Surveillance of blood utilisation

Usefulness for hemovigilance

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Newcastle upon Tyne UK
Northumbria

A Land of hills.....
..... AND CASTLES
We could not calculate the risks of transmitting vCJD if we did not know who was receiving blood transfusion and what happened to them.
Haemovigilance

Recording and collating adverse effects of transfusion
Haemovigilance

Recording and collating adverse effects of transfusion with the aim of improving the benefit to risk ratio
Would you transfuse a unit of possibly vCJD infected blood to this patient?

21 year old mother ex-sanguinating from PPH

77 year old THR with CVD, post op Hb 5.6g/dL
21 year old mother
• Likely to prevent death
• 60 yrs life saved
• Significant societal gain

But..
• Infection devastating

77 year old THR
• Death less likely
• 7 yrs life saved
• Better rehabilitation

But..
• Infection may not to be clinically manifest
Haemovigilance

Does not operate in a moral or economic vacuum

The risk benefit equation depends on many factors
The ‘New Castle on Tyne’ built by Robert Curthose, 1080

Son of William the Conqueror

William commissioned the Doomsday book. This detailed every farmstead, every peasant, every house in England.

'there was no single hide nor a yard of land, nor indeed one ox nor one cow nor one pig which was left out.'
**Recipient factors**

Who is transfused
- Age
- Sex

Why are they transfused
- Underlying disease
- Immediate indication

How long will they survive

**Procedural factors**

Where are they transfused
- Theatres
- Day units
- Home

When are they transfused
- Day
- Night

How old is the blood
Recipient factors

Who is transfused
  Age
  Sex

Why are they transfused
  Underlying disease
  Immediate indication

How long will they survive

Procedural factors

Where are they transfused
  Theatres
  Day units
  Home

When are they transfused
  Day
  Night

How old is the blood
Where does Blood Go?
Wells, A.W et al. 2002. BMJ, 325, 803-7

Simple paper based survey
Done in real time
Filled in by hospital blood bank
Data collected for 2 weeks x 2

All hospitals in the Northern region
Population 2.9 million
All supplied by Newcastle BTS

99% complete returns
Findings reported to each blood bank

Costs = £0.00

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<td>Neonatal</td>
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<td></td>
<td></td>
<td>Other</td>
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</table>
Transfusion by age

![Graph showing units transfused by age and gender](image-url)
Use by speciality

- Medicine: 52%
- Surgery: 41%
- O & G: 7%
- No details: 0%
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<thead>
<tr>
<th>Surgical category</th>
<th>Total</th>
<th>Percentage of surgical use</th>
<th>Percentage of total use</th>
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<tr>
<td>(Excluding heart/lung transplant)</td>
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<td>ENT</td>
<td>37</td>
<td>1.6</td>
<td>0.5</td>
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<td>Abdominal surgery</td>
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<td>16.9</td>
<td>4.9</td>
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<tr>
<td>(excluding solid organ transplant)</td>
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<tr>
<td>Neurosurgery</td>
<td>31</td>
<td>1.3</td>
<td>0.3</td>
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<tr>
<td>Trauma (including fractured femur)</td>
<td>280</td>
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<td>Urology</td>
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<td>Solid organ transplant</td>
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<td>2.5</td>
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<tr>
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<td><strong>Total</strong></td>
<td><strong>2360</strong></td>
<td><strong>100</strong></td>
<td><strong>29</strong></td>
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</table>
**Recipient factors**

Who is transfused
- Age
- Sex

Why are they transfused
- Underlying disease
- Immediate indication

How long will they survive

**Procedural factors**

Where are they transfused
- Theatres
- Day units
- Home

When are they transfused
- Day
- Night

How old is the blood
How long do red cell recipients survive?

Wallis et al Transfusion 2004
Patient survival by number of red cells received
Survival by red cell units

- **Expected**
  - 5 yr survival 83.0%

- **Survival by red cell units**
  - Median survival 30 months, 5 yr survival 40.9%
**Recipient factors**

- Who is transfused
  - Age
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- Why are they transfused
  - Underlying disease
  - Immediate indication
- How long will they survive

**Procedural factors**

- Where are they transfused
  - Theatres
  - Day units
  - Home
- When are they transfused
  - Day
  - Night
- How old is the blood
More transfusions happen on a Wednesday!

Courtesy of Dr Hazel Tinegate
Adverse events are more likely to be reported for:
1. Transfusions given on A/E, and general wards
2. Transfusions given out of normal working hours
3. Transfusions cross matched out of hours
Utilisation surveys help inform Haemovigilance

Provide denominator data

Predicting future risks

Identifying high risk areas

Cost benefit calculations for interventions
March 2012

Blood service:
‘A donor has converted to HIV positive, the last unit pre-conversion came to your hospital’

Me:
‘Whoops, OK I’ll find out who received the blood’
Questions

Is the recipient still alive?

Has the recipient developed HIV?

Was the transfusion justified?
Exposing a patient to a measured risk.... OK

Exposing a patient to an unnecessary risk... Not OK
Haemovigilance

Recording and collating adverse effects of transfusion with the aim of improving the benefit to risk ratio

Knowing all transfusion carries some risk, ensuring that transfusion is always justified on clinical grounds
There are things we know
There are known unknowns
And there are unknown unknowns
Report on the collection, testing and use of blood and blood components in Europe in 2004
CL Van der Poel et al. Council of Europe

<table>
<thead>
<tr>
<th>Country</th>
<th>Red cell use per 1000 population</th>
<th>Ratio FFP:RC</th>
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<tbody>
<tr>
<td>France</td>
<td>32.8</td>
<td>1:7.7</td>
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<tr>
<td>Netherlands</td>
<td>36.6</td>
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<tr>
<td>UK</td>
<td>41.4</td>
<td>1:7.1</td>
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<tr>
<td>Sweden</td>
<td>50.5</td>
<td>1:4</td>
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<td>Germany</td>
<td>54.4</td>
<td>1:3.3</td>
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<tr>
<td>Greece</td>
<td>59.3</td>
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<tr>
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<td>72.9</td>
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<td>35.2</td>
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Drackley et al Transfusion 2012; 52:366-74
**www.census.gov/ipc/www/idb/country.php**
# Changes in blood use in North of England 1999-2009

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<thead>
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<td></td>
<td>Units transfused</td>
<td>Percentage of all blood transfused</td>
<td>Units transfused</td>
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<td>Obs/Gyn</td>
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<td>6</td>
<td>444</td>
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<td>509</td>
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<td>Total units transfused</td>
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<td>9003</td>
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<td>8025</td>
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What led to the change?

Transfusion in Critical Care Trial
Hebert et al NEJM 1999
Causes of change in red cell use

- TRICC trial: Changes in transfusion triggers
- Introduction of transfusion practitioners
- ‘Better Blood Transfusion’ initiative
- Increasing cost of blood
- (Reduction in cardiac surgery)
- (Improvement in surgical techniques)
- (Cell salvage)
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**www.census.gov/ipc/www/idb/country.php**
Red cell use in cardiac surgery

US: 7.1% of 48.8 = 3.5 units per 1000 pop

UK: 4.1% of 35 = 1.5 units per 1000 pop


Tinegate et al. Submitted for publication 2012.
Red cell use by age
North of England 2009
Units red cells per annum per thousand population
One year period prevalence of blood transfusion

Madsen, Titlestad et al, Transfusion medicine 2010; 20: 191-5

- Standardised transfusion rates based on WHO standard population structure

- Allows comparison between populations without population demographics affecting results.
If one country is using > 2x as much blood for cardiac surgery than another..

If transfusion of stored blood has deleterious effects..... (See Koch et al NEJM 2009, Murphy et al )

Then these differences should be far more important to haemovigilance officers than rates of minor allergic reactions
Utilisation studies

**Recipient factors**
- Who is transfused
  - Age
  - Sex
- Why are they transfused
  - Underlying disease
  - Immediate indication
- How long will they survive

**Procedural factors**
- Where are they transfused
  - Theatres
  - Day units
  - Home
- When are they transfused
  - Day
  - Night
- How old is the blood
Proposed ISBT Indication codes for erythrocyte transfusion

- **E1** Acute blood loss ie active bleeding
  - To maintain Hb >70g/L in an otherwise fit patient
  - To maintain Hb >80g/L in an elderly but otherwise fit patient
  - To maintain Hb >90g/L in a patient with known cardiovascular disease

- **E2** Acute anaemia eg post operative but haemodynamically stable
  - To maintain Hb >70g/L in an otherwise fit patient
  - To maintain Hb >80g/L in an elderly but otherwise fit patient
  - To maintain Hb >90g/L in a patient with known cardiovascular disease

- **E3** Chronic correctable anaemia
  - Planned surgical procedure and Hb 70-100g/L depending on procedure
  - To reduce symptoms/ enable discharge from hospital????
  - Frequent Angina or heart failure

- **E4** Chronic anaemia that is not correctable
  - Bone marrow failure inherited. To maintain Hb > xx
  - Bone marrow failure acquired. To alleviate symptoms, typically to maintain Hb> 80g/L
  - Continuous bleeding or haemolysis

- **E5** To alleviate damage due to patient’s own red cells
  - Acute top up or exchange transfusion for sickle cell crisis
  - Chronic exchange transfusion for sickle cell disease
  - Exchange transfusion to prevent kernicterus
  - Exchange transfusion for malaria
  - Other

- **E6.** Radiotherapy
  - To maintain Hb >110g/L for radiotherapy where this has been shown to be associated with a better response to treatment.
Clinical code

- **Surgical**
  - Orthopaedic
    - TRH 18
    - TKR 19
    - Spinal 20
    - Other 21
  - Cardiac
    - CABG 1st 22
    - CABG redo 23
    - Valve 24
    - Other 25
- **Medical**
  - GI bleeding 41
  - Haematology 42
  - ....
  - ....
  - ....

Indication code

- **E1** active bleeding
  - Trigger <7g/dl young
  - Trigger <8g/dl elderly
  - Trigger <9g/dl Acute coronary
- **E2** Acute anaemia but haemodynamically stable
  - <7g/dl
  - <8g/dl
  - <9g/dl
- **E3** Chronic correctable anaemia
- **E4** Anaemia not correctable
  - .......
  - .......
  - .......

**CODE = 20 E2**
How?

- Paper or electronic
- Intermittent or continuous
- Prospective or Retrospective
- Simple codes or CD codes (eg AIM2 )
Surveillance of blood utilisation

Usefulness for hemovigilance?

Utilisation surveillance should be an integral part of haemovigilance
and another thing.....
There was 1 case of major morbidity reported as a result of an ABO incompatible transfusion.

A patient with a haematemesis was in need of an urgent blood transfusion. The patient’s wristband was contaminated with blood and could not be read. As a consequence the electronic bedside checking system was not used.
ABO errors SHOT 2009

- An elderly patient with an underlying heart condition was transfused, during hip arthroplasty….

- An elderly patient was admitted as an emergency during the night with chest pain, ECG changes, chest infection and iron deficiency anaemia, and was deteriorating….

- ITU patient receives ABO-incompatible transfusion despite electronic bedside device…

- Cancer day unit: Incorrect unit collected and transfused despite training, competency-assessment and fridge locking system…

- Man receives emergency transfusion which is both ABO and D incompatible with no ill effects…
Group O blood only for non-elective transfusion

- Sampling errors..mainly out of hours
- Administration errors..mainly out of hours
- Collect more group o red cells with apheresis
- Use fresh gp O blood for all non elective transfusions
Getting blood transfusion right is not always a picnic