Patient Blood Management Experience from Tseung Kwan O Hospital

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What is PBM?

- Evidence based
- Multidisciplinary
- Minimize need of allogeneic transfusion
- Improve patient outcomes
Five Drivers Shifting the Paradigm from Product-Focused Transfusion Practice to Patient Blood Management

**The Oncologist**

- Scarity
- Cost
- Safety
- Adverse outcome
- Questionable efficacy

*Axel Hofmann, Shannon Farmer, Aryeh Shander*
A Comprehensive Health-system-wide PBM Program was launched in 2008
To Compare Clinical Outcomes; Blood Product Utilization & Product-related Cost Savings

4 Adult Tertiary-care Hospitals in Western Australia

All 6-YEAR admissions 2008~2014 (=604,046 in total)

7.8% with transfusion (=47,382 patients)

BLOOD PRODUCT UTILIZATION

<table>
<thead>
<tr>
<th>Blood Product</th>
<th>Use/1,000 Discharge</th>
<th>Change</th>
<th>Reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Red Cells</td>
<td>311 → 182</td>
<td></td>
<td>41%</td>
</tr>
<tr>
<td>Plasma</td>
<td>94 → 50</td>
<td></td>
<td>47%</td>
</tr>
<tr>
<td>Platelets</td>
<td>53 → 38</td>
<td></td>
<td>28%</td>
</tr>
</tbody>
</table>

CLINICAL OUTCOMES

- Hospital length of stay: 15%
- In-hospital mortality: 28%
- Hospital-acquired infections: 21%
- Incidence of heart attack or stroke: 31%

PRODUCT-RELATED COST SAVINGS

AU $ 18.5M

Michael F. Leahy et al. Improved outcomes and reduced costs associated with a health system-wide patient blood management program: a retrospective observational study in four major adult tertiary-care hospitals. Transfusion 2017; Feb 2.
PBM in TKOH

TKR 2016

Major gynae OT 2017

Colorectal OT 2015
Preoperative haemoglobin assessment and optimisation template

This template is for patients undergoing procedures in which substantial blood loss is anticipated such as cardiac surgery, major orthopaedic, vascular and general surgery. Specific details, including reference ranges and therapies, may need adaptation for local needs, expertise or patient groups.

Is the patient anaemic?

- Hb <130 g/L (male) or Hb <120 g/L (female)

Preoperative tests
- Full blood count
- Iron studies including ferritin
- CRP and renal function

NO

Ferritin <30 mcg/L

- Iron deficiency anaemia
  - Evaluate possible causes based on clinical findings
  - Discuss with gastroenterologist regarding GI investigations and their timing in relation to surgery
  - Commence iron therapy

Possible iron deficiency
- Consider clinical context
- Consider haematology advice or, in the presence of chronic kidney disease, renal advice
- Discuss with gastroenterologist regarding GI investigations and their timing in relation to surgery
- Commence iron therapy

Ferritin 30–100 mcg/L

Possible iron deficiency
- Consider clinical context
- Review renal function, MCV/MCH and blood film
- Check B12/folate levels and reticulocyte count
- Check liver and thyroid function
- Seek haematology advice or, in the presence of chronic kidney disease, renal advice

Ferritin >100 mcg/L

Possible anaemia of chronic disease or inflammation, or other cause
- Consider clinical context
- Review renal function, MCV/MCH and blood film
- Check B12/folate levels and reticulocyte count
- Check liver and thyroid function
- Seek haematology advice or, in the presence of chronic kidney disease, renal advice

YES

Ferritin >100 mcg/L

Possible anaemia of chronic disease or inflammation, or other cause
- Consider clinical context
- Review renal function, MCV/MCH and blood film
- Check B12/folate levels and reticulocyte count
- Check liver and thyroid function
- Seek haematology advice or, in the presence of chronic kidney disease, renal advice

CRP

Raised

Normal

No anaemia: ferritin <100 mcg/L
- Consider iron therapy if anticipated postoperative Hb decrease is ≥30 g/L
- Determine cause and need for GI investigations if ferritin is suggestive of iron deficiency <30 mcg/L

Indications of IV iron

- Oral iron used but
  - Not effective
  - Not tolerated
- Oral iron contraindicated
- Short interval between treatment and surgery
# Available iron replenishment medications

<table>
<thead>
<tr>
<th>Oral Iron</th>
<th>Dose</th>
<th>Elemental Iron</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ferrous sulphate</td>
<td>300mg</td>
<td>60mg</td>
<td>HK$0.23</td>
</tr>
<tr>
<td>Ferrous fumarate</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ferrum Hausmann</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chewable</td>
<td>100mg</td>
<td>100mg</td>
<td>HK$1.3</td>
</tr>
<tr>
<td>Oral</td>
<td>50mg Fe/ml</td>
<td></td>
<td>HK$1.47</td>
</tr>
<tr>
<td>Syrup</td>
<td>50mg Fe/5ml</td>
<td></td>
<td>HK$0.36</td>
</tr>
<tr>
<td>Fortifer</td>
<td></td>
<td></td>
<td>HK$0.39</td>
</tr>
<tr>
<td>Fortifer FA</td>
<td>300mg</td>
<td>98.6mg</td>
<td>HK$0.49</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>IV Iron</th>
<th>Dose</th>
<th>Elemental Iron</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Venofer (Iron sucrose)</td>
<td>Max 200mg</td>
<td></td>
<td>HK$81 (per 100mg amp)</td>
</tr>
<tr>
<td>Monofer (Iron isomaltoside)</td>
<td>Max 20mg/kg</td>
<td></td>
<td>HK$580 (per 500mg vial)</td>
</tr>
</tbody>
</table>
Ganzoni formula

Cumulative iron deficit =

\[ \text{Weight (kg)} \times (\text{Target Hb - Current Hb (g/dl)}) \times 2.4 \] + \text{Iron store}^* \text{ (mg)}

*Iron store = 500 mg if body weight > 35 kg  
15 mg/kg if body weight < 35 kg
TKOH experience for IV iron – April 2017 to Mar 2019

- Total no. of patients: 92
  - Surgical: 66
  - Gynae: 25
  - Others: 1 (TKR)

<table>
<thead>
<tr>
<th></th>
<th>Surgical</th>
<th>Gynaecology</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average Baseline Hb level (g/dL)</td>
<td>9.96</td>
<td>9.3</td>
</tr>
<tr>
<td>Average Hb level after IV Iron (g/dL)</td>
<td>10.65</td>
<td>11.24</td>
</tr>
<tr>
<td>Average Hb rise (g/dL)</td>
<td>0.7</td>
<td>1.94</td>
</tr>
<tr>
<td>Average interval to surgery (days)</td>
<td>25.68</td>
<td>35.28</td>
</tr>
</tbody>
</table>
Case Sharing
Mr Tse/60 yo
CA rectum → Laparoscopic Abdominoperineal Resection

Baseline Hb 9.3g/dL
Oral iron x 2 weeks by surgeon
Ferric carboxymaltose 250mg iv (11 days before OT); Hb 10.8g/dL
Preop Hb: 13.8g/dL
Intaop blood loss: 600ml
No transfusion required
Postop Hb 11.6
Mr. Fong/59 yo
CA descending colon →
left hemicolecotomy (lap converted to open)

Baseline Hb 8.7
Fe 3.4, TIBC 69.8, Ferritin 3.4
IV Ferinject 1000mg given (25 days before OT)
Pre-op Hb 10.6
Intraop blood loss 1800ml, 2 units of packed cell transfused
Postop Hb 8.2
No transfusion required postop, TnI, RFT normal
Ms. Tsang/53 yo
Intramural, subserosal multiple fibroids →
Total Abdominal Hysterectomy +
Bilateral Salpingo-oophorectomy

Baseline Hb 6.9
Fe 2.3, TIBC 86.1, Ferritin 3
1st dose of IV Monofer 1000mg given (33 days before OT)
Hb 1/52 after: 8.3
2nd dose of IV monofer 500mg given (26 days before OT)
Pre-op Hb: 10.9 (Fe 11.4, TIBC 52.5, Ferritin 72)
Introp Blood loss: 1400ml (H’cue 8.8; IV transamine 1g given)
No transfusion needed
Post-op Hb 8.6
Elective colorectal OT, transfusion rate (blood products) within the same admission, 10/2016-9/2017, extracted from CDARS
Take home message

• Consider PBM as an alternative to blood transfusion
• Correct even mild anemia pre-op
• Consider IV iron if oral iron is not tolerated or too short interval to OT
• IV Iron of choice: Iron Isomaltoside (Monofer)
  • Hb<9 → 20mg/Kg
  • Hb>9 → Ganzoni formula
Thank you!