OVERVIEW AND RECOMMENDATIONS FROM THE

6TH ANNUAL SHOT REPORT
2001/2002
INCREASES IN REPORTING YEAR BY YEAR

Initial reports
Questionnaires

<table>
<thead>
<tr>
<th>Year</th>
<th>Initial reports</th>
<th>Questionnaires</th>
</tr>
</thead>
<tbody>
<tr>
<td>1996/97</td>
<td>169</td>
<td>142</td>
</tr>
<tr>
<td>1997/98</td>
<td>196</td>
<td>188</td>
</tr>
<tr>
<td>1998/99</td>
<td>255</td>
<td>246</td>
</tr>
<tr>
<td>1999/00</td>
<td>293</td>
<td>289</td>
</tr>
<tr>
<td>2000/01</td>
<td>315</td>
<td>283</td>
</tr>
<tr>
<td>2001/02 (12 mths)</td>
<td>378</td>
<td>363</td>
</tr>
<tr>
<td>2001/02 (15 mths)</td>
<td>482</td>
<td>478</td>
</tr>
</tbody>
</table>
HOSPITAL PARTICIPATION 2001/2002

» 405 hospitals eligible to participate

» 378 participated in the scheme

» 187 submitted initial reports

» 191 indicated that they had seen no incidents

» OVERALL PARTICIPATION = 93%
  (compared with 92% last year)
SHOT

SERIOUS HAZARDS OF TRANSFUSION

COMPARISON OF INITIAL REPORTS
1996 - 2002

TOTAL  IBCT  ATR  DTR  PTP  TA-GVHD  TRALI  TTI  Unclassified

1996/1997
1997/1998
1998/1999
1999/2000
2000/2001
2001/2002 (12 mths)
2001/2002 (15 mths)
OVERVIEW OF 478 CASES FOR WHICH INITIAL REPORTS WERE RECEIVED 2001/2002

IBCT (71.8%)
ATR (10.1%)
DTR (9.5%)
PTP (0.6%)
TRALI (6.7%)
TTI (1.0%)
### TOTAL ISSUES OF BLOOD COMPONENTS FROM THE TRANSFUSION SERVICES OF THE UK IN FISCAL YEAR 2001/2002

<table>
<thead>
<tr>
<th>Component</th>
<th>Issues</th>
</tr>
</thead>
<tbody>
<tr>
<td>Red cells</td>
<td>2,683,463</td>
</tr>
<tr>
<td>Platelets</td>
<td>251,451</td>
</tr>
<tr>
<td>Fresh frozen plasma</td>
<td>385,236</td>
</tr>
<tr>
<td>Cryoprecipitate</td>
<td>88,253</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>3,408,402</strong></td>
</tr>
</tbody>
</table>
## Serious Hazards of Transfusion

**TRANSFUSION RELATED MORTALITY/MORBIDITY IN 482 COMPLETED QUESTIONNAIRES 2001/2002**

<table>
<thead>
<tr>
<th></th>
<th>Total</th>
<th>IBCT</th>
<th>ATR</th>
<th>DTR</th>
<th>PTP</th>
<th>TRALI</th>
<th>TTI</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>DEATHS</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Definitely attributed</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Probably attributed</td>
<td>5</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Possibly attributed</td>
<td>8</td>
<td>3</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td><strong>TOTALS</strong></td>
<td>16</td>
<td>4</td>
<td>2</td>
<td>3</td>
<td>0</td>
<td>7</td>
<td>0</td>
</tr>
<tr>
<td>Unrelated</td>
<td>33</td>
<td>18</td>
<td>5</td>
<td>6</td>
<td>0</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td><strong>Major morbidity</strong></td>
<td>35</td>
<td>9</td>
<td>0</td>
<td>2</td>
<td>1</td>
<td>18</td>
<td>5</td>
</tr>
<tr>
<td>Minor or no morbidity</td>
<td>393</td>
<td>310</td>
<td>41</td>
<td>36</td>
<td>2</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td><strong>TOTALS</strong></td>
<td>482</td>
<td>346</td>
<td>48</td>
<td>47</td>
<td>3</td>
<td>33</td>
<td>5</td>
</tr>
</tbody>
</table>
MAJOR MORBIDITY WAS DEFINED AS THE PRESENCE OF ONE OR MORE OF THE FOLLOWING:

- Intensive care admission and / or ventilation
- Dialysis and / or renal dysfunction
- Major haemorrhage from transfusion-induced coagulopathy
- Intravascular haemolysis
- Potential RhD sensitisation in a female of child-bearing potential
- Persistent viral infection
- Acute symptomatic confirmed infection (viral, bacterial or protozoal)
INCORRECT BLOOD COMPONENT TRANSFUSED

ALL REPORTED EPISODES WHERE A PATIENT WAS TRANSFUSED WITH A BLOOD COMPONENT OR PLASMA PRODUCT WHICH DID NOT MEET THE APPROPRIATE REQUIREMENTS OR WHICH WAS INTENDED FOR ANOTHER PATIENT
TOTAL NUMBER OF ERRORS PER CASE
(total cases = 346; total errors = 552)
DISTRIBUTION OF ERRORS ACCORDING TO THE MAIN REPORTING CATEGORIES (n=552)

- Hospital Blood Bank 157 (28.4%)
- Prescription, sampling, request 149 (26.9%)
- Blood Centre 6 (1.0%)
- Other 4 (1.0%)
- Collection, administration 236 (42.7%)
INCIDENCE OF ERRORS AT THE VARIOUS STAGES OF THE PROCESS OF EMERGENCY AND ELECTIVE TRANSFUSION
DISTRIBUTION OF PROCEDURAL FAILURES IN TERMS OF TOTAL ERRORS (1)

<table>
<thead>
<tr>
<th>Prescription, sampling &amp; request</th>
<th>No. of errors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sample taken from wrong patient</td>
<td>6</td>
</tr>
<tr>
<td>Details on request form incorrect</td>
<td>14</td>
</tr>
<tr>
<td>Details on sample incorrect</td>
<td>13</td>
</tr>
<tr>
<td>Prescription of inappropriate and/or incompatible component(s)</td>
<td>19</td>
</tr>
<tr>
<td>Inappropriate request</td>
<td>83</td>
</tr>
<tr>
<td>Other</td>
<td>13</td>
</tr>
<tr>
<td>Unknown</td>
<td>1</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>149</strong></td>
</tr>
</tbody>
</table>
### DISTRIBUTION OF PROCEDURAL FAILURES IN TERMS OF TOTAL ERRORS (2)

<table>
<thead>
<tr>
<th>Error Type</th>
<th>No. of errors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hospital Blood Bank</td>
<td></td>
</tr>
<tr>
<td>Transcription error</td>
<td>3</td>
</tr>
<tr>
<td>Failure to consult/heed historical record</td>
<td>23</td>
</tr>
<tr>
<td>Grouping error</td>
<td>30</td>
</tr>
<tr>
<td>Missed antibody(ies): Screen error</td>
<td>5</td>
</tr>
<tr>
<td>Missed antibody(ies): ID error</td>
<td>2</td>
</tr>
<tr>
<td>Missed incompatibility</td>
<td>2</td>
</tr>
<tr>
<td>Selection/issue of inappropriate component</td>
<td>24</td>
</tr>
<tr>
<td>Labelling error</td>
<td>8</td>
</tr>
<tr>
<td>Failure to irradiate</td>
<td>9</td>
</tr>
<tr>
<td>Crossmatch error</td>
<td>2</td>
</tr>
</tbody>
</table>
### DISTRIBUTION OF PROCEDURAL FAILURES IN TERMS OF TOTAL ERRORS (3)

<table>
<thead>
<tr>
<th>Hospital Blood Bank</th>
<th>No. of errors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crossmatch wrong sample</td>
<td>5</td>
</tr>
<tr>
<td>Failure to follow protocol</td>
<td>11</td>
</tr>
<tr>
<td>Incorrect serological reasoning</td>
<td>3</td>
</tr>
<tr>
<td>Clerical error</td>
<td>7</td>
</tr>
<tr>
<td>Technical error</td>
<td>7</td>
</tr>
<tr>
<td>Failure to clear satellite refrigerator</td>
<td>5</td>
</tr>
<tr>
<td>Failure to detect error by Blood Centre</td>
<td>1</td>
</tr>
<tr>
<td>Other</td>
<td>10</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>157</strong></td>
</tr>
</tbody>
</table>
DISTRIBUTION OF PROCEDURAL FAILURES IN TERMS OF TOTAL ERRORS (4)

<table>
<thead>
<tr>
<th>Collection &amp; Administration</th>
<th>No. of errors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Collection of wrong component</td>
<td>39</td>
</tr>
<tr>
<td>Failure to detect error earlier in the chain</td>
<td>46</td>
</tr>
<tr>
<td>Failure of bedside checking procedure</td>
<td>103</td>
</tr>
<tr>
<td>Wristband missing or incorrect</td>
<td>4</td>
</tr>
<tr>
<td>Inappropriate component selected by clinician</td>
<td>6</td>
</tr>
<tr>
<td>General administration error</td>
<td>2</td>
</tr>
<tr>
<td>Failure to follow protocol</td>
<td>24</td>
</tr>
<tr>
<td>Other</td>
<td>12</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>236</strong></td>
</tr>
</tbody>
</table>
OUTCOMES OF IBCT EVENTS

• 2 deaths due to erroneous Hb results
  • 92F with g-i haemorrhage and CVA
    FBC sample taken from drip arm 81g/L - 4 unit transfusion. Post-transfusion Hb 176g/L

  • 96F with g-i haemorrhage.
    FBC sample tube under-filled - Hb 50g/L
    3 unit transfusion given despite warning from lab
    Post-transfusion Hb 200g/L
OUTCOMES OF IBCT EVENTS

• 2 deaths due to ABO incompatibility

• 67F (Group O) terminally ill with bronchiectasis not intended to receive blood
  Given 1 unit Group A blood intended for another patient

• 21M (Group B) with haematological malignancy
  Given 4 units Group O FFP selected from freezer out-of-hours by nurse - no on-call transfusion service
OUTCOMES OF IBCT EVENTS

• 9 major morbidity
  – 5 ABO incompatible RBC transfusions (1 teenage F with major trauma died )
  – 1 actual & 2 potential RhD sensitisation in young F (1 discrepant D typing)
  – 1 incompatible platelet transfusion (Group O to Group B)
NEAR MISS PARTICIPATION

146/405 (36%) HOSPITALS REPORTED NEAR MISS

50% OF PARTICIPATING HOSPITALS STATE THAT THEY HAD EXPERIENCED NEAR MISS

709 REPORTS SUBMITTED
IMPORTANCE OF NEAR MISS REPORTING

- Valuable audit tool as often have the same root cause as actual transfusion events

- Can provide useful management information to identify deficiencies in systems
TYPES OF NEAR MISS EVENTS

➤ Sample errors

➤ Request errors

➤ Laboratory sample handling and/or testing errors

➤ Laboratory component selection, handling and storage errors

➤ Component issue, transportation, collection and administration errors
NEAR MISS EVENTS 2001/2002 (n=709)

- Sample errors (59%)
- Laboratory component selection, handling & storage errors (13%)
- Laboratory sample handling &/or testing errors (12%)
- Component issue, transportation, collection & administration errors (10%)
- Request errors (6%)
TRANSFUSION-TRANSMITTED INFECTIONS

2001-2002
Transfusion-Transmitted Infections 2001/2002

- 34 post-transfusion infections reported
- + 13 transfusion reactions

- No case of HBV, HCV, HIV or HTLV

- 5 confirmed TTIs

- All were bacterial contamination
TRANSFUSION-TRANSMITTED BACTERIAL INFECTIONS 2001-2002

- 1 x *Staphylococcus epidermidis* infection, 5 day old pooled platelets during treatment for myeloma
- 1 x *Staphylococcus epidermidis* infection, 5 day old pooled platelets
- 1 x *Morganella morganii* infection, 5 day old platelets during treatment for thrombocytopenia
- 1 x Group B *streptococcus* infection, 3 day old pooled platelets during treatment for myeloma
- 1 x *Staphylococcus epidermidis*, 5 day old pooled platelets during treatment for myelodysplasia
IMMUNE COMPLICATIONS OF TRANSFUSION

Acute transfusion reactions

Delayed transfusion reactions

Transfusion-related acute lung injury

Post-transfusion Purpura

Transfusion-Associated Graft-versus-host Disease
ACUTE TRANSFUSION REACTIONS

ALL REPORTED EPISODES WHICH OCCURRED AT ANY TIME UP TO 24 HOURS FOLLOWING A TRANSFUSION OF BLOOD OR COMPONENTS, EXCLUDING CASES OF ACUTE REACTIONS DUE TO INCORRECT COMPONENT BEING TRANSFUSED
ACUTE TRANSFUSION REACTIONS

- 48 reports
  - Red cells 17
  - Platelets + cryoprecipitate 1
  - Platelets 10 (4 apheresis, 6 pools)
  - Platelets + FFP 1
  - FFP 19 (1 SD, 1 cryopoor)

- 31/48 involved FFP +/- or platelets
- 27/34 allergic/anaphylactic reactions due to FFP +/- or platelets
ACUTE TRANSFUSION REACTIONS

Cumulative data show that ATR reactions to FFP are 4 times more frequent, and those to platelets 6 times more frequent than those to red cells, proportional to the number of units transfused.
ACUTE TRANSFUSION REACTIONS

• 2 deaths associated with ATRs
  
  • 69F with pre-existing AIHA recently transfused. Developed acute intravascular haemolysis post-tx ? Exacerbation of AIHA
  
  • 93M known anti-k recent AAA repair re-admitted with massive haemorrhage, tx in A&E with Group ORhDneg Kneg. Received 4 units before k neg blood available.
DELAYED TRANSFUSION REACTIONS

ALL REPORTED EPISODES WHICH OCCURRED MORE THAN 24 HOURS FOLLOWING A TRANSFUSION OF BLOOD OR BLOOD COMPONENTS. IN PRACTICE, THESE ARE ALMOST INVARIA NY DELAYED HAEMOLYTIC REACTIONS DUE TO THE DEVELOPMENT OF RED CELL ALLOANTIBODIES. SIMPLE SEROLOGICAL REACTIONS (ANTIBODY DEVELOPMENT WITHOUT A POSITIVE DAT OR EVIDENCE OF HAEMOLYSIS) ARE EXCLUDED
DELAYED TRANSFUSION REACTIONS

• 47 cases analysed

• 3 deaths
  • 2 definitely attributed to transfusion
  • 1 probably attributed to transfusion
DELAYED TRANSFUSION REACTIONS

- In 2/3 fatal cases the DHTR was not recognised.
  - In 1 patient this led to unnecessary laparotomy
- In 2 of the fatal cases there were critical delays obtaining compatible red cells
- Kidd +/or c antibodies were implicated in 75% of cases and all of the deaths
- We have insufficient information to know whether these cases have been adequately investigated
TRANSFUSION-RELATED ACUTE LUNG INJURY

ACUTE DYSPNOEA WITH HYPOXIA AND BILATERAL PULMONARY INFILTRATES OCCURRING DURING OR IN THE 24 HOURS AFTER TRANSFUSION, WITH NO OTHER APPARENT CAUSE
TRANSFUSION-RELATED ACUTE LUNG INJURY

- 15 in 2000/2001
- 26 new cases reported in 2001/2002
- 33 cases analysed in this year’s report
DIAGNOSING TRALI

OF THE 33 CASES:

5 EMERGED AS PROBABLE

14 AS POSSIBLE

13 AS HIGHLY LIKELY

1 AS UNLIKELY

THERE REMAINS, THEREFORE, A WIDE DEGREE OF UNCERTAINTY ABOUT THE DIAGNOSIS OF TRALI
TRALI - OUTCOMES

• 7 deaths
  – 1 definitely attributable to transfusion
  – 2 probably attributable to transfusion
  – 4 possibly attributable to transfusion

• 18 patients suffered major morbidity
  – all but 1 made a full recovery
OUTCOME OF CASES WITH LIKELIHOOD OF CASE BEING TRALI

Unlikely
Possible
Probable
Highly likely

Full recovery
Impaired respiratory function
Died - definitely related
Died - probably related
Died - possibly related
Died - not related
COMPONENTS IMPLICATED IN TRALI INCLUDING LIKELIHOOD OF CASE BEING TRALI

Unlikely
Possible
Probable
Highly likely

- FFP
- Platelets
- Red cells
- Not stated
POST-TRANSFUSION PURPURA

THROMBOCYTOPENIA ARISING 5-12 DAYS FOLLOWING TRANSFUSION OF RED CELLS ASSOCIATED WITH THE PRESENCE IN THE PATIENT OF ANTIBODIES DIRECTED AGAINST THE HPA (Human Platelet Antigen) SYSTEMS
CASES REPORTED

4 CASES REPORTED
(1 case excluded as platelet count was low before transfusion & no HPA antibodies were detected)

3 CASES ANALYSED

Case 1 - clinical features consistent with PTP but negative serology

Cases 2 & 3 - classic features of PTP & in both cases the patient’s serum was found to contain anti-HPA-1a
TRANSFUSION ASSOCIATED GRAFT VERSUS HOST DISEASE

NO NEW CASES WERE REPORTED DURING 2001-2002

TA-GVHD REMAINS A FATAL CONSEQUENCE OF TRANSFUSION

69 PATIENTS IN IBCT CATEGORY WERE PUT AT RISK
SHOT EVENTS REPORTED IN PATIENTS LESS THAN 18 YEARS OF AGE
CUMULATIVE DATA 1996-2002

A validated case reported to SHOT involving a patient less than 18 years of age
CASES REPORTED

A TOTAL OF 1630 ANALYSABLE REPORTS RECEIVED SINCE OCTOBER 1996

OF THESE

141 (8.65%) INVOLVED PATIENTS LESS THAN 18 YEARS OF AGE

EPIDEMIOLOGICAL STUDIES OF TRANSFUSION RECIPIENTS SUGGEST THAT THE FREQUENCY OF ADVERSE EVENTS MAY BE DISPROPORTIONATELY HIGH IN THIS AGE GROUP
CATEGORIES OF ADVERSE EVENTS REPORTED AND THE RELATIVE PROPORTIONS SINCE OCTOBER 1996

<table>
<thead>
<tr>
<th>Nature of adverse events reported</th>
<th>Proportion of all reports</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>All ages</td>
</tr>
<tr>
<td>Incorrect blood component transfused (IBCT)</td>
<td>63.9%</td>
</tr>
<tr>
<td>Acute transfusion reactions (ATR)</td>
<td>12.2%</td>
</tr>
<tr>
<td>Delayed transfusion reactions (DTR)</td>
<td>11.5%</td>
</tr>
<tr>
<td>Transfusion related acute lung injury (TRALI)</td>
<td>6.6%</td>
</tr>
<tr>
<td>Transfusion associated graft versus host disease (TA-GVHD)</td>
<td>0.8%</td>
</tr>
<tr>
<td>Post transfusion purpura (PTP)</td>
<td>2.5%</td>
</tr>
<tr>
<td>Transfusion transmitted infection (TTI)</td>
<td>2.2%</td>
</tr>
</tbody>
</table>
OUTCOME

5 DEATHS DUE TO TRANSFUSION RELATED EVENTS AMONGST THE 141 CASES

3 DUE TO TRALI

2 DUE TO TA-GVHD

6 DEATHS FROM UNRELATED CAUSES

13 CHILDREN SUFFERED MORBIDITY OR HAVE A RISK OF FUTURE PROBLEMS DUE TO RhD SENSITISATION
EXAMPLES OF IBCT ERRORS

- 3 group A or B recipients were given group O FFP (laboratory error in 2 cases, anaesthetist error in 1 case).

- 3 patients received untreated FFP who should have received pathogen inactivated FFP; SDFFP (1 case) & methylene blue FFP (2 cases)

- 3 babies who had previous intrauterine transfusions were given non-irradiated blood.

- Excessively old blood was issued for exchange transfusion (1 case) & not red cells of five days or less of age
RECOMMENDATIONS BASED ON 2001-2002 FINDINGS
GENERAL RECOMMENDATIONS

- All institutions where blood transfusions are administered must participate in SHOT.

- An open learning & improvement culture must be developed in which SHOT reporting is a key element.

- Adequate resources must be made available for improvements in transfusion safety in hospitals.
GENERAL RECOMMENDATIONS

Hospital transfusion teams must be established & supported

SHOT recommendations must be on the clinical governance agenda

Appropriate use of blood components must be strenuously promoted

Training in blood administration should be implemented & competency testing developed to ensure an effective outcome
GENERAL RECOMMENDATIONS

➤ Blood transfusion should only be prescribed by authorized clinicians

➤ Blood transfusion teaching must be included in all relevant academic curricula

➤ Hospital blood bank laboratory staffing must be sufficient for safe transfusion practice
GENERAL RECOMMENDATIONS (4)

- Electronic aids to transfusion safety should be assessed & developed at national level
- There is a need for a national body, with relevant expertise & resource, to advise government on priorities for improvement in transfusion safety
- Clear policies for communication must be developed
SPECIFIC RECOMMENDATIONS

- Patients receiving transfusion must be monitored
- All adverse reactions should be fully investigated & reviewed
- Information on previous transfusion history must be available to all who need it
SPECIFIC RECOMMENDATIONS

▸ FFP continues to be associated with significant risk of reactions including TRALI

▸ Reduction of the risk of TRALI demands a high priority
SPECIFIC RECOMMENDATIONS

➡️ Particular care should be taken when providing blood for patients with a positive DAT, who are known to have an autoimmune haemolytic anaemia or have been recently transfused.

➡️ Withholding transfusion may be a greater risk than DTR.
SPECIFIC RECOMMENDATIONS

Transfusion-transmitted bacterial infection remains an avoidable cause of death & major morbidity & merits increased efforts to prevent bacterial contamination of blood components.
SPECIFIC RECOMMENDATIONS

- Neonates and children are a vulnerable group with special transfusion requirements.

- Laboratory, nursing & medical staff should all be aware of the special transfusion needs of neonates and infants. Education of these staff in paediatric transfusion practice is important.

- The wearing & checking of identity bands is essential in the paediatric age group.
ACKNOWLEDGEMENTS

» SHOT office staff
  » Hilary Jones
  » Aysha Boncinelli
» SHOT Steering Group and Working Group
» Participating hospitals
» UK Blood Services