Transfusion thresholds in hip fracture

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Declarations of interest

• Member:
  – Topic Expert Group, NICE
  – Editorial Board, BJA

• Research funding:
  – NIHR
  – NIAA
  – Nexfin (loan equipment)
Transfusion thresholds in hip fracture

- NICE
  - OG124
- AAGBI
  - Hip fracture guidelines
Identify and treat correctable comorbidities immediately so that surgery is not delayed by:

- Anaemia
- Anticoagulation
- Volume depletion
- Electrolyte imbalance
- Uncontrolled diabetes
Acceptable

- Haemoglobin concentration < 8 g.dl\(^{-1}\)
- Plasma sodium concentration < 120 or > 150 mmol.l\(^{-1}\) and potassium concentration < 2.8 or > 6.0 mmol.l\(^{-1}\).
- Uncontrolled diabetes.
- Uncontrolled or acute onset left ventricular failure.
- Correctable cardiac arrhythmia with a ventricular rate >120 .min\(^{-1}\)
- Chest infection with sepsis.
- Reversible coagulopathy.

Unacceptable

- Lack of facilities or theatre space.
- Awaiting echocardiography.
- Unavailable surgical expertise.
- Minor electrolyte abnormalities.
Why all the fuss?

- Admission Hb
  - < 10 g/dl
    - Mortality:
      - 30-day: OR 1.87
      - 12 months: OR 4.5
    - Readmission

Maxwell 2008
Gruson 2002
Halm 2004
Why all the fuss?

- **Post-op Hb**
  - Associated with mobility
- **Discharge Hb**
  - <12 g/dl – non-predictive of outcome

Foss 2008
Su 2004
Why all the fuss?

- Preventing blood loss
  - Tranexamic acid
    - Probably effective but ? Increased CVS complications
    - Ongoing studies
  - Regional anaesthesia
    - Not much evidence
    - Clopidogrel!
Why all the fuss?

- Erythropoiesis
  - Oral iron
    - Ineffective
  - IV iron
    - Possibly effective
    - Most data from single Spanish group
    - Need EPO as well
    - Ongoing studies

Parker 2010
Serrano-Trenas 2011
Bernabeu-Wittel 2012
Why all the fuss?

- Transfusion
  - Expensive
  - Limited resource
  - Limited evidence of benefit
    - Observational studies
    - Bias
    - Lack of standardisation
FOCUS

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Liberal or Restrictive Transfusion in High-Risk Patients after Hip Surgery

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Hypothesized, ...that a higher haemoglobin level might facilitate more active participation in rehabilitation, leading to more successful recovery of ambulation.
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• 2016 patients
  – Age > 65
  – ‘Risk factors’ for CVD
  – Walking unaided
• Randomised post-op
  – Hb < 10 g / dL
  – Within 3 days of surgery
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- Liberal trigger – 10 g / dL
- Restrictive trigger – 8 g / dL
  - Caveat of ‘symptomatic’ transfusion
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- **Primary outcome:**
  - death or an inability to walk 10 ft (or across a room) without human assistance at 60-day follow-up.

- **Secondary outcomes:**
  - combined outcome of in-hospital myocardial infarction, unstable angina, or death for any reason
FOCUS

- No difference in primary outcome
  - Liberal: 459/995
  - Restrictive: 481/1000

- Death alone:
  - Liberal: 52/995
  - Restrictive: 43/1000

- Higher rate of CCF and tachycardia/hypotension in restrictive group
FOCUS

- Relevance to clinical practice?
  - Post-op trial
  - 25% transfused before trial entry
  - Thresholds?
<table>
<thead>
<tr>
<th>Transfusions before randomization</th>
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<tbody>
<tr>
<td>0 units — no./total no. (%)</td>
<td>754/1006 (75.0)</td>
<td>720/1008 (71.4)</td>
</tr>
<tr>
<td>≥1 unit — no./total no. (%)</td>
<td>252/1006 (25.0)</td>
<td>288/1008 (28.6)</td>
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<tr>
<td>Total no. of units</td>
<td>452</td>
<td>531</td>
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<th>Transfusions after randomization</th>
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<tr>
<td>0 units — no./total no. (%)</td>
<td>33/1003 (3.3)</td>
<td>594/1007 (59.0)</td>
</tr>
<tr>
<td>1 unit — no./total no. (%)</td>
<td>420/1003 (41.9)</td>
<td>246/1007 (24.4)</td>
</tr>
<tr>
<td>2 units — no./total no. (%)</td>
<td>346/1003 (34.5)</td>
<td>127/1007 (12.6)</td>
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<tr>
<td>3 units — no./total no. (%)</td>
<td>132/1003 (13.2)</td>
<td>24/1007 (2.4)</td>
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<tr>
<td>≥4 units — no./total no. (%)</td>
<td>72/1003 (7.2)</td>
<td>16/1007 (1.6)</td>
</tr>
</tbody>
</table>
FOCUS

- Relevance to clinical practice?
  - Post-op trial
    - 25% transfused before trial entry
  - Walking unaided as inclusion criterion
  - 60-day mortality 9%
    - Unrepresentative of UK/Europe
FOCUS

- Supports TRIOCC data
- Stronger evidence than previous observational studies
  - But narrower inclusion criteria
Risks from Transfusion

- HIV
- HCV
- HBV
- TRALI
- Life-threatening reaction
- Fatal hemolysis
- Motor vehicle fatalities
- Firearm homicide
- TACO
- Death from medical error
- Fall fatalities
- Lightning fatalities
- Airplane fatalities
- Fever

Red Blood Cell Transfusion: A Clinical Practice Guideline From the AABB
Jeffrey L. Carson, MD; Brenda J. Grossman, MD, MPH; Steven Kleinman, MD; et al. Ann Intern Med. 26 March 2012
Haemoglobin management

• Stop the bleeding

• Encourage erythropoiesis

• Think hard before transfusing post-op
Selected References

Bernabeu-Wittel, Aparicio R, Romero M et al. Ferric carboxymaltose with or without erythropoietin for the prevention of red-cell transfusions in the perioperative period of osteoporotic hip fractures: a randomized controlled trial. The PAHFRAC-01 project. BMC Musculoskeletal Disorders 2012, 13:27


