet count < 10 x 10⁹/L with failure of platelet production
- Platelet count 10-20 x 10⁹/L with failure of platelet production and additional risk factors
- Platelet count <20 x 10⁹/L in the pre engraftment phase in stem cell transplantation
- Active bleeding in association with a platelet qualitative defect
- Unexplained excessive bleeding in a patient undergoing cardiopulmonary bypass
- Platelet count < 50-100 x 10⁹/L in a patient undergoing ECMO
- Platelet count < 50 x 10⁹/L in DIC or with abnormal coagulation and bleeding
<table>
<thead>
<tr>
<th>PLATELET PRODUCT</th>
<th>&lt;10kg</th>
<th>10-20kg</th>
<th>20-30kg</th>
<th>30-40kg</th>
<th>&gt;40kg</th>
</tr>
</thead>
<tbody>
<tr>
<td>PLATELETS Apheresis Paediatric Leucocyte Depleted Irradiated Part 1,2,3,or 4 of 4 (Volume 40-50mL)</td>
<td>1 pack or MAX 10ml/kg which ever is less</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>4</td>
</tr>
</tbody>
</table>

**IF A PAEDIATRIC APHERESIS SPLIT IS NOT AVAILABLE USE THE FOLLOWING guide**

| PLATELETS POOLED in PAS Leucocyte Depleted Irradiated (Volume >160mL - an adult dose) | MAX 10ml/kg | MAX 10ml/kg | MAX 10ml/kg | 1 pack or MAX 10ml/kg which ever is less | 1 |
| PLATELETS Apheresis Leucocyte Depleted Irradiated (Volume >100ml - an adult dose) | MAX 10ml/kg | MAX 10ml/kg | MAX 10ml/kg | 1 pack or MAX 10ml/kg which ever is less | 1 |
| PLATELETS Apheresis Leucocyte Depleted Irradiated Part 1 or 2 of 2 (Each part is an adult dose) | MAX 10ml/kg | MAX 10ml/kg | MAX 10ml/kg | 1 pack or MAX 10ml/kg which ever is less | 1 |
7. Solvent-detergent treatment of blood products is effective in reducing the risk of infection from

- Hepatitis A
- Variant CJD
- Human parvovirus B19
- Hepatitis C
Viral Inactivation: Fresh Products

- Currently no ‘viral inactivation steps’ in routine processing in Australia
- SD treated plasma as a substitute for FFP available in some countries
- Fibrinogen concentrates as a substitute for cryoprecipitate available in some countries
Viral Inactivation: Processed products

• Current industry standard is 2 inactivation steps
• Processes
  – Heat treatment
  – Solvent-detergent
  – Nanofiltration
• IntragramP
  – incubation at low pH
  – Pasteurisation – wet heat treatment 60°C for 10 hours
8. The following are currently used methods for viral inactivation (choose incorrect response)

- Gamma irradiation
- Nanofiltration
- Solvent-detergent treatment
- Heat
9. NAT is expected to add safety to transfusion of fresh blood products by

- Inactivating HIV
- Reducing the risk of graft-versus-host disease
- Reducing the risk of window period viral transmission
- Ensuring only compatible blood is given
Nucleic Acid Testing (NAT)

- Introduced by ARCBS June 2000
- Direct detection of viral nucleic acid: HCV and HIV-1
- Aim to prevent window period donations: after infection but before antibody response
- Addition to current screening tests to improve safety
- Product release based on NAT
11. The risk of acquiring hepatitis C from transfusion in Australia is currently

- 1 in 30,000
- 1 in 300,000
- 1 in 3,000,000
- 1 in 30,000,000
Risk of Transfusion Transmitted Infections 2007

- HIV (Ab & NAT)- approx 1 in 35 million
- HCV- (Ab & NAT) – approx 1 in 3.2 million
- HBV – (HepBsAg) – approx 1 in 1.9 million
- HTLV I/II (Ab) – approx 1 in 14.7 million
- vCJD (no testing) – possible, not yet reported in Aust
- Malaria- approx 1 in 4-10 million
12. Infectious disease screening of blood donations in Australia includes testing for the following (choose incorrect response)

- Syphilis
- HTLV-1
- vCJD
- Hepatitis B
Blood donation testing in Australia

• HepBsAg
• HCV antibody and NAT
• HIV 1 and 2 antibody and HIV-1 NAT
• HTLV1 and 2 antibody
• Syphilis
• Malaria in ‘at-risk’ donors
13. The commonest cause of serious morbidity following transfusion is

- Liver failure from Hepatitis C transmission
- TRALI
- Post transfusion Purpura
- Acute Haemolytic Transfusion Reaction
TRALI

- Transfusion Related Acute Lung Injury
- Definition:
  - Within 6-8 hours of transfusion
  - Plasma containing component
  - Fever, hypotension, respiratory distress, hypoxia
  - Noncardiogenic pulmonary oedema
Causes

- 1. HLA/neutrophil antibody in donor with cognate antigen in recipient

- 2. ‘Primed’ neutrophils in sick/septic patient and bioactive lipid (?) in component
TRALI risk reduction strategies

- Appropriate transfusion
- Reducing plasma in platelets (PAS)
- Male predominant FFP
“Real” risks of blood transfusion: (the ones that cause serious and immediate harm)

- ABO incompatibility: receiving the ‘wrong blood’ meant for another person
- Bacterial contamination
- Transfusion-related acute lung injury
- Allergic and anaphylactic reactions
- Some acute non-ABO HTR
- Volume overload
- TA-GVHD - rare but usually fatal
Risk of Serious Hazards of Transfusion 1996-2002 UK, 20 million components transfused

- Serious hazard: 1:12,000
- Major morbidity: 1:100,000
- Death (definite/possible/probable): 1:256,000
- Risk of IBCT: 1:19,000
- Risk of death from IBCT: 1:1.3 million
- Risk of TRALI: 1:194,000
But children don’t have transfusion reactions.....

<table>
<thead>
<tr>
<th>Nature of Adverse Event</th>
<th>Less than 18 yrs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Incorrect Blood Component Transfused</td>
<td>80.1%</td>
</tr>
<tr>
<td>Acute Transfusion Reaction</td>
<td>10.6%</td>
</tr>
<tr>
<td>Delayed Transfusion Reaction</td>
<td>0.7%</td>
</tr>
<tr>
<td>Transfusion Related Acute Lung Injury</td>
<td>6.4%</td>
</tr>
<tr>
<td>Transfusion -Associated Graft-Versus-host disease</td>
<td>1.4%</td>
</tr>
<tr>
<td>Post-Transfusion Purpura</td>
<td>0%</td>
</tr>
<tr>
<td>Transfusion-Transmitted Infection</td>
<td>0.7%</td>
</tr>
</tbody>
</table>

SHOT Annual Report 2001/2002
14. In an emergency when blood groups are not available which of the following is suitable for transfusion of FFP

- O Rh(D) negative
- AB Rh(D) positive
- B Rh(D) positive
- O Rh(D) positive
Choosing groups for Plasma

- FFP and Cryo contain minimal red cell stroma so can disregard Rh
- Group O contains anti-A, anti-B
- Group A contains anti-B
- Group B contains anti-A
- Group AB universal plasma donor
15. Cryoprecipitate contains large amounts of which of the following

- Factor V
- Platelets
- Factor IX
- Fibrinogen
16. A group & screen is ordered for a patient. The blood bank says blood will not be available for 2 hours because the antibody screen is positive. What does this mean?

- The patient has infectious mononucleosis
- The blood bank scientist is on a tea break
- There is a blood shortage
- The patient has a red cell alloantibody
Pretransfusion Testing

• Verification of sample identity
• Forward blood group -? A, B. D antigens present
• Back group (except in infants)-Is the expected antibody present?
• Antibody screen
• Check of pretransfusion history
When the antibody screen is positive

- Red Cell panel for antibody identification
- Phenotyping of patient and donor units
- Provision of crossmatch compatible, antigen negative blood
13.(ii) Which of the following patients is most likely to have a positive antibody screen?

- Child with sickle cell disease on a regular transfusion program
- A pregnant woman, blood group A Rh(D) positive
- A 2yo boy with Trisomy 21 and newly diagnosed ALL
- A child with SCID
Alloantibodies

- Uncommon in childhood, rare in infancy
- Form in response to pregnancy and transfusion
- Pregnancy related eg -D, -K, -c
- Some arise spontaneously eg -P1, -M, not usually clinically significant
13(iii) What blood will be appropriate for the patient?

- CMV negative blood
- Antigen negative, crossmatch compatible blood
- Frozen-thawed-washed blood
- Irradiated blood
17. A 5yo girl, blood group A Neg bleeding post cardiac surgery requires a platelet transfusion. A Neg platelets are not available. Which of the following platelets would be your first choice?

• O Pos
• B Neg
• A Pos
• O Neg
Platelet Transfusion

• Group identical platelet transfusion is ideal
• Platelets express ABO antigens so incompatible platelets may have a shorter life
• A small number of contaminating RBC can immunise a Rh neg patient (esp non immunocompromised)
• Beware of incompatible plasma causing haemolysis in children
  – choose a ‘low plasma’ product eg in TSol
18. Washed red blood cells are sometimes used for transfusion in the following conditions (Choose incorrect response)

- Necrotising enterocolitis with positive lectin screen
- Paroxysmal nocturnal haemoglobinuria
- IgA deficiency
- Jehovah’s witness
17. Leukoreduction assists in reducing the risk of transmission of the following viruses

- Human T Lymphotropic virus (HTLV-1)
- Human immunodeficiency Virus (HIV)
- Cytomegalovirus (CMV)
- Human Herpes Virus 8 (HHV8)
TACO

• TACO = Transfusion associated circulatory overload
• Children, infants, the elderly most at risk
STIR

• STIR = Serious Transfusion Incident Reporting
• The DHS funded incident reporting scheme for Victoria and Tasmania
TRALI

- TRALI = Transfusion related acute lung injury