AN AUDIT OF BLOOD PRODUCTS USAGE in adult cardiac surgery at CMJAH/WITS towards minimal or zero blood usage

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SAHA SANDTON CONVETION CENTRE
PREAMBLE

- Blood products- limited, expensive
- Usage not without risk
- Historically- liberal usage (10:30 rule)
- Risk benefit ratio supported by clinical evidence offering guidelines
- Observation that CMJAH blood product usage is excessive
## 2017 Blood and Platelet Products Prices

### SANBS-BHF Codes

<table>
<thead>
<tr>
<th>Red Cells</th>
<th>Nappi Codes</th>
<th>Description</th>
<th>Price Excl. VAT 2017</th>
<th>Price VAT 2017</th>
</tr>
</thead>
<tbody>
<tr>
<td>78040</td>
<td>708800-001</td>
<td>Red Cell Concentrate</td>
<td>R 1 554,52</td>
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<td>78051</td>
<td>708802-001</td>
<td>Red Cell Conc. Leucocyte Depleted</td>
<td>R 2 540,00</td>
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<tr>
<td>78043</td>
<td>708803-001</td>
<td>Red Cell Conc. Paed. Leucodepleted</td>
<td>R 1 436,65</td>
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</table>

### Platelets

<table>
<thead>
<tr>
<th>Platelets</th>
<th>Nappi Codes</th>
<th>Description</th>
<th>Price Excl. VAT 2017</th>
<th>Price VAT 2017</th>
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</thead>
<tbody>
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<td>78124</td>
<td>708804-001</td>
<td>Platelet Conc. Single Donor Apherisis</td>
<td>R 9 009,49</td>
<td>R 10 035,99</td>
</tr>
<tr>
<td>78125</td>
<td>708805-001</td>
<td>Platelet Conc. Leucocyte Depleted, Pooled</td>
<td>R 8 245,99</td>
<td>R 9 321,99</td>
</tr>
<tr>
<td>78127</td>
<td>708808-001</td>
<td>Platelet Concentrate (Paediatric)</td>
<td>R 1 976,56</td>
<td>R 2 250,99</td>
</tr>
<tr>
<td>78122</td>
<td>708806-001</td>
<td>Platelet Concentrate Pooled</td>
<td>R 6 549,31</td>
<td>R 7 489,99</td>
</tr>
</tbody>
</table>

### Whole Blood

<table>
<thead>
<tr>
<th>Whole Blood</th>
<th>Nappi Codes</th>
<th>Description</th>
<th>Price Excl. VAT 2017</th>
<th>Price VAT 2017</th>
</tr>
</thead>
<tbody>
<tr>
<td>78001</td>
<td>708807-001</td>
<td>Whole Blood</td>
<td>R 1 721,53</td>
<td>R 1 972,53</td>
</tr>
<tr>
<td>78059</td>
<td>708809-001</td>
<td>Whole Blood Leucocyte Depleted</td>
<td>R 2 707,03</td>
<td>R 3 127,09</td>
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</tbody>
</table>
TRANSFUSION STRATEGIES

- Liberal (Hb\(\leq 9\)g/dl)
- Restrictive (Hb\(\leq 7.5\)g/dl)
- **MSBOS:** Maximum surgical blood ordering schedule (Friedman 1979)
- **SBOE:** Surgical blood order equation ([Nuttall et al. 1998](#))(Sakurai and Okada 2001)
- Patient specific blood ordering system (Palmer et al. 2003)
- Landmark trials: TRACS (Hajjar et al. 2010)-2000 pts
  : TITRe2 (Murphy et al. 2005)-502 pts
A WORD OF CAUTION (TITRe TRIAL)


Liberal or restrictive transfusion after cardiac surgery. Murphy GJ¹, Pike K, Rogers CA, Wordsworth S, Stokes EA, Angelini GD, Reeves BC; TITRe2 Investigators.

CONCLUSIONS:

A restrictive transfusion threshold after cardiac surgery was not superior to a liberal threshold with respect to morbidity or health care costs.
STANDARD ORDERING PROTOCOLS

• Nottingham university hospital, UK
  3 units crossmatch/6 units for reoperation

• Presbyterian medical centre, USA
  2 units for CABG (1ST)/3 units redo CABG+ valve surgery (Carson et al. 2013; Zimmerman, Fogt and Logan 1999)

• CMJAH/WITS Jhb, South Africa
  4 units RBC/4 units FFP (TSH)/2 mega platelets (TSH)
PREOPERATIVE

• 1. Four adult packed red cells
• 2. Four FFP’s TSH
• 3. Two platelets TSH
INTRAOPERATIVE AND POSTOPERATIVE

• No protocol
• Anaesthetist and perfusionist decision
• Surgeon’s decision postoperative
AUDITING METHODS

- 2016 CMJAH adult cardiac patients
- Mean age
- Gender
- Preoperative blood count
- Procedure variables
- Preoperative blood products ordered
- Perioperative transfusion trigger
- Surgeries and length of stay
OTHER VARIABLES

• Electronic vs manual crossmatch systems - efficiency
• SANBS at CMJAH – manual system
• Some patients inherent high risk
  1. Comorbidities
  2. Elderly
  3. Small BSA
  4. Emergency or complex procedures
  5. Other medications e.g. antiplatelet and anticoagulant therapy
RESULTS

Sample

During this one-year period, 194 patients had a total 274 “cardiac” procedures. The SANBS only provided data for 183 procedures. Of these, 50 procedures were excluded because there was no blood bank data available or the procedure was non-cardiac (rather, related to a complication of cardiac surgery such as sternal sepsis or the need for a tracheostomy). This resulted in a sample size of 133 cardiac procedures, performed on 113 patients.

Patient demographics

The mean age of the sample was 50, with more male patients than females (62 vs 51).

Surgeries and length of ICU stay

Of the 133 procedures performed; coronary artery bypass grafts, single valve procedures, and double valve procedures accounted for approximately 75% of the surgeries performed.
The patients were admitted to ICU for a mean of 3.3 days (sd 2.2)
PREOPERATIVE HB

![Graph showing preoperative hemoglobin distribution](image)
PLATELETS
### TABLE 1: BLOOD PRODUCTS USED IN 2016

<table>
<thead>
<tr>
<th></th>
<th>Ordered</th>
<th>Issued</th>
<th>Returned</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Packed red cells (units)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>525</td>
<td>262</td>
<td>27</td>
</tr>
<tr>
<td>Mean (per case)</td>
<td>3.9</td>
<td>2.0</td>
<td>0.2</td>
</tr>
<tr>
<td><strong>FFP (units)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>540</td>
<td>379</td>
<td>20</td>
</tr>
<tr>
<td>Mean (per case)</td>
<td>4.1</td>
<td>2.8</td>
<td>0.15</td>
</tr>
<tr>
<td><strong>Platelets (units)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>186</td>
<td>54</td>
<td>1</td>
</tr>
<tr>
<td>Mean (per case)</td>
<td>1.4</td>
<td>0.4</td>
<td>0.0075</td>
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</table>
POSTOPERATIVE Hb
CONCLUSION

• Standard preoperative ordering schedule is inefficient
• Unnecessary transfusion with Hb>9g/dl
• Mean preoperative Hb>12.8g/dl could benefit from perioperative optimization
• Implementation of blood transfusion strategy may decrease usage of blood products
RECOMMENDATIONS

• Heart team
• Preoperative: haematinics, erythropoietin, autologous transfusion
• Intraoperative: medication, CPB components, TEG/Rotem, surgery, perfusion
• Postoperative: protocols, transfusion triggers, massive transfusion protocol for bleeding patients
FINANCIAL IMPLICATIONS


● Consideration of RCC (red cell concentrate) usage only

● This cost analysis only examines the blood usage for the pre-operative blood order, and units used from that order (typically the intraoperative and early postoperative periods)
COSTS

Pre-operative order (Full cross match x 4 RCC)  
R743,91 x 4  
= R2975,64

Average of 2 RCC used per case:  
+ R1671,84 x 2  
= R 6319,32 per patient

Based on an approximation of 200 cardiac cases done annually

Annual cost of RCC (excluding other products) = R1 263 864,00

IF CHANGES IMPLEMENTED

Pre-operative order (Type and screen x 2 RCC)  
R333,11 x 2  
= R666,22

If RCC cut down to average of one per case through the implementation of blood conservation strategies:  
+ R1671,84 x 1  
= 2 338,06 per patient

Based on an approximation of 200 cardiac cases done annually

Annual cost of RCC services only:  
= R467 612,00
THANK YOU