The Anaesthetist's view - blood products, medications and new technologies

Dr Phillip Cowlishaw
Patient blood management guidelines: Module 5
Obstetrics and Maternity
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Transplantation matching in lung transplants
Dr Glen Westall from the Alfred and the Blood Service's Rhonda Holdsworth present a 90 minute education session exploring HLA cross-matching in lung transplantation and the role of transplantation labs.

Quick Links
- News
- High ferritin app
- Storage and handling
- Patient blood management
- Resource centre
- Iron deficiency anaemia
- IVIg
- Risk and consent
- Forms
- Administration of products
- Patient monitoring
- Blog
Why transfuse?
Planning & Preparation

PREPARATION
“Be ready when opportunity comes ... Luck is the time when preparation and opportunity meet.”

I LOVE IT WHEN A PLAN COMES TOGETHER
<table>
<thead>
<tr>
<th>Code</th>
<th>Text</th>
</tr>
</thead>
<tbody>
<tr>
<td>PP15</td>
<td>All providers of birthing services should develop a plan to manage obstetric haemorrhage. The plan should give consideration to local resources, transport and access to relevant specialist advice, blood products and equipment.</td>
</tr>
<tr>
<td>EOP7</td>
<td>In pregnant women at risk of major obstetric haemorrhage (e.g. women with placenta accreta or major placenta previa), a multidisciplinary management plan is strongly advised.</td>
</tr>
<tr>
<td>PP3</td>
<td>In maternity patients with critical bleeding, a structured approach to patient care that includes escalation procedures, and timely and appropriate use of RBC and other blood components (e.g. an MTP), may reduce the risk of morbidity and mortality.</td>
</tr>
<tr>
<td>PP1</td>
<td>Major blood loss can develop rapidly around the time of giving birth in the absence of haemodynamic compromise; hence, close monitoring of all women, and early recognition and rapid response, are critical.</td>
</tr>
<tr>
<td>PP22</td>
<td>Maternity patients with pre-existing haematological conditions (e.g. thrombocytopenia, inherited or acquired disorders of coagulation) should have their condition optimised before giving birth, and have a multidisciplinary plan in place for birth and the postnatal period.</td>
</tr>
<tr>
<td>EOP8</td>
<td>It is strongly advised that maternity services develop an MTP that includes access to RBC and the dose, timing and ratio of blood component therapy, for use in maternity patients with critical bleeding requiring massive transfusion.</td>
</tr>
<tr>
<td>------</td>
<td>---------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>EOP14</td>
<td>In the maternity population, activate MTPs early.</td>
</tr>
<tr>
<td>EOP15</td>
<td>The MTP should be modified for the maternity patient, because fibrinogen levels approaching 2 g/L are indicative of critical physiological derangement and are associated with severe haemorrhage.</td>
</tr>
</tbody>
</table>
Mater Blood Bank MUST be used for supply of products.

1) Anticipate

2) Activate

3) MTP Packs
   - MTP 1
   - MTP 2

4) Reassess

5) Bleeding Suppressed?
   - No
   - Yes

6) Cease MTP
Massive transfusion protocol (MTP) template

The information below, developed by consensus, broadly covers areas that should be included in a local MTP. This template can be used to develop an MTP to meet the needs of the local institution's patient population and resources.

**Senior clinician determines that patient meets criteria for MTP activation**

**Baseline:**
- Full blood count, coagulation screen (PT, INR, APTT, fibrinogen), biochemistry, arterial blood gases

**Notify transfusion laboratory (insert contact no.) to:**
- ‘Activate MTP’

**Laboratory staff**
- Notify haematologist/transfusion specialist
- Prepare and issue blood components as requested
- Anticipate repeat testing and blood component requirements
- Minimise test turnaround times
- Consider staff resources

**Haematologist/transfusion specialist**
- Liaise regularly with laboratory and clinical team
- Assist in interpretation of results, and advise on blood component support

**Senior clinician**
- **Request:**
  - 4 units RBC
  - 2 units FFP
- **Consider:**
  - 1 adult therapeutic dose platelets
  - tranexamic acid in trauma patients
- **Include:**
  - cryoprecipitate if fibrinogen < 1 g/L
  - Or locally agreed configuration

**AIM FOR:**
- temperature > 35°C
- pH > 7.2
- base excess < -6
- lactate < 4 mmol/L
- Ca²⁺ > 1.1 mmol/L
- platelets > 50 x 10⁹/L
- PT/APTT < 1.5 x normal
- INR ≤ 1.5
- fibrinogen > 1.0 g/L

**OPTIMISE:**
- oxygenation
- cardiac output
- tissue perfusion
- metabolic state

**MONITOR**
(every 30–60 mins):
- full blood count
- coagulation screen
- ionised calcium
- arterial blood gases

**Bleeding controlled?**

**YES**
- Notify transfusion laboratory to:
  - ‘Cease MTP’

**NO**
The Team

- Anaesthetic technicians
- Anaesthetists
- Cell salvage technician
- Haematologist
- Intensivist
- Midwife
- Paediatrician
- Radiologist
- Surgeons
- Theatre & recovery nurses
- Theatre assistants
Equipment

- Level one infusor / rapid infusion catheter
- Central line & arterial line & ultrasound
- Difficult intubation trolley / C-MAC
- 2x Warm lines, Bair huggers
- Cell salvage
- Haemacue/ blood tubes / TEG
- Laparotomy, hysterectomy, vascular set
Communication

...AND THAT IS WHY WE LIFT ON THREE...

COMMUNICATION
Communication
New advances and controversies
Blood and clotting products

<table>
<thead>
<tr>
<th>PP18</th>
<th>In women with major obstetric haemorrhage requiring massive transfusion, suggested doses of blood components are:³</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>- FFP: 15 mL/kg</td>
</tr>
<tr>
<td></td>
<td>- platelets: 1 adult therapeutic dose</td>
</tr>
<tr>
<td></td>
<td>- cryoprecipitate: 3–4 g.</td>
</tr>
</tbody>
</table>

³ Or as directed by the haematologist/transfusion specialist. See Appendix E for dose equivalents.
### RECOMBINANT ACTIVATED FACTOR VII

| PP29 | The administration of rFVIIa may be considered in maternity patients with life-threatening haemorrhage, but only after conventional measures (including surgical haemostasis and appropriate blood component therapy) have failed.\(^2\)  
NB: rFVIIa is not licensed for this use. Its use should only be considered in exceptional circumstances. | 3.5.4 |
| PP30 | Ideally, rFVIIa should only be administered to maternity patients as part of a locally adapted MTP. The MTP should include strict attention to the control of bleeding, physiological and metabolic parameters, coagulation status and temperature maintenance. | 3.5.4 |
| PP31 | When rFVIIa is administered to maternity patients with life-threatening haemorrhage, an initial dose of 90 μg/kg is suggested. | 3.5.4 |

### TRANEXAMIC ACID

| PP32 | In maternity patients with significant blood loss, the early use (within 3 hours of the onset of haemorrhage) of TXA may be considered.\(^3\)  
\(^3\) The use of TXA in this context is considered off label. | 3.5.5 |
| PP33 | TXA should only be administered in the context of overall patient management; the protocol should include strict attention to the control of bleeding, physiological and metabolic parameters, coagulation status and temperature maintenance. | 3.5.5 |
## Blood conservation

### CELL SALVAGE

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>PP23</td>
<td>In maternity patients, cell salvage should be considered if anticipated blood volume loss is likely to result in transfusion.(^2)</td>
</tr>
<tr>
<td>PP24</td>
<td>In maternity patients who are at increased risk of bleeding and in whom transfusion is not an option, cell salvage should be considered.</td>
</tr>
<tr>
<td>PP25</td>
<td>Cell salvage requires a local procedural guideline that should include patient selection, use of equipment and reinfusion. All staff operating cell salvage devices should receive appropriate training, to ensure that they are familiar with and proficient in the technique.</td>
</tr>
</tbody>
</table>

### INTERVENTIONAL RADIOLOGY

<table>
<thead>
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</tr>
</thead>
<tbody>
<tr>
<td>PP27</td>
<td>Preventative IR may be appropriate in selected maternity patients; however, the risk of complications from this procedure should be balanced against the potential benefits.</td>
</tr>
<tr>
<td>PP28</td>
<td>Although the role of therapeutic IR in the treatment of major obstetric</td>
</tr>
</tbody>
</table>
Appendix V

Use of Intraoperative Cell Salvage in Obstetrics

Intraoperative cell salvage is increasingly used internationally in obstetric surgery. Maternal haemorrhage during delivery is a significant risk in pregnancy. CMACH/CMACE Obstetric haemorrhage accounts for 3 - 4% of all red cell units transfused in England and Wales, and it is likely that it accounts for a similar proportion of blood usage here in Australia.

Early, theoretical concerns over intra-operative cell salvage for Obstetric surgery have not been borne out in clinical practice. These concerns include:

- The risk of amniotic fluid embolism with reinfusion of fetal squames/fetoprotein/lipid components
- Allo-immunisation with the exposure of an RhD negative mother to red cells of an RhD positive fetus.
Potential problems

- Hypothermia
- Electrolyte disturbance
- Clotting derangement
- Acute lung injury (TRALI)
- Air embolus
- Organ failure
- Transfusion errors
- Immuno-modulation
- Other transfusion risks
## Transfusion risks

<table>
<thead>
<tr>
<th>Transfusion Risk</th>
<th>Estimated Rate&lt;sup&gt;a&lt;/sup&gt; (Highest to Lowest Risk)</th>
<th>Calman Rating&lt;sup&gt;b&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transfusion-associated circulatory overload (iatrogenic)</td>
<td>Up to 1 in 100 transfusions</td>
<td>High</td>
</tr>
<tr>
<td>Transfusion-related acute lung injury</td>
<td>1 in 1200–190,000</td>
<td>Low to minimal</td>
</tr>
</tbody>
</table>
| Haemolytic reactions                                | Delayed: 1 in 2500–11,000  
Acute: 1 in 76,000  
Fatal: Less than 1 in 1.8 million  | Low to very low  
Very low  
Negligible  |
<p>| Anaphylactoid reactions or anaphylaxis (usually due to IgA deficiency) | 1 in 20,000–50,000                                   | Very low                    |
| Bacterial sepsis: platelets                         | At least 1 in 75,000                                 | Very low                    |
| Bacterial sepsis: red blood cells                   | At least 1 in 500,000                                | Minimal                     |
| Hepatitis B virus                                   | Approximately 1 in 468,000                           | Minimal                     |
| Hepatitis C virus                                   | Less than 1 in 1 million                             | Negligible                  |
| Human immunodeficiency virus                        | Less than 1 in 1 million                             | Negligible                  |
| Human T-lymphotropic virus (types 1 and 2)          | Less than 1 in 1 million                             | Negligible                  |</p>
<table>
<thead>
<tr>
<th>TRANSFUSION RISK</th>
<th>ESTIMATED RATE(^a) (HIGHEST TO LOWEST RISK)</th>
<th>CALMAN RATING(^b)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Malaria</td>
<td>Less than 1 in 1 million</td>
<td>Negligible</td>
</tr>
<tr>
<td>Variant Creutzfeldt-Jakob disease (not tested)</td>
<td>Possible, not yet reported in Australia</td>
<td>Negligible</td>
</tr>
<tr>
<td>Transfusion-associated graft-versus-host disease</td>
<td>Rare</td>
<td>Negligible</td>
</tr>
<tr>
<td>Transfusion-related immune modulation</td>
<td>Not quantified</td>
<td>Unknown</td>
</tr>
</tbody>
</table>
Elective or Emergency

KEEP CALM AND CARRY ON
• Major blood loss can develop rapidly in the absence of haemodynamic compromise

• Close peripartum monitoring of all women, early recognition and rapid response are critical

• All providers of birthing services should develop a plan to manage obstetric haemorrhage. The plan should give consideration to local resources, transport and access to tertiary services, blood products and equipment
Patients with major haemorrhage. In addition to clinical observations, patients major haemorrhage:

- stimulating agents
- Blood group and screen prior to birth
Equipment

- Anaesthetic
- Surgical
Equipment - Surgical

- Laparotomy set
- Hysterectomy set
- Vascular surgical set
- Urinary catheter
Drugs and fluids

- Blood products - X or O negative
- Albumin / Gelofusin / Voluven
- Inotropes / Vasopressors
- Antibiotics
- Oxytocics
Anaesthetic technique

- GA versus RA
- Early versus delayed delivery of baby.
- Timing of central and arterial lines
- TAP blocks?
- Prolonged ventilation versus early extubation
- ICU versus recovery
Appointed in April 2012, Leigh McJames is the General Manager of the National Blood Authority (NBA). The NBA is an independent statutory authority responsible to all Australian and state and territory governments for the management of a budget of over $1b to ensure the adequate, safe, secure and affordable supply of blood and blood products in Australia. The General Manager reports to the Commonwealth Minister for Health and Ageing.
Patient blood management guidelines: Module 5

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Obstetrics and Maternity

Critical Bleeding Massive Transfusion
Perioperative
Medical
Critical Care