REGIONAL AUDIT OF PLASMA PRODUCTS 2016

Background:

In 2010, the East of England RTC carried out an audit of the use of Fresh Frozen Plasma (FFP) in adult patients. With the introductions of trauma networks and protocols and the publication of the NICE guidelines for transfusion, the RTC decided to conduct a re-audit. It was agreed to audit the use of Cryoprecipitate (Cryo) at the same time.

Aims:

- To determine which patient groups are being transfused with frozen products.
- To assess whether patients are given the correct doses of FFP and Cryo.
- To discover if patients are being transfused with frozen products appropriately.
- To see which plasma products are being used in which clinical scenarios.
- To make comparisons between FFP use in the region in 2010 and 2016 to see if there has been improvement to practice.

Method:

The Regional Transfusion Team agreed on the criteria to be included in the audit. All 18 NHS Trusts were invited to participate; use of FFP and Cryo by the region’s private hospitals is minimal to non-existent.

Trusts were asked to audit for a period of 4 weeks or 40 cases, at a time convenient to themselves, during May and June 2016. 14 Trusts took part; 4 were unable to do so because of staff shortages.

Products included in the FFP audit were: Fresh Frozen Plasma (FFP), Methylene Blue treated FFP (MBFFP), Octaplas© and thawed FFP, which can be now used for trauma cases following the extension of shelf life recommendations by the Joint UKBTS Professional Advisory Committee (JPAC) and the British Committee for Standards in Haematology (BCSH) in March 2016.

Some patients were transfused with FFP or Cryo on more than one occasion; for the purposes of these audits each incident is analysed individually, although some data relates to the number of patients undergoing transfusion.
In total, the audit analysed 276 incidents of FFP transfusion from 212 patients. A total of 876 units were transfused.

### 1.1 Indication codes:

- **F1**: Replacement of single coagulation factor deficiencies (where specific factor concentrate not available)
- **F3**: Acute disseminated intravascular coagulation (DIC) in presence of microvascular bleeding & abnormal coagulation results
- **F5**: Massive transfusion when coagulation factor deficiency may be expected after loss of 1.5x blood volume.
- **F6**: Liver disease to correct bleeding or as prophylaxis before surgery when PT is >1.5 x control

### Number of FFP transfusion incidents by indication code (n=276)
1.2 Patient demographics

Age of patients undergoing FFP transfusions n=276

![Pie chart showing patient demographics]

61% of FFP transfusions were to male patients.

1.3 Clinical areas and diagnoses of patients:

Clinical areas in which FFP transfusions took place n=276

![Pie chart showing clinical areas]

- A&E 19%
- Critical Care 22%
- Medicine 12%
- Surgery 15%
- Obst 7%
- Liver 11%
- Haem/onc 7%
- Other 7%
Primary diagnosis of patients by incident of FFP transfusion (n=276)

- Burns: 4%
- Gastro: 12%
- Haem/onc: 10%
- Liver: 19%
- Medical: 5%
- Obs & Gynae: 9%
- Renal: 4%
- Sepsis: 4%
- Surgery: 7%
- Sepsis: 4%
- Trauma: 10%
- Vascular: 9%
- Other/NS: 7%

Patients receiving FFP transfusions by primary diagnosis (n =212)

- Burns: 3%
- Gastro: 16%
- Haem/onc: 9%
- Liver: 18%
- Medical: 7%
- Obs & Gynae: 9%
- Renal: 4%
- Sepsis: 3%
- Surgery: 9%
- Trauma: 9%
- Vascular: 8%
- Other/NS: 9%
Total units of FFP transfused by diagnosis (n=876)

1.4 Plasma products transfused

Plasma product by incident of transfusion (n=277)

n=277 because one patient was transfused with both FFP and pre-thawed FFP in one incident.

At the time of the audit only 2 of the regions Hospitals had begun using thawed FFP for trauma cases. MB FFP was used for a patient born post 1996.
1.5 Specialist treatment

Of the 276 incidents of plasma transfusion audited, 19 were for Octaplas, from 3 hospitals.
8 of these transfusions were to 3 different TTP patients.
11 of these transfusions were for plasma exchange to a patient with a failed renal transplant. In total during the audit period this patient had 74 units of Octaplas.

During the audit period the regional Burns Unit treated 4 burns patients with FFP. Those 4 represented 31% of the patients undergoing FFP transfusions but they received 60% of the units of FFP transfused.

One hospital treats patients with anti-neutrophil cytoplasmic antibody (ANCA) which causes vasculitis. During the audit period they treated 3 patients with this condition using plasma exchange. These 3 were 21% of the total patients receiving FFP but they received 81% of the units of FFP transfused.

On a regional level, this meant that vascular patients accounted for 9% of all transfusion incidents but 18% of the number of units transfused.

1.6 Coagulation screening

The following graphs exclude data on all plasma exchange patients (TTP, ANCA and renal failure) because the coagulation screens are irrelevant in these cases and usually not performed.

Pre-transfusion coagulation screen (n =276)
1.7 Number of FFP units transfused

Percentage of units transfused per episode n=276
Comparison with the 2010 regional audit indicates that the number of 1 and 2 unit FFP transfusions has decreased. However, the number of transfusion episodes where FFP was issued but not administered has risen from 5.9% to 10.5%.

**Percentage of units of FFP transfused per episode**

![Bar chart showing percentage of units of FFP transfused per episode from 2016 and 2010]

**1.8 Under dosing**

The post transfusion coagulation screen was abnormal in 110 incidents (out of 248).

Excluding underweight patients (where weight was given):
- 38% of these had 2 or less units of FFP
- 20% had 3 units of FFP
- 42% had 4 or more units of FFP

There were 89 cases where 2 or less units were transfused. This excludes TTP, burns and plasma exchange patients and cases where units were ordered but not transfused and the coagulation screen was normal or not done.

Clinical areas in which these transfusions took place:
- A & E 24%
- Critical care 28%
- Medical 17%
- Liver 9%
- Obstetrics 9%

**No hospital had a significant percentage of under dosing occurring in any one clinical area**
1.9 Wastage

Total FFP units issued during audit period (n=1037)

As previously mentioned, 2 hospitals use thawed FFP for trauma cases. During the audit period one of these hospitals issued 220 units of FFP. 7 were wasted and 23 returned for re-issue. This reduced wastage from a potential 13.6% to 3.2%.

Wasted or returned units of FFP by clinical area (n=159)
FFP units wasted by patient diagnosis (n=159)

1.10 Requestors of FFP transfusions

Professional grade of requestor
In the 2010 regional audit of FFP, 29% of FFP requests were made by junior doctors. In 2016, this has fallen to 12%.
In 2010, 8% of requests were made by Consultants; this year that figure has risen to 30%.
In 2010, 32% of incidents were by unknown or unstated requestors, this year that has fallen to 14% but 3 hospitals did not state the requestor for any incident of FFP transfusion.

1.11 Summary and conclusions

- Massive transfusion (F5) was the most common indication code for FFP transfusion at 43%. Liver disease (F6) accounted for 21%. 25% of FFP transfusions did not have a National Indication Code; the majority of these were for plasma exchange.
- 64% of patients receiving FFP were over 50 years of age and 61% were male.
- In terms of primary diagnosis, liver patients account for 19% of FFP transfusions.
- A & E (19%) and Critical Care (22%) were the clinical areas in which most transfusions took place.
- 89% of plasma products transfused during the audit were FFP. Only 3 hospitals transfused with Octaplas and in all cases these were for plasma exchange for patients with TTP or renal failure.
- Regionally, and excluding plasma exchange patients, in 24% of all incidents of transfusion the patients had a normal pre transfusion coagulation screen result. 12% were not screened prior to transfusion.
In 44% of cases, the patient had an abnormal post transfusion coagulation screen. 22% were not screened after transfusion.

- 50% of patients received 4 or more units per transfusion episode and 50% received 3 or less, with 2 units being the most common dose (29.7%) followed by 4 units (27.2%). However, the number of patients receiving 2 units has declined since 2010 when it was 42.9%. In 10.5% of cases FFP was issued but not administered, an increase since 2010.

- 38% of patients with an abnormal post transfusion coagulation screen were given 2 units or less. However there was no evidence that any one clinical area in any hospital is consistently under dosing.

- Only 2 hospitals taking part had implemented the use of thawed plasma for trauma cases at the time of the audit. Statistics indicate that its use can have a considerable impact on wastage.

- 33% of wastage occurred in accident and emergency departments. 19% of the recorded wastage was from units issued to gastric patients and 17% to trauma patients.

- 56% of all requests were made by mid grade and consultant doctors. 12% were made by junior doctors; in 2010 this figure was 29%. In 2010, 32% of requests were by unknown or unstated staff members; in 2016 this has fallen to 14% but it should be noted that 3 hospitals did not record the staff grade of the requestor.

- Specialist patient groups were transfused with a high number of units. It would be useful and interesting to gain a better understanding of the treatment needs of these patient groups. To this end, we will invite specialists in these fields to talk at future RTC meetings.

1.12 Limitations

- It would have been useful to have known the date and time that the pre transfusion coagulation screens were performed. However, in order to keep the audit proforma to a single page there was no space to allow for this information.

- In cases where the coagulation screen was abnormal post transfusion, whether or not the patient was given a further FFP transfusion within 24 hours was not analysed.

- Some hospitals utilise point of care testing in theatres and the results are not usually visible to laboratories.

1.13 Recommendations

1. Based on the reduction to wastage shown at one hospital following the introduction of the use of thawed plasma for trauma patients, hospitals should review their patient mix to investigate if this could be a viable change to practice.

2. Hospitals should audit or review cases where FFP was issued but not transfused.

3. Patients who receive less than the standard adult dose should be reviewed to ensure that they are receiving appropriate treatment.

4. Hospitals should ensure that clinical staff are aware of the correct dose and patient weight should be recorded.
SECTION 2: AUDIT OF CRYOPRECIPITATE TRANSFUSIONS

<table>
<thead>
<tr>
<th>Hospital</th>
<th>No. of cases</th>
<th>No. of patients</th>
<th>Hospital</th>
<th>No. of cases</th>
<th>No. of patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>40</td>
<td>32</td>
<td>H</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>B</td>
<td>1</td>
<td>1</td>
<td>J</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>C</td>
<td>4</td>
<td>3</td>
<td>K</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>D</td>
<td>3</td>
<td>3</td>
<td>L</td>
<td>6</td>
<td>5</td>
</tr>
<tr>
<td>E</td>
<td>0</td>
<td>0</td>
<td>M</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>F</td>
<td>18</td>
<td>10</td>
<td>N</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>G</td>
<td>4</td>
<td>2</td>
<td>P</td>
<td>8</td>
<td>1</td>
</tr>
</tbody>
</table>

The same 14 hospitals took part in the Cryo audit but 3 did not have any cases during the audit period. In total there were 92 incidents of Cryo transfusion from 65 patients. A total of 169 units were transfused.

### 2.1 Indication codes

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>C1</td>
<td>Acute disseminated intravascular coagulation (DIC) where there is bleeding and fibrinogen &lt;1g/L</td>
</tr>
<tr>
<td>C2</td>
<td>Advanced liver disease to correct bleeding or as prophylaxis before surgery with fibrinogen &lt;1g/L</td>
</tr>
<tr>
<td>C3</td>
<td>Bleeding associated with thrombolytic therapy causing hypofibrinogenaemia</td>
</tr>
<tr>
<td>C4</td>
<td>Hypofibrinogenaemia secondary to massive transfusion Fibrinogen of 1.5g/L is required</td>
</tr>
<tr>
<td>C5</td>
<td>Renal or liver failure associated with abnormal bleeding where DDAVP is contraindicated or ineffective</td>
</tr>
<tr>
<td>C6</td>
<td>Inherited fibrinogenaemia where fibrinogen concentrate is not available</td>
</tr>
</tbody>
</table>
Cryo transfusions by percentage per indication code
(n = 92)

![Pie chart showing the percentage distribution of cryo transfusions by indication code.]

2.2 Patient demographics

Age of patients undergoing cryo transfusions (n=92)

![Pie chart showing the age distribution of patients undergoing cryo transfusions.]

65% of Cryo transfusions were to male patients
2.3 Clinical areas and diagnoses of patients

Clinical areas in which cryo transfusions took place (n= 92)

- A & E: 21%
- Critical Care: 30%
- Haem/Onc: 13%
- Liver: 25%
- Medicine: 2%
- Obstetrics: 4%
- Surgery: 5%

Cryo transfusions by primary diagnosis (n=92)

- Liver: 39%
- Haem/Onc: 10%
- Gastro: 15%
- Medical General: 4%
- Obs & gynae: 5%
- Sepsis: 3%
- Renal: 1%
- Sepsis: 3%
- Vascular: 2%
- Burns: 3%
- Cardiac: 1%
- Trauma MBL: 13%
Patients receiving cryo transfusions by primary diagnosis (n=65)

- Trauma MBL, 18%
- Burns, 3%
- Vascular, 5%
- Gastro, 9%
- Haem & Onc, 6%
- Liver, 37%
- Sepsis, 5%
- Surgery, 5%
- Renal, 2%
- Obs & gynae, 5%
- Medical General, 5%

Total units of Cryo transfused by diagnosis (n= 169)

- Trauma MBL, 9%
- Burns, 3%
- Gastro, 15%
- Haem/onc, 8%
- Other/NS, 4%
- Vascular, 2%
- Sepsis, 4%
- Surgery, 3%
- Obs & gynae, 6%
- Medical General, 5%
- Liver, 41%
2.4 Fibrinogen levels

Pre-transfusion fibrinogen levels (n=92)

Post-transfusion fibrinogen levels (n=92)
2.5 Number of units transfused

Percentage of units of cryo transfused per episode

2.6 Wastage

Wasted cryo units by clinical area (n=14)
2.7 Requestors of Cryo transfusions

Professional Grade of Requestor

Grade of requestor - regional data

- Consultant: 48%
- Mid grade doctor: 22%
- Junior Doctor: 11%
- Practitioner: 2%
- NS: 17%
2.8 Summary and Conclusions

- As with FFP, the largest indication for Cryo transfusion was massive transfusion (C4) at 35%.
- 66% of transfusions were to patients over 50 years of age and 65% were male.
- Patients with a primary diagnosis of liver disease accounted for 39% of transfusion incidents and they received 41% of the total units transfused.
- 14% of all Cryo transfusions were to patients with a normal fibrinogen level. In 14% of cases, fibrinogen was not tested. In 31% of cases, patients had an abnormal post transfusion fibrinogen and in 24% of cases the test was not performed or not recorded following transfusion.
- 73% of Cryo transfusions were of 2 units.
- 15% of Cryo issued was wasted and 50% of this wastage occurred in Accident and Emergency departments.
- 65% of Cryo requests were made by mid grade and consultant doctors but 22% of requests came from unknown staff grades.

2.9 Recommendations

1. In 13% of cases audited, patients were given 1 unit. The correct dose for an adult is 2 units. Hospitals should review cases when less than the adult therapeutic dose was given and ensure that clinical staff are aware of the correct dose.
2. Fibrinogen levels must be tested when a patient is transfused with Cryo. Maintenance of fibrinogen is part of both the BCSH Guideline on the Haematological Management of Major Haemorrhage and the regional major haemorrhage guidelines.
3. Hospital Transfusion Teams should raise awareness of the component characteristics of Cryo and the financial cost of wasted units.

Acknowledgements:

The RTC are very grateful to the transfusion staff of all participating hospitals.

Data analysis: Jane O’Brien

Report authors: Jane O’Brien, Frances Sear, Dora Foukaneli