



Welsh Blood Service Gwasanaeth Gwaed Cymru









## 2011 Audit of Use of Blood in Adult Medical Patients – Part 1

St. Elsewhere's Hospital



#### ACKNOWLEDGEMENTS

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#### HOSPITALS THAT AGREED TO PILOT THE AUDIT

Doncaster & Bassetlaw Hospitals NHS Foundation Trust, Hull Royal Infirmary, James Paget University Hospital, Kettering General Hospital, Manchester Royal Infirmary, Northampton General Hospital NHS Trust, North Bristol NHS Trust, Taunton & Somerset NHS Foundation Trust, The Ipswich Hospital NHS Trust, The John Raddiffe Hospital, The Rotherham NHS Foundation Trust, The Royal Berkshire NHS Foundation Trust, The Royal Free Hampstead NHS Trust, Torbay Hospital, University Hospitals of Leicester NHS Trust, Wythenshawe Hospital & Ysbyty Glan Clywd.

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### HOW TO USE THIS REPORT

You should use this audit report to evaluate the quality of the use of red cells in adult medical patients in your hospital with reference to the national guidance and to your own local blood transfusion policy.

Immediately following the closure of the audit in December 2011, participating sites were issued with a brief interim audit report (see Appendix B) containing 'your site' results only.

This national comparative audit report contains a detailed analysis of the audit with a commentary, from the project group, on the findings.

The results for the audit are shown as national results with 'your site' results displayed alongside for comparison purposes. Where comparison of an important variation in practice has been identified, other further comparisons have been made using subgroup analysis, where appropriate. Comparison of results for the Regional Transfusion Committee (RTC) regions in England and for Wales, Northern Ireland and Scotland will be provided in the form of regional PowerPoint slide shows.

We suggest you use both your local audit findings and the national comparisons given to assist you in evaluating the quality of transfusion management of adult medical patients in your hospital. You should also take opportunities to share these results as widely as possible, particularly with physicians and their teams.

You should bear in mind that practice may vary from that suggested by the guidelines because you have a local policy that differs from the published guidance. Before dismissing any results as not applicable to you because of policy differences, you should first ask if your policy facilitates the safe and effective use of blood in adult medical patients.

#### Sharing of information

The Department of Health places a requirement on NHS Trusts to provide an annual 'Quality Account' to "enhance accountability to the public and engage the leaders of an organisation in their quality improvement agenda". There is a list of national audits that are to be included in a Trust's Quality Account and for this purpose we have produced a template in line with DH guidance, which you might wish to use when compiling your statement to your Clinical Governance Lead (Appendix E). Quality Accounts are publically available via the "NHSChoices" website.

We have for some years provided the Care Quality Commission (CQC)<sup>(1)</sup> with the names of sites that participate in our audit programme.

### EXECUTIVE SUMMARY

#### Introduction

National red cell demand has fallen by nearly 20% over the last 10 years. Most of this has been due to reduction in surgical use and medical indications now account for two thirds of red cells transfused. Recent audits in English Regions, North Wales and Northern Ireland have shown that transfusion outside British Committee for Standards in Haematology (BCSH) guidelines occurs in medical patients and that there is scope for further reduction in red cell usage though observance of agreed transfusion triggers and better anaemia management.

#### **Aims and Objectives**

- To capture the indications for, recipient demographics and co- morbidities of medical patients receiving red cell transfusion;
- Collect pre and post haemoglobin measurements, number of units transfused, place of transfusion and who makes the decision to transfuse;
- Collect information about prior investigation of anaemia to identify those with a potentially reversible cause, e.g. iron deficiency anaemia.

The ultimate aim of the audit is to produce new guidance on the use of red cell transfusion in medical patients and tools for the better investigation and management of patients with anaemia.

#### Methods

Participating sites were asked to audit all adult patients (unless on ITU or in A&E) under the care of a physician in one week of their choice during each of the months September, October and November 2011. Only one in three Haematology patients was included to prevent this group dominating the dataset. Data was submitted electronically and was analysed in SPSS. Audit standards were developed from the BCSH guidelines and other sources. The data were analysed to identify cases of potentially reversible anaemia and cases of transfusion above the threshold set according to age, comorbidity and diagnosis. Cases of overtransfusion were defined as post transfusion Hb of 2g/dl more than the threshold set for that patient group.

#### Results

135/156 (86.5%) NHS Trusts (182 sites) and 15 Independent hospitals in the UK contributed data on 9126 red cell transfusions. The primary reason for transfusion was anaemia in 78% of cases, blood loss in 20% and prophylaxis prior to procedure in 2%. Fifty three percent were male. Median age was 73 years. Despite restricting the number of haematology patients, this group accounted for 32% of cases. 29.8% of cases had gastrointestinal or other haemorrhage. 'Anaemia under investigation' accounted for 20% of cases. The ward was the commonest place for transfusion (62%) followed by the day unit (21%).

Fourteen percent of all patients had transfusion in progress at 1 a.m., 13% for anaemia, 20% for blood loss and 17% as prophylaxis prior to a procedure. 10% of patients received 1 unit of red cells, 65% 2 units, 17% 3 units and 6% 4 units.

The grade of the person making the decision to transfuse (known in 75% of cases) was consultants 44%, Specialist registrars 19%, core medical trainees 13%, foundation doctors 12% and nurses 1%.

#### Audit standards

Standard 1 A pre-transfusion haemoglobin (Hb) is taken in 100% of cases within 3 days of transfusion (and preferably the same day).

93% compliance.

Standard 2 No non-radiotherapy patient should have a pre transfusion Hb > 10g/dl

96.4% compliance

Standard 3 A post-transfusion Hb is taken in 100% of cases within 3 days following transfusion (and preferably the same day).

Within 3 days 84%, same day 12%

Standard 4 No non-radiotherapy patient should have a post transfusion Hb > 12 g/dl 94.1% compliance.

The median (IQR) pre transfusion Hb was 7.8 (7.1-8.5) g/dl and median (IQR) post transfusion Hb was 9.9 (9-10.7) g/dl.

#### Potentially avoidable transfusions

20% of cases had a possible potentially reversible anaemia (13% possible iron deficiency, 3% B12/folate deficiency, 1.5% positive direct antiglobulin test, 3.2 % eGFR  $\leq$  30).

Transfusion was started above the agreed audit haemoglobin standard in 35% of patients with anaemia and 6% of patients with blood loss. 33% of patients were transfused to >2g/dl above the agreed audit standard. Overall, 53% of cases fell outside the algorithm set.

#### Discussion

Much of the transfusion practice seen was appropriate and reflected the high quality of care given, but there are some areas of concern:

- 323 patients had a pre-transfusion Hb or more that 10g/dl, which put them at risk of adverse effects without any likely clinical benefit.
- Overnight transfusion was more common than necessary.

There may be excessive transfusion of red cells to medical patients in the UK because of:

- Transfusion in cases with possible reversible anaemia (20%)
- Transfusion above the Hb threshold defined by the audit algorithm (29%)
- Over-transfusion (33%)

There was wide variation between sites.

The audit showed that UK physicians do not always have restrictive transfusion practice. However in patients with chronic anaemia, alleviation of symptoms and improvement of quality of life may be more appropriate than a restrictive practice.

#### Further work:

- 2000 cases have been selected randomly to review the clinical management of anaemia. Symptoms / signs of anaemia will be assessed in those transfused above the audit trigger.
- In addition, the patient's body weight will be captured to help understand the reasons for overtransfusion.

#### Next steps

Part 2 of the audit was conducted during April – June 2012 and will be reported in early 2013

#### **RECOMMENDATIONS and ACTION PLAN**

A full final audit report incorporating the findings of Part 1 and Part 2 will contain a detailed list of recommendations and actions. It is likely that the recommendations will include the following:

- Develop tools to guide appropriate transfusion decisions for physicians
- Develop tools to support the best management of anaemia
- Use of single unit transfusion then check Hb when transfusing for anaemia.
- Promote development of services to aid effective anaemia management
- Educate and train staff in primary and secondary care
- Ensure reason for transfusion and patient consent is documented

### INTRODUCTION & BACKGROUND

National red cell demand has fallen by nearly 20% over the last 10 years (Figure 1). Regional surveys show that this is all due to a very marked reduction in surgical use of blood but that medical use over this period has remained static. Medical indications now account for very nearly two thirds of all red cell units transfused <sup>2</sup> (Table 1). Of this use, 28% of red cells are given to patients with haematological diagnoses, mainly with bone marrow failure and 17% are given to patients with acute or chronic GI haemorrhage. Non-haematological cancer (15%), ITU patients (7%) and renal failure (4%) were the next commonest indications. In studies using a different breakdown, i.e. by nature of anaemia rather than underlying disease, anaemia of chronic disease is also given as a common indication.



Figure 1: Red cell issues to hospitals 1999-2012 (NHSBT data)

Table 1. Failing abe of rea bend in dargioar patients in NE England
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Year of audit	Percentage of red cells transfused to medical patients	Percentage of red cells transfused to surgical patients
2000	52%	41%
2004	62%	33%
2008	64%	29%



In 2005, audit of red cell transfusion in Northern Ireland, where overall blood use per head of population is lower than in England and North Wales, found 19% of transfusion episodes to be outside consensus guidelines with 29% of episodes using more units than was necessary <sup>3</sup>.

A similar audit in 2007 in North West England found 8% inappropriate transfusion episodes, with a further 8% uncertain using fairly generous guidelines <sup>4</sup>.

Guidelines for use of transfusion in haemodynamically stable patients have generally been rather loose mainly because of lack of good evidence. The well known TRICC trial of transfusion thresholds in critically ill patients<sup>5</sup> that influenced surgical use was felt not necessarily applicable to ambulant patients. Some new pieces of evidence suggest that more restrictive use of red cell transfusion in ambulant patients is both safe and for certain indications may possibly be beneficial.

1. A recently published large randomised trial of transfusion thresholds in patients with cardiac disease and having surgery for fractured hips compared a threshold of 8g/dl and 10g/dl. No differences were found in mortality, morbidity or hospital stay<sup>6</sup>.

2. There is evidence from a small randomised study and a large prospective non-randomised study that transfusion may perhaps be detrimental in haemodynamically stable patients with GI bleeding<sup>7</sup>.

3. SHOT reports over recent years have documented a number of cases where death or morbidity has resulted from over transfusion. The SHOT report does not collect data on mortality or morbidity from under transfusion and thus there are no figures to balance against these but these findings and the international trend towards an increased incidence of transfusion associated circulatory overload do suggest that over transfusion is a significant cause of morbidity<sup>8</sup>.

Newer guidelines on transfusion thresholds from the Netherlands<sup>9</sup>, the USA<sup>10</sup> and Australia<sup>11</sup> all encourage the judicious use of lower transfusion thresholds in haemodynamically stable patients.

International comparison of transfusion rates show surprising differences with countries with similar health care systems collecting and transfusing anything from 31 to 72 units of red cells per 1000 population. At present we collect and transfuse 35.5 units of red cells per 1000 population in England and North Wales<sup>12</sup>. It is clear from the audits quoted above that there is room for further improvement especially in patients who have potentially reversible anaemia, e.g. iron deficiency.



#### **AIMS OF THE AUDIT**

Part 1

- Understand reasons for red cell transfusion in medical patients (under the care of a physician) and who makes the decision to transfuse
- Define demographics of the adult population of patients under the care of physicians receiving red cell transfusion
- Collect information about comorbidities
- Collect information about investigation of anaemia in order to identify patients with a potentially reversible anaemia, e.g. iron deficiency anaemia, B12 / folate deficiency, autoimmune haemolytic anaemia and renal anaemia
- Collect information about pre and post haemoglobin measurements, number of units transfused and place of transfusion in order to make an assessment of the quality of decision-making around red cell transfusion

#### Part 2

In Part 1 data analysis, a cohort of patients was identified who may have a reversible anaemia and /or who were transfused above the threshold Hb set by the audit standard and/or who were over transfused (2g or more above the threshold set). A further proforma was sent to hospitals to capture information in a random selection of these patients to gain further information on the identification, investigation and management of patients with anaemia in order to assess whether transfusion could have been avoided with more effective anaemia management. In addition, information was sought on the documented reason for transfusion if transfused above the threshold, i.e. clinical factors other than the Hb value that justified the decision to transfuse. In cases of over transfusion information on the body weight was collected. Part 2 took place during May – June 2012 with a report planned for early 2013.

The ultimate aim of the audit is to produce new guidance for physicians on the use of red cell transfusion in medical patients and tools for the identification, investigation and management of patients with potentially reversible anaemia.

This audit will form part of the change management programme which is working alongside the NCA programme to understand and influence behavioural change in transfusion decision-making.

#### **AUDIT STANDARDS**

## Standard 1 A pre-transfusion haemoglobin (Hb) is taken in 100% of cases within 3 days of transfusion (and preferably the same day) Grade 1 C – consensus opinion

The pre transfusion Hb informs the accurate planning of transfusion requirements but it is recognised that this is not the only factor required when making the decision to transfuse

#### Standard 2 No non-radiotherapy patient should have a pre transfusion Hb > 10g/dl Grade 2 A

There is randomised controlled trial evidence to suggest that there is lack of benefit for liberal transfusion practice versus restrictive practice in critical care patients <sup>5</sup> and patients undergoing hip fracture repair with significant co morbidities <sup>6</sup>; randomised controlled trials have not been performed in 'medical' patients. Patients with chronic anaemia should be transfused to a level to alleviate symptoms and in occasional patients this may result in an Hb trigger of > 10g/dl. There is limited evidence for maintaining Hb above 10-11g/dl in patients receiving radiotherapy for cervical and possibly other tumours <sup>13</sup>

Standard 3 A post-transfusion Hb is taken in 100% of cases within 3 days following transfusion (and preferably the same day) to assess the effectiveness of the red cell transfusion

Grade 1 C consensus opinion

Standard 4No non-radiotherapy patient should have a post transfusion Hb > 12 g/dlGrade 1 C consensus opinionThis is a generous post transfusion Hb level for the majority of patients and<br/>those transfused above this threshold are likely to have been over transfused

Other parameters developed for the audit by the steering group are shown in figures 2,3,4 & 5; further explanation is given in the Methods section on page 13.

#### Figure 2. Definition of possible potentially reversible anaemia

Iron deficiency = Ferritin  $\leq$ 15 mcg/l (female) or  $\leq$  20 mcg/l (male) or if there was no Ferritin result then Iron studies suggestive of TSAT  $\leq$ 20 or if there was also no TSAT result then TIBC  $\geq$  85 micromol/l or if there was also no TIBC result then MCV  $\leq$  78fl

**B12 deficiency** = B12  $\leq$  150 ng/l (pg/ml)

Folate deficiency = Serum folate ≤ 2mcg/l (ng/ml) or if there was no serum Folate result then Red cell folate ≤ 80 mcg/l (ng/ml)

Autoimmune haemolytic anaemia = Direct Antiglobulin Test (DAT) 'Positive' or grade 1 and above

**Renal Anaemia (definition 1)** calculated eGFR of ≤ 44 (Chronic Kidney Disease stage 3b to 5) but excluding patients with 'acute renal failure', 'blood loss' and unknown age or gender. **Renal Anaemia (definition 2)** calculated eGFR of ≤30 (Chronic Kidney Disease stage 4 to 5)and chronic renal failure as ONLY diagnosis 'ticked '

#### Figure 3. Definition of possible unnecessary transfusion above pre-transfusion Hb trigger

The categories below are stepped in that anaemia patients at one level are those remaining after patients belonging to all earlier levels have been excluded. For example level 2 patients with thalassaemia are selected from the whole group of anaemia patients after excluding the level 1 patients with radiotherapy.

- 1. Radiotherapy **and** pre-Hb >11 g/dl
- 2. Thalassaemia and pre-Hb >10 g/dl
- 3. Age > 65 with bone marrow failure<sup>A</sup> and pre-Hb >9.0 g/dl
- 4. Age > 65 with chemotherapy **and** pre-Hb >9.0 g/dl
- 5. Age >65 without bone marrow failure <sup>A</sup> or chemotherapy or comorbidity<sup>B</sup> and pre-Hb >8.0 g/dI
- 6. Any age with comorbidity<sup>B</sup> and pre-Hb >8.0 g/dl
- 7. Age ≤65 with bone marrow failure <sup>A</sup> and pre-Hb >8.0 g/dl
- 8. Age ≤65 with chemotherapy **and** pre-Hb >8.0 g/dl
- 9. Age ≤65 without bone marrow failure<sup>A</sup> or chemotherapy or comorbidity<sup>B</sup> and pre-Hb >7.0 g/dl

A: Aplastic anaemia, Acute myeloid leukaemia, Acute lymphoblastic leukaemia, Myelodysplasia, Myeloproliferative disease (myelofibrosis), Chronic leukaemia any type, Myeloma, Non-haematological malignant infiltration (Q6B1 thru Q6B9)

B: Cardiac, respiratory or vascular disease (Q13) or on any of the drugs (Q13b)

In patients with acute blood loss, a threshold of 10g/dl has been set

- 1. Transfusion to more than 2g/dl above Hb threshold set for that patient group
- 2. In patients with possible potentially reversible anaemia, transfusion to more than 2g/dl above pre-transfusion Hb

#### METHODS

Transfusions were audited during a three-month period between September and November 2011.

#### SITE SELECTION AND RESPONSE

All hospitals in England, Scotland, Wales and Northern Ireland where transfusions are administered to adult medical patients were invited to take part. Although some participants elected to take part as a Trust (or Hospital Board) hospitals were intended to be the unit of involvement, since practice may vary from hospital to hospital within a Trust. However, data were submitted by Trusts as a whole and by individual hospitals. Therefore, the term 'sites' is used throughout this report to refer to either Trust or hospital.

#### CASE SELECTION AND QUOTAS

Participating sites were asked to audit all cases in one week of their choice during each of the months September, October and November 2011. All adult patients under the care of a physician were included (unless on ITU or in A&E), and children were excluded because of a previous audit. Haematology patients are heavy users of blood so sites were asked to audit one in three of these cases. Sites were reminded that this is an audit of physicians and not patients so those struggling to audit cases because of resources should audit as wide a range of physicians as possible.

#### DATA ENTRY, CLEANING AND VALIDATION

The audit data from the transfusion episode was entered via a web-based audit tool specifically designed for the purpose although data could be collected on a paper proforma that was available to download (see appendix A). Submitted audit data was collated by the audit project manager after the closing date for data entry and prior to issuing an interim report to participating hospitals. Because no patient identifiable data is recorded on the website, auditors were recommended to keep an audit linkage record to assist in review of cases and validation of data.

#### DATA ANALYSIS

#### 1. Identification of cases of possible potentially reversible anaemia

The data were analysed in order to select patients with possible potentially reversible anaemia using the criteria outlined below. The whole dataset was used for this analysis, i.e. patients classified as being transfused for anaemia, blood loss and before a procedure. A random selection of these patients will be studied in more detail in part 2 of the audit to ascertain whether a transfusion could have been avoided if the anaemia had been recognised , investigated and treated in a timely manner.

#### **Possible Iron deficiency**

Following analysis of the reference ranges used by participating sites and discussion with the audit steering group, it was decided to choose a reference range for ferritin that would pick up definite iron deficiency cases: i.e. ferritin  $\leq$ 15 mcg/l (female) or  $\leq$  20 mcg/l (male). It is recognised that there may well be other cases of iron deficiency within the cohort of patients with ferritin above 15-20 mcg/l especially in conjunction with a raised CRP / ESR. The decision was made to remain with cases of definite iron deficiency where possible. For patients without serum ferritin results, results of serum iron studies were analysed and a cut off transferrin saturation of < 20% was selected to represent possible cases of iron deficiency. Some hospitals used TIBC and following review of the reference ranges in those hospitals, a cut off of TIBC > 85 was selected by consensus.

In order to pick up possible cases of iron deficiency in the remaining patients who had not had haematinic investigations, MCV < 78 was selected as a surrogate marker, recognising that within this cohort there may well be some cases of thalassaemia trait and more severe cases of anaemia of chronic disease. It was felt important to use the MCV to identify cases of possible iron deficiency patients as this is the cohort of patients who had not been specifically investigated and the opportunity therefore missed to consider alternatives to blood transfusion.

#### Possible B12 / folate deficiency

The problem with both B12 and folate assays is that there can be significant variation in reference ranges depending on the assay employed. Following analysis of the reference ranges used by participating trusts, cut-offs were chosen that would be most likely associated with significant B12 or folate deficiency, rather than borderline results. For B12, the consensus opinion was to choose a value  $\leq 150$  ng/l (pg/ml). Folate analysis was more complex. The majority of laboratories have moved to the use of serum folate rather than red cell folate. Following analysis of the reference ranges submitted a cut off of Serum folate  $\leq 2mcg/l$  (ng/ml) was selected to represent possible folate deficiency, recognising that this is an imperfect test with regards to representing total folate stores. Red cell folate was only used in < 10% of cases and a cut off of  $\leq 80 \text{ mcg/l}$  (ng/ml) was selected again to pick out cases of true deficiency. Elevated MCV was not used as a surrogate marker for those without B12 or folate results since it is well recognised that it is possible to have B12 / folate deficiency without macrocytosis and that there are many other reasons for an elevated MCV.

#### Possible autoimmune haemolytic anaemia (AIHA)

The aim was to pick up some sort of information on possible cases of AIHA since this is a well recognised anaemia where transfusion should be avoided if possible. It is recognised that the direct antiglobulin test (DAT) is not particularly specific for the diagnosis of AIHA but has been used in our dataset to select out cases with possible AIHA for further analysis in part 2.



#### Possible renal anaemia

Cases of possible renal anaemia (definition 1) were selected by calculating the e GFR from the creatinine result, if available, age and sex and using the following algorithm: (186 x (Creat / 88.4)<sup>-1.154</sup> x (Age)<sup>-0.203</sup> x (0.742 if female) <u>http://www.renal.org/eGFRcalc</u>. Racial origin could not be factored in as this information was not available. A cut off of  $\leq$  44 was selected as this represents chronic kidney disease stages 3b to 5. Patients with blood loss and acute renal failure were excluded. Further analysis of this group was undertaken in an attempt to select patients more likely to have true renal anaemia rather than renal impairment as an incidental finding: renal anaemia (definition 2): patients with chronic renal failure as the only diagnosis with no other diagnosis ticked and an eGFR of  $\leq$ 30.

In Part 2, further more detailed information on a random selection of patients with possible reversible causes of anaemia was obtained by scrutiny of the patients' case notes using the part 2 proforma (see appendix B). A transfusion in a patient with a potentially reversible cause of anaemia may be deemed appropriate if the patient has significant documented symptoms / signs of anaemia or has failed corrective treatment, or has an additional diagnosis that means that response to corrective treatment will be unlikely.

# 2. Identifying Hb transfusion thresholds for patients according to diagnosis, age, therapies and co morbidities

Red cell transfusion should be given to improve oxygen delivery or prevent tissue hypoxia. The direct measure of this would be intracellular pH or blood lactate/blood base excess as a surrogate marker. These measurements, of course, are not readily available and even in intensively monitored patients measurements such as mixed venous oxygen saturation and arterial oxygenation level are governed by other factors which interact and complicate interpretation. Understandably, Hb is used to make decisions about red cell transfusion because it is readily accessible. The transfusion thresholds set by the audit group have been developed by consensus opinion following extrapolation of the available evidence and review of the BCSH guidelines on red cell transfusion<sup>15</sup>, the AABB<sup>10</sup> guidelines and the National Indication codes<sup>13</sup>. The algorithm has been applied to the cohort of patients in the dataset classified as 'anaemia'. In deciding whether to give a transfusion in an individual patient, clinical judgement is required and if the patient has significant symptoms or signs of anaemia then it may be acceptable to transfuse at a level above the thresholds set, particularly in chronic transfusion dependent patients. This will be investigated further in part 2 where a random selection of cases transfused above the threshold set by the algorithm will be analysed to ascertain whether the transfusion was given because of documented significant symptoms / signs of anaemia.

Thresholds where transfusion is likely to be inappropriate:

- 1. Radiotherapy and pre-Hb >11 g/dl
- 2. Thalassaemia and pre-Hb >10 g/dl

(UK thalassaemia society recommends transfusion trigger of 9.5 – 10g/dl<sup>14</sup>)

- 3. Age > 65 with bone marrow failure **and** pre-Hb >9.0 g/dl
- 4. Age > 65 with chemotherapy **and** pre-Hb >9.0 g/dl
- 5. Age >65 without bone marrow failure or chemotherapy or comorbidity **and** pre-Hb >8.0 g/dl
- 6. Any age with comorbidity **and** pre-Hb >8.0 g/dl
- 7. Age ≤65 with bone marrow failure **and** pre-Hb >8.0 g/dl
- 8. Age ≤65 with chemotherapy and pre-Hb >8.0 g/dl
- Age ≤65 without bone marrow failure or chemotherapy or comorbidity and pre-Hb >7.0 g/dl

Thresholds listed 3-9 have been developed from: BCSH red cell guidelines<sup>15</sup>, National Indication codes, Cochrane Review April 2012<sup>16</sup> and AABB guidelines 2012<sup>10</sup>. The restrictive practice recommendation has come from two main randomised controlled trials in critical care<sup>5</sup> and patients undergoing hip fracture surgery with significant comorbidities <sup>6</sup> and extrapolated to medical patients with anaemia.

Patients with acute blood loss rarely need to be transfused above an Hb of 10g/dl, although the decision also has to be based on volume and rate of ongoing blood loss  $^{15}$ 



Figure 5 shows the algorithm developed by the project group.

#### 3. Definition of over transfusion

#### Two definitions of over transfusion have been developed:

- Transfusion to more than 2g/dl above Hb threshold set for that patient group
- In patients with possible potentially reversible anaemia, transfusion to more than 2g/dl above pre transfusion Hb

There are some occasions when a higher Hb may be acceptable: in patients who are on a chronic transfusion programme and receiving day case transfusion, it may be more appropriate to raise the Hb to a higher level so that there can be a longer gap between transfusions and less interference with lifestyle. In patients with possible potentially reversible anaemia, the presenting Hb may be very low and an increment of more than 2g/dl may be required to control the patient's symptoms of anaemia. In patients with ongoing blood loss it can be difficult to gauge the amount of blood to give in a rapidly changing situation.

#### SECTION ONE – PRINCIPAL FINDINGS

This section contains the results from the audit, showing national data to compare with the results from your hospital or Trust site, where such a comparison is informative.

#### PARTICIPATION AND SAMPLE SIZE

135/156 (86.5%) NHS Trusts (182 NHS sites in all) and 15 Independent hospitals in England, Scotland, Wales and Northern Ireland were identified using the NCABT database and NHSBT Customer service database. Those organisations were emailed an invitation to register.

Country	Status	Number of sites	Number of cases per site			Total assas
Country	Status	Number of Siles	Median	IQR	Range	10101 6385
England	NHS	156	45	32-67	2-165	7957
	Independent	14	8	4-13	1-25	127
	Total	170	43	28-64	1-165	8084
Scotland	NHS	12	29	22-45	15-106	471
	Independent	0	-	-	-	-
	Total	12	29	22-45	15-106	471
Wales	NHS	9	34	n/a	21-92	420
	Independent	1	-	-	-	9
	Total	10	32	23-69	9-92	429
N Ireland	NHS	5	24	n/a	10-46	142
	Independent	0	-	-	-	-
	Total	5	24	n/a	10-46	142
Total	NHS	182	44	30-65	2-165	8990
	Independent	15	8	Na	1-25	136
	Total	197	41	26-63	1-165	9126

#### Table 2 – Participation by country

See regional/country slideshows for further breakdown of these data

#### Your site audited 72 case(s).

There has been an excellent participation rate by UK hospitals and the number of cases at 9126 represents the largest audit of red cell transfusion practice in medical patients.

#### PATIENT DEMOGRAPHICS

There were a total of 9126 patients; 53% (4791) were male and 47% (4325) were female, unknown for 10. Median age was 73 years, Interquartile range 60-82 years, range 18-111 years.





In keeping with most audits of blood use <sup>(3) (4)</sup> the majority of patients receiving red cells are over 65 years and this has implications for future red cell demand.



#### REASON FOR RED CELL USE

The primary reason for transfusion was anaemia in 78% of cases, blood loss in 19% and prophylaxis prior to procedure in 2%.

#### Table 3 - Reason for red cell use

	National (9126)		Your site (72)	
	%	Ν	%	Ν
Anaemia	78	7128	85%	61
Blood loss	19	1773	15%	11
Prophylactic prior to procedure	2	189*	0%	0
Not known	0.4	36	0%	0

\*Surgery (95), endoscopy without biopsy (36), endoscopy with biopsy (17), liver biopsy (3), ECRP without sphincterotomy (2), ECRP with sphincterotomy (1), others (32), not known 3.

#### Table 4 - Clinical presentation

		Natio	onal (9126)	Vour sito (72)
		%	Ν	Tour site (72)
A. A ir	naemia under	20	1848	9
В. С	Bastro-intestinal	21	1954	13
C. ⊢	laematology	10	946	10
D. B	Sone marrow failure	22	2039	22
E. N	lephrology	10	875	17
F. C	Incology	19	1719	14
G. C	Other bleeding	8	755	2

Multiple selections were possible as appropriate

A more detailed breakdown of clinical presentation for the whole group is shown overleaf:

Table	5 – Clinical presentation	Nationa	l (9126)
	·	%	Ň
Α.	Anaemia under investigation	20	1848
В.	Gastro-intestinal	21	1954
	Acute GI bleed	5.1	469
	<ul> <li>Upper – Haematemesis or melaena</li> </ul>	11.8	1082
	<ul> <li>Lower – Bleeding per rectum</li> </ul>	4.9	450
	Liver failure	2.3	213
	Pancreatitis	0.3	24
С.	Haematology	10	946
	<ul> <li>Iron deficiency (not acute GI bleed)</li> </ul>	3.9	357
	B12/folate deficiency	0.7	68
	Anaemia of chronic disorder	4.2	381
	<ul> <li>Haemolysis acquired – autoimmune</li> </ul>	0.4	40
	<ul> <li>Haemolysis congenital – spherocytosis</li> </ul>	<0.1	2
	<ul> <li>Sickle cell disease acute transfusion</li> </ul>	0.2	15
	<ul> <li>Sickle cell disease chronic transfusion</li> </ul>	03	25
	programme	0.5	25
	Thalassaemia	1.2	107
D.	Bone marrow failure*	22	2039
	Aplastic anaemia	0.7	64
	Acute myeloid leukaemia	3.7	335
	<ul> <li>Acute lymphoblastic leukaemia</li> </ul>	0.7	66
	Myelodysplasia	6.9	634
	Myeloproliferative disease (myelofibrosis)	1.5	136
	<ul> <li>Chronic leukaemia any type</li> </ul>	2.3	214
	<ul> <li>Lymphoma any type</li> </ul>	3.9	357
	Myeloma	2.5	228
	<ul> <li>Non-haematological malignant infiltration</li> </ul>	0.6	59
E.	Nephrology	10	875
	Chronic renal failure	8.0	729
	Acute renal failure as primary diagnosis	2.0	182
F.	Oncology	19	1719
	Chemotherapy	9.0	817
	Anaemia of malignancy	11.1	1013
	Radiotherapy	1.3	119
G.	Other bleeding	8	755
	Menorrhagia	0.8	73
	Epistaxis	0.8	75
	Haemoptysis	0.3	31
	Retroperitoneal bleeding	0.1	12
	Other	6.3	575

Multiple selections were possible as appropriate.

\* sites were requested to select 1 in 3 of their haemato-oncology cases, therefore this table does not given an accurate picture of 'where blood goes' in medical patients.

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#### Table 6 - Place of Transfusion

	Nationa	al (9126)	Your site (72)
	%	Ν	Number
Ward	62	5698	39
Day Unit	21	1950	19
EAU/MAU	12	1094	4
Hospice	0.3	30	
Home	0.2	21	
Other*	3	314	10
Not known	0.2	19	

\*Other included: A & E; Acute care unit; Cardiac pacing room; Coronary care unit; Chemotherapy unit; Community hospital; Delivery suite; Dialysis unit; Endoscopy unit; ITU; Stroke unit and Theatre (n = 314). The ward was the commonest place for transfusion (62%) followed by the day unit (21%). A subset analysis of haematology/bone marrow failure patients in Table 7 below shows that 42% of patients were transfused on the day unit.

Table 7	Cases	%
Ward	1431	49.2
Day unit	1213	41.7
EAU/MAU	184	6.3
Hospice	6	0.2
Home	16	0.6
Other	54	1.9
Blank	2	0.1
Total	2906	

#### TIMING OF TRANSFUSION

14% of all patients were receiving the transfusion during the night (as defined as in progress at 1 a.m.), 13% for patients with anaemia, 20% for patients with blood loss and 17% for patients having a prophylactic transfusion prior to procedure.

#### Table 8 - Transfusion during the night

	National (9126)		Your site (72)	
	%	Ν	%	Ν
All patients	14	1298/9110	4%	3/72
By reason for red cell use:				
Anaemia	13	909/7119		2/61
Blood loss	20	351/1770		1/11
Prophylactic prior to procedure	17	33/189		/0

#### COMMENT:

Overnight transfusion should be avoided wherever possible as monitoring may be more difficult and patients will not be able to rest due to frequent observations of vital signs. Overnight transfusion may have been unavoidable in some patients with acute blood loss, but it is a concern that nearly three quarters of overnight transfusions were for patients with anaemia.

#### Number of units transfused

The median number of units administered during a transfusion episode was 2 (range 1-28). The full distribution histogram of the number of units for the whole group is shown below:



Figure 7

Table 9 - Number of units transfused

	Nation	al (9126)	Your site (72)	
	%	Ν	rour site (72)	
1 unit	10	952	4	
2 units	65	5901	57	
3 units	17	1542	10	
4 units	6	560	1	
5-10 units	2	149		
11-28 units	0.1	11		
Not known	0.1	11		



	Nationa	al (7128)	Vour site (61)
	%	Ν	Tour site (61)
1 unit	11	775	4
2 units	67	4778	49
3 units	17	1190	8
4 units	5	324	
5-10 units	0.7	53	
11-28 units	<0.1	1	
Not known	0.1	7	

#### Table 10 - Number of units transfused for patients with anaemia

#### Table 11 - Number of units transfused for patients with blood loss

	Nationa	l (1773)	Vour site (11)
	%	Ν	Tour site (TT)
1 unit	9	153	
2 units	54	966	8
3 units	18	322	2
4 units	13	229	1
5-10 units	5	92	
11-28 units	0.6	10	
Not known	<0.1	1	

For 189 patients with prophylaxis prior to procedure 12% (23) had one unit, 70% (133), two units, 13% (24) three units, 3% (6) four units, and 2% (3) had six to eight units.

#### COMMENT:

In the past it was generally accepted that a transfusion of a single unit of red cells was either insufficient or unnecessary. It is now recognised that a single unit transfusion may well be appropriate in patients with anaemia who are just below the threshold for transfusion. We are concerned that some clinicians may be transfusing two units in cases where one would be sufficient. There is a trend for patients to receive more units if they have blood loss as the reason for transfusion, but still the largest proportion has a 2 unit transfusion, suggesting that the amount of blood loss in many cases is not significant.



Table	12 -	Who	made	the	decision	to	transfuse?
10010	. –				400101011		

	National (9126)		Your site (72)	
	%	Ν	%	Ν
Grade of physician making the prescription decision is KNOWN	75	6866	72%	52
(if KNOWN) Which grade of staff made the decision?				
Consultant	45	3090		19
Other grade*	55	3776		33

\*Other included: SpRs, and other middle grades N=1296 (19%), SHOs / Core medical trainees N=928 (14%), Foundation doctors N=852 (12%), nurse specialists N=83 (1%) and General Practitioners N=117 (2%).

Figure 8



#### COMMENT:

It is of concern that in 25% of cases, the grade of person making the decision to transfuse was not recorded. Consultants made the decision to transfuse in half of the episodes where the grade was known. Junior doctors of all grades are making the decision to transfuse on many occasions. A small number of nurse specialists are authorising transfusions, particularly in haematology. General Practitioners (GPs) are also involved. All grades of staff will need to be targeted when implementing the recommendations from this audit.

# Standard 1A pre-transfusion haemoglobin (Hb) is taken in 100% of cases within 3<br/>days of transfusion (and preferably the same day)

The pre transfusion Hb was taken in 51% (4678/9126) of cases on the same day as the transfusion (anaemia 48%, blood loss 66%, prophylaxis 51%) and 93% (8480/9126) within 3 days before transfusion (anaemia 92%, blood loss 98%, prophylaxis 88%).

	Nation	National (9126)		ır site (72)	
	%	Ν	%	Ν	
Same day as transfusion	51	4678	<b>49%</b>	35	
Day before	32	2922		23	
2 days before	7	616		5	
3 days before	3	264		3	
Within 3 days	93	8480	92%	66	
More than 3 days before*	6	566		5	
Not known	1	80		1	

#### Table 13 - Days before transfusion of the pre-transfusion haemoglobin (Hb)

\*Some of these (unknown number) will be input errors in dates.

#### Site variation: % within 3 days plotted against number of cases submitted by site

Median site: 94%, IQR of sites 90-98%. The dotted line in figure 9 below depicts the 93% (8480/9126) national statistic. The shaded circles indicate sites with audit results that are inconsistent (p<0.01) with the overall rate (93%) in relation to their sample size; they may have more of a problem in relation to this standard than sites not shaded.

Figure 9





Site variation: % same day as transfusion plotted against number of cases submitted by site.

Median site: 50%, IQR of sites 41-61%. The dotted line in figure 10 below depicts the 51% (4678/9126) national statistic.

The shaded circles indicate sites with audit results that are inconsistent (p<0.01) with the overall rate (51%) in relation to their sample size; they may have more of a problem in relation to this standard than sites not shaded.

Figure 10



The median (IQR) pre transfusion Hb was 7.8 (7.1-8.5) g/dl, with n=9051

-			0	· /		
		Na	tional	Your	site (72)	
		(9	126)		0.110 (1 = )	
		%	Ν	%	Ν	
	With pre-Hb	99.2	9051	99%	71	
	≤4.0	0.6	53		0	
	4.1-5.0	2	170		0	
	5.1-6.0	6	541		3	
	6.1-7.0	15	1389		11	
	7.1-8.0	36	3261		37	
	8.1-9.0	28	2488		15	
	9.1-10.0	9	806		4	
	10.1-11.0	3	232		1	
	11.1-12.0	0.8	68		0	
	12.0-13.0	0.3	26		0	
	13.1-14.0	0.1	12		0	
	>14.0	0.1	5		0	

#### Table 14 - Pre-transfusion haemoglobin (Hb)





#### COMMENT:

99.2% of patients had a pre transfusion Hb recorded and, of these, 51% were taken on the same day as transfusion and 93% within 3 days before transfusion. In patients with anaemia, the longer the lag time the higher the Hb suggesting that transfusion is being planned/prioritised on the basis of Hb result. In bleeding patients fewer have a significant lag between Hb and transfusion, which is to be expected. The median (IQR) pre transfusion Hb was 7.8 (7.1-8.5) g/dl.



# **Standard 2** No Non radiotherapy Patients should have a pre transfusion Hb of greater than 10g/dl

In the whole group, 3.6% of patients had a pre transfusion Hb of > 10g/dl.

#### Table 15 - Pre transfusion Hb of greater than 10.0g/dl for non-radiotherapy patients

	National (9007)		You	r site (72)
	%	Ν	%	Ν
All patients with Hb >10.0	3.6	323/8933	1%	1/71
By reason for red cell use:				
Anaemia	2.9	205/6971		1 <i>/</i> 60
Blood loss	6.1	106/1749		<b>0/ 11</b>
Prophylactic prior to procedure	6.6	12/181		/0

The 323 cases came from 123 sites

#### Site variation: % with pre-Hb>10.0g/dl plotted against non-radiotherapy cases by site

Median site: 2.2%, IQR of sites 0-5.1%. The dotted line in figure 12 below depicts the 3.6% (323/8933) national statistic. The shaded circles indicate sites with audit results that are inconsistent (p<0.01) with the overall rate (3.6%) in relation to their sample size; they may have more of a problem in relation to this standard than sites not shaded.

Figure 12





«Name»

*Consultants* making decision to transfuse: 3.8% (114/3030) with pre-transfusion Hb of > 10g/dl

Other grades making decision to transfuse: 3.2% (118/3709) with pre-transfusion Hb of > 10g/dl

Unknown grade making decision to transfuse: 4.1% (91/2194) with pre-transfusion Hb of > 10g/dl

#### COMMENT:

Although it can be very difficult to accurately gauge blood loss (and hence transfusion requirements) in patients with acute bleeding, these figures give cause for concern. 323 patients with Hb > 10.0 g/dl received a total of 716 units of red cells which put them at risk of adverse effects without any likely clinical benefit. There were a small number of patients with very high pre transfusion haemoglobins, and that raises concerns that the decision to transfuse was based on a clinical error such as an incorrectly taken sample or a result from the wrong patient.

The highest pre-Hb value recorded for a patient with anaemia was 16.4 g/dl, with blood loss 17.7 g/dl and with prophylaxis was 13.3 g/dl. Looking at the 18 patients who were transfused with a pre transfusion Hb of >13g/dl, 11 of these were transfused because of blood loss and in some of these cases the Hb was lower after the transfusion than before, highlighting the difficulty of relying on the Hb as the only measure in a rapidly changing situation. In some of these cases, there may have been an additional (and perhaps lower) near patient Hb test that was not recorded in the patient's record. There are some anomalous results in the anaemia group suggesting the possibility of transcription errors.

There were 119 oncology radiotherapy patients and of these 17% (20/118) had a pre-Hb > 10.0 g/dl, and 8.5% (10/118) had a pre-Hb > 11.0 g/dl. The highest recorded value was 11.9 g/dl.

Sub analysis of the 18 patients with Hb  $\geq$ 13.0 g/dl:

	Pre- Transfusion Hb g/dl	Post-Transfusion Hb g/dl	(Post minus Pre) Hb	Reason for red cell use	Age Patients age (=2011 minus year of birth)
1	17.7	16.7	-1.0	Blood loss	22
2	16.4	9.8	-6.6	Anaemia	67
3	15.9	17.4	1.5	Anaemia	71
4	15.0	17.6	2.6	Blood loss	28
5	14.2	7.7	-6.5	Blood loss	78
6	13.9	10.5	-3.4	Blood loss	22
7	13.8	13.6	-0.2	Blood loss	58
8	13.7	13.1	-0.6	Blood loss	34
9	13.5	14.4	0.9	Anaemia	47
10	13.5	12.1	-1.4	Anaemia	29
11	13.5	9.0	-4.5	Blood loss	43
12	13.5	12.9	6	Blood loss	63
13	13.4	11.3	-2.1	Blood loss	33
14	13.3		-	Anaemia	53
15	13.3	9.8	-3.5	Blood loss	23
16	13.3	9.5	-3.8	Prophylactic	71
17	13.2	10.1	-3.1	Anaemia	74
18	13.0	13.8	0.8	Blood loss	95

#### Table 16

Standard 3	A post-transfusion Hb is taken in 100% of cases within 3 days following
	transfusion (and preferably the same day) to assess the effectiveness of
	the red cell transfusion. Post-transfusion Hb was known for 84% (7625)
	and of these it was taken in 84% (6414) of cases within 3 days after
	transfusion (anaemia 81%, blood loss 94%, prophylaxis 96%).

				<u> </u>	_
	National (9126)		Your	site (72)	
	%	Ν	%	Ν	
Known	84	7625	64%	46	
Same day as transfusion	12	877		3	
Day after	52	3965		27	
2 days after	16	1187		12	
3 days after	5	385		4	
Within 3 days	84	6414	100%	46	
More than 3 days after*	16	1211			

#### Table 17 - Days after transfusion of the post-transfusion haemoglobin (Hb)

\*Some of these (unknown number) will be input errors in dates.

## Site variation: % within 3 days plotted against number of cases with Post-Hb submitted by site.

Median site: 87%, IQR of sites 77-94%. The dotted line in figure 13 below depicts the 84% (6414/7625) national statistic. The shaded circles indicate sites with audit results that are inconsistent (p<0.01) with the overall rate (84%) in relation to their sample size; they may have more of a problem in relation to this standard than sites not shaded.



Figure 13

«Name»

The median (IQR) post transfusion Hb was 9.9 (9.0-10.7) g/dl, with n=7638. For those with post transfusion Hb within 3 days, the median (IQR) was 9.8 (9.0-10.7) g/dl, with n=6414 Selecting those with post transfusion Hb on the same day as transfusion, the median (IQR) was 9.6 (8.6-10.4) g/dl, with n=877.

	National		Your	<sup>-</sup> site (72)
	%	Ν	%	Ν
With post-Hb	84	7638	64%	46
≤4.0	<0.1	4		0
4.1-5.0	0.1	11		0
5.1-6.0	0.2	16		0
6.1-7.0	1.5	114		3
7.1-8.0	6.4	489		1
8.1-9.0	17	1336		8
9.1-10.0	30	2294		17
10.1-11.0	25	1947		9
11.1-12.0	13	959		6
12.0-13.0	4.2	322		1
13.1-14.0	1.4	107		0
>14.0	0.5	39		1

Table 18 - Post-transfusion haemoglobin (Hb)





«Name»

		National			site
	Median	IQR			
	(Post-Pre)	(Post-Pre)	Ν	Median	Ν
	Hb	Hb			
All patients	2.1	1.2-2.9	7608	2.1	46
By reason for red cell use:					
Anaemia	2.1	1.3-2.9	5737	2.1	36
Blood loss	2.1	1.1-3.2	1653	2.5	10
Prophylactic prior to procedure	2.0	0.9-2.7	171		0

#### Table 19 - (Post minus Pre) transfusion haemoglobin (Hb)

Figure 15



#### COMMENT:

There was no post transfusion Hb measurement in 16% of patients. Only by routinely checking the blood count after transfusion will under- or over-transfusion be detected. It may be argued that it is not necessary in patients with chronic anaemia managed with a regular transfusion programme as post transfusion Hb is of little value - what is important is the pre-transfusion nadir in relation to the symptoms. A small number of patients may have transferred to other hospitals or died before repeat testing.

# Standard 4 No non-radiotherapy patient should have a post transfusion Hb of greater Than 12 g/dl

In the whole group, 5.9% of patients had a post transfusion Hb of > 12g/dl.

	National (9007)		Your site (72)		
	%	Ν	%	N	
All patients with Hb >12.0	5.9	* 445/7536	4%	2/46	
By reason for red cell use:					
Anaemia	5.7	322/5686		1/36	
Blood loss	6.9	115/1656		1/10	
Prophylactic prior to procedure	4.2	7/167		/0	

#### Table 20 - Post transfusion Hb of greater than 12.0g/dl for non-radiotherapy patients

\*The 445 cases came from 155 sites

#### Site variation: % with post-Hb>12.0g/dl plotted against non-radiotherapy cases by site

Median site: 5.4%, IQR of sites 2.3-9.1%. The dotted line in figure 16 below depicts 5.9% (455/9126) national statistic. There were no sites with audit results that are inconsistent (p<0.01) with the overall rate (5.9%) in relation to their sample size.





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*Consultants* making decision to transfuse: 5.8% (140/2432) with post transfusion Hb of > 10g/dl

*Other grades* making decision to transfuse: 6.3% (202/3225) with post-transfusion Hb of > 10g/dl

Unknown grade making decision to transfuse: 5.5% (103/1879) with post-transfusion Hb of > 10g/dl

The highest post-Hb value recorded for a patient with anaemia was 19.3 g/dl, with blood loss 18.0 g/dl and with prophylaxis 14.0 g/dl.

There were 119 oncology radiotherapy patients and of these 23% (23/102) had a post-Hb > 12.0 g/dl, and 13% (13/102) had a post-Hb > 13.0 g/dl. The highest recorded value was 14.0 g/dl.

#### COMMENT:

445 (5.9 %) of the 7536 non-radiotherapy patients had post transfusion Hb levels greater than 12.0; these patients have received at least one unnecessary unit of blood and been put at increased risk of adverse events without any corresponding benefit. This is a conservative estimate and it could be argued that transfusion above 11.0 g/dl haemoglobin is unnecessary in this group, which would bring the number of patients transfused up to 1383 (18 %). There were a very small number of patients with very high post transfusion haemoglobins, and that raises concerns that the decision to transfuse was based on a clinical error such as an incorrectly taken sample or a result from the wrong patient.
#### Defining patients with possible potentially reversible anaemia

		National		Your site
	Men	Women	Not known*	ALL
Total number	4791	4325	10	72
Number with a ferritin, transferrin saturation, TIBC or MCV result	4739	4270	10	71
With ferritin result (% of Total number)	37% (1774)	40% (1723)	20% (2)	28
With ferritin $\leq 20 \text{ mcg/I}$ (male) or $\leq 15 \text{ mcg/I}$ (female)	248	341	0	5/ 28
Without ferritin results but with transferrin saturation result	94	107	0	3
With transferrin saturation ≤ 20	58/94	78/107	-	1/3
Without ferritin or transferrin saturation results but with TIBC result	17	22	0	0
With TIBC ≥85.0	0/17	2/22	-	/0
Without ferritin or transferrin saturation or TIBC results but with MCV result	2854	2418	8	40
With MCV ≤ 78	210/2854	262/2418	2/8	3/40
Total possible iron deficiency	11% (516/4739)	16% (683/4270)	2/10	
Overall total	13%	<b>% (1201/9019</b> )		13% ( <b>9/</b> 71)

#### Table 21 - Possible Iron deficiency Anaemia

\*the 2 with ferritin results both had values above 600 mcg/l; the other 8 only had MCV values to work with.

#### COMMENT:

Overall, 38% (3499/9126) of cases had a ferritin checked within 3 months of transfusion and of these, 589 patients were shown to be iron deficient. A further 136 patients were identified as functionally iron deficient using a transferrin saturation cut-off of < 20. Of the 5280 patients without iron studies, 474 had an MCV  $\leq$ 78fl suggestive of iron deficiency (it is recognised that some of these cases may be thalassaemia trait or severe anaemia of chronic disorder). In total 1201, 13% of all cases had possible iron deficiency anaemia. A random selection of cases will be investigated in more detail in Part 2 of the audit and a more

detailed analysis of appropriateness of transfusion in patients with possible iron deficiency will be undertaken following analysis of Part 2.

	National	Your site
Total number	9126	72
With B12, serum folate or red cell folate test*	3193	25
With B12 result (% of Total number)	34% (3127)	35% (25)
With B12 ≤ 150 ng/I (pg/mI)	111/3127	1/25
With serum folate (% of Total number)	30% (2757)	<b>32% (23)</b>
With serum folate $\leq 2mcg/I (ng/mI)$	95/2757	0/23
With red cell folate (and no serum folate)	220	0
Red cell folate $\leq$ 80 mcg/l (ng/ml)	31/220	/0
Total B12/folate deficiency	7.3% (232/3193)	4% (1/25)

#### Table 22 - B12 / folate deficiency

\*only 268 cases had a red cell folate investigation, 220 of these without serum folate estimation

#### COMMENT:

There were 111 cases of significant B12 deficiency and 126 cases of possible folate deficiency (recognising that serum folate is not an ideal diagnostic test to identify true folate deficiency). In total, 232 cases of possible B12 and folate deficiency were identified (2.5% of all cases). Further information about a random selection of these cases will be obtained in Part 2 to ascertain whether transfusion could have been avoided. It is likely that this is an underestimate of the true number of cases, since 65% did not have B12 or folate testing undertaken in the 3 months before transfusion. 467 cases (excluding cases with: MDS, aplastic anaemia, liver failure, haemolytic anaemia and those with B12 and folate measurements) had an MCV > 100fl and may have had B12 or folate deficiency identified if the test had been done.



Table 23 - Possible Autoimmune haemolytic anaemia (AIH/
---

	National	Your site
Total number	9126	72
With DAT result (% of Total number)	5% (437)	<b>0% (0)</b>
With DAT Positive or grade 1 and above	137/437	/0
Total possible AIHA	31% (137/437)	% ( <b>/ 0)</b>

It is recognised that a positive DAT is a non-specific marker of autoimmune haemolytic anaemia. The DAT was only checked in 437 (5%) of all cases. Diagnosis of AIHA is dependent on the recognition of the combination of jaundice and anaemia; often it is the request for transfusion that reveals the diagnosis as the autoantibody interferes with the crossmatch procedure.

#### Table 24 - Possible Renal anaemia

	National	Your site
Total number	9126	72
Number of patients after excluding patients with 'acute renal failure', 'blood loss' removed, unknown gender & unknown age	7178	59
With creatinine result available	6847	58
Definition 2: With chronic renal failure ticked ONLY and no other diagnosis ticked and eGFR ≤ 30	4.3% (293/6847)	14% ( <b>8/</b> 58)

A one-off eGFR reading alone is an imperfect measure of the diagnosis of renal anaemia since the result can be affected by inter-current illness and there may be additional reasons for the anaemia which means that the Hb may not respond to EPO/ IV iron. For this reason, definiton2 is preferred when considering cases of renal anaemia likely to be suitable for management with Erythropoeitin / iron . Further information on a random selection of cases will be collected in Part 2.



#### Any evidence of possible reversible anaemia

Defined as any possible cases of the following: iron deficiency, B12/folate deficiency, autoimmune haemolytic anaemia (AIHA) or renal anaemia (definition 2).

#### Table 25

	National	Your site
Total number	9126	72
Number of possible reversible anaemia cases with renal anaemia definition 2: With chronic renal failure ticked ONLY and no other diagnosis ticked and eGFR ≤ 30	20% (1791/9126)	24% (17/72 <b>)</b>

*Consultants* making decision to transfuse: 19.7% (608/3090) with possible reversible anaemia

Other grades making decision to transfuse: 20.5% (775/3776) with possible reversible anaemia

Unknown grade making decision to transfuse: 18.1% (408/2260) with possible reversible anaemia

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#### Site variation: % with possible reversible anaemia plotted against number of cases per site

This incorporates definition 2 of renal anaemia as being with chronic renal failure ticked ONLY and no other diagnosis ticked and eGFR  $\leq$  30.

Median site: 19%, IQR of sites 13-26%. The dotted line in figure 17 below depicts the 20% (1870/9126) national statistic. The shaded circles indicate sites with audit results that are inconsistent (p<0.01) with the overall rate (20%) in relation to their sample size; they may have more of a problem than sites not shaded.





#### COMMENT:

A random selection of possible reversible anaemia cases will be analysed in more detail following data collection in Part 2 of the audit; a further more detailed report on the investigation and management of anaemia will be included in the final audit report. It is clear from the figure above that there is wide variation between sites in the percentage of audit cases being transfused with possible reversible anaemia, varying from 0 to 60% of cases.

There was no difference in the proportion of patients with possible reversible anaemia being transfused when the decision was taken by consultants or other grades.

$$P_{age}41$$

#### Defining transfusions above Hb threshold

The categories for anaemia patients in the table below are stepped in that level 2 patients (with thalassaemia) are selected from the whole group of anaemia patients after excluding the level 1 patients (with radiotherapy). Thus, level 9 patients comprise those remaining once patients belonging to all previous levels have been excluded.

Table 26		National		Y	our site
	Pre- transfusion Hb threshold	% above threshold	Number above threshold	% above threshold	Number above threshold
[A] All Patients with anaemia <sup>1</sup>		34	2427/7071	23%	14/60
1. Radiotherapy	11.0	7	7/102		/0
2. Thalassaemia	10	39	40/103		1/5
3. Age > 65 with bone marrow failure	9.0	18	231/1295		1/11
4. Age > 65 with chemotherapy	9.0	24	59/245		/0
5. Age >65 without bone marrow failure or chemotherapy or comorbidity <sup>1</sup>	8.0	32	160/502		0/3
6. Any age with comorbidity <sup>2</sup>	8.0	34	1224/3633		7/ 32
7. Age ≤65 with bone marrow failure	8.0	46	185/400		1/4
8. Age ≤65 with chemotherapy	8.0	74	138/186		1/2
<ol> <li>9. Age ≤65 without bone marrow failure or chemotherapy or comorbidity<sup>1</sup></li> </ol>	7.0	63	383/605		3/3
[B] Patients with blood loss <sup>3</sup>	10.0	6	106*/1749	0%	0/11
[A and B] All patients		29	(2533/8820)	20%	14/71

Notes

1. Of 7128 patients with anaemia, 55 could not be classified because the pre-transfusion Hb was not known and 2 because age was not known.

2. Co-morbidity defined as cardiac, respiratory or vascular disease (Q13) or on any of the drugs (Q13b).

3. Of 1773 patients with blood loss, 10 having radiotherapy were excluded and 14 could not be classified because the pre-transfusion Hb was not known.

\*These 106 cases were from 68 different sites.

Page4.

#### [A and B] All patients

*Consultants* making decision to transfuse: 30.8% (920/2990) above allocated Hb threshold. *Other grades* making decision to transfuse: 24.8% (909/3670) above allocated Hb threshold. *Unknown grade* making decision to transfuse: 32.6% (704/2160) above allocated Hb threshold.





# Possible inappropriate transfusion (defined as transfusion above Hb threshold allocated by audit algorithm): Site variation (patients with anaemia).

Site median 33%, IQR 25-44%, n=196 sites. The dotted line in figure 19 below depicts 34% (2427/7071) national statistic and the shaded circles indicate sites with audit results that are inconsistent (p<0.01) with the overall rate (34%) in relation to their sample size; they may have more of a problem than sites not shaded.





#### Possible inappropriate transfusion: Site variation (patients with blood loss):

Site median 0%, IQR 0-0%, 10-90<sup>th</sup> centiles 0-18%, n=181 sites. The dotted line in figure 20 below depicts 6.1% (106/1749) national statistic.

For 77 sites having 10 or more cases with blood loss: site median 6.7%, IQR 0-11.3%, 10-90<sup>th</sup> centiles 0-19%.

For 104 sites having less than 10 cases with blood loss the overall % of transfusions above the Hb threshold was 4.4% (25/563).

There were no sites with audit results that are inconsistent (p<0.01) with the overall rate (6.1%) in relation to their sample size.



Figure 20

**Note:** there are a lot of points on this graph that represent more than one site, these predominantly being 0% with fewer than 10 relevant cases per site

#### COMMENTS:

The transfusions above the thresholds set for the audit may not necessarily be considered as inappropriate, as the Hb is not the only parameter used to guide the decision to transfuse, since the physician also considers the patients symptoms and signs of anaemia, and in patients with bleeding, the rate and volume of blood loss. In patients on a chronic transfusion programme it is important to transfuse at a level that helps to keep the symptoms of anaemia under control to improve quality of life.



In GI bleeding, there is evidence to suggest that over-transfusion can cause increased risk of re-bleeding and there is a move to being restrictive even in the management of blood loss – to keep the Hb nearer 8g/dl if possible. Finally, we have not collected data on the presence of acute coronary syndrome and there may be a suggestion that such patients need to have a higher threshold than others with less acute cardiac comorbidities. Further analysis on appropriateness of transfusion according to Hb threshold will be available following data collection in Part 2. For those cases transfused above threshold, we will be looking for documented evidence of significant symptoms and signs of anaemia.

Consultants appear to be more likely to transfuse above allocated transfusion threshold as opposed to other grades of staff (30.8% vs. 24.8% P < 0.001).

Overall transfused with possible reversible anaemia and above threshold set by audit algorithm:

#### Table 27

	National	Your site
[A] Patients with anaemia:		
Possible Reversible anaemia (using eGFR≤30 and chronic renal failure being the only diagnosis for renal anaemia) AND/OR transfusion above Hb threshold	49% (3480/7071)	42% (25/60)
[B] Patients with blood loss:		
Possible Reversible anaemia (using eGFR≤30 and chronic renal failure being the only diagnosis for renal anaemia) AND/OR transfusion above Hb threshold	22% (384/1749)	18% (2/11)

#### [A] Patients with anaemia:

*Consultants* making decision to transfuse: 49.9% (1244/2494) possible reversible anaemia and above threshold set by audit algorithm.

*Other grades* making decision to transfuse: 47.7% (1335/2799) possible reversible anaemia and above threshold set by audit algorithm.

*Unknown grade* making decision to transfuse: 50.7% (901/1778) possible reversible anaemia and above threshold set by audit algorithm.

#### [B] Patients with blood loss:

*Consultants* making decision to transfuse: 21.6% (107/496) possible reversible anaemia and above threshold set by audit algorithm.

*Other grades* making decision to transfuse: 21.8% (190/871) possible reversible anaemia and above threshold set by audit algorithm.

*Unknown grade* making decision to transfuse: 22.8% (87/382) possible reversible anaemia and above threshold set by audit algorithm.



# PATIENTS WITH ANAEMIA: Site variation for possible reversible anaemia (using eGFR≤30 and chronic renal failure being the only diagnosis for renal anaemia) AND/OR transfusion above Hb threshold.

Site median 50%, IQR 42-58%, 10-90th centiles 33-67%, n=196 sites. The dotted line in figure 21 below depicts 49% (3480/7071) national statistic.

The shaded circles indicate sites with audit results that are inconsistent (p<0.01) with the overall rate (49%) in relation to their sample size; they may have more of a problem than sites not shaded.





# PATIENTS WITH BLOOD LOSS: Site variation for possible reversible anaemia (using eGFR≤30 and chronic renal failure being the only diagnosis for renal anaemia) AND/OR transfusion above Hb threshold

Site median 19%, IQR 10-33%, 10-90th centiles 0-50%, n=181 sites. The dotted line in figure 22 below depicts 22% (384/1749) national statistic.

For 77 sites having 10 or more cases with blood loss: site median 21%, IQR 14-30%, 10-90<sup>th</sup> centiles 10-38%.

For 104 sites having less than 10 cases with blood loss the overall % of transfusions outside the Part 1 algorithm was 21% (119/563).

There were no sites with audit results that are inconsistent (p<0.01) with the overall rate (22%) in relation to their sample size.

Figure 22



#### COMMENT:

55% of transfusions are outside the algorithm set for Part 1 of the audit. Further assessment of the inappropriateness of these transfusions will be assessed in Part 2 of the audit where a random selection of cases will be analysed in more detail.



There is considerable variation in practice between sites with overall cases outside Part 1 algorithm ranging from 0-90%. In patients with anaemia, the site median is 50%. The management of patients with blood loss was closer to the algorithm with site median 21%.

#### **Over-transfusion**

Anaemia patients should not be transfused to more than 2 g/dl above the transfusion trigger, unless a reason for doing so is documented in the patient's case notes (in patients with reversible anaemia, the patient should not be transfused more than 2g/dl above the pre transfusion Hb unless there is a reason recorded in the notes).

Just over half of patients with reversible anaemia were transfused to more than 2g/dl above the starting Hb.

40% of patients with anaemia were transfused to more than 2g above the pre transfusion threshold trigger.

Table 28	3
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		National	Your site
Possible reversible anaemia			
Possible reversible anaemia transfused to >2g/dl above pre-Transfusion Hb (using eGFR≤30 and chronic renal failure only diagnosis for renal anaemia)		59% (911/1535)	90% (9/10)
[A] All anaemia patients with post Hb		5773	36
Transfused to >2g/dl above the pre-transfusion threshold trigger		40% (2335/5773)	33% (12/36)
	Trigger		
1. Radiotherapy	13.0	11% (10/89)	/0
2. Thalassaemia	12.0	13% (6/46)	/0
<ol> <li>Age &gt; 65 with bone marrow failure</li> </ol>	11.0	13% (115/882)	0/ 4
4. Age > 65 with chemotherapy	11.0	34% (66/192)	/0
5. Age >65 without bone marrow failure or chemotherapy or comorbidity <sup>1</sup>	10.0	45% (183/406)	1/2
6. Any age with comorbidity <sup>1</sup>	10.0	44% (1384/3152)	9/24
7. Age ≤65 with bone marrow failure	10.0	36% (127/355)	0/ 4
8. Age ≤65 with chemotherapy	10.0	65% (95/147)	/0
9. Age ≤65 without bone marrow failure or chemotherapy or comorbidity <sup>1</sup>	9.0	69% (349/504)	2/2
[B] All blood loss patients with post Hb		1664	10
Transfused to >2g/dl above post- transfusion trigger	12.0	7% (116/1664)	10% (1/10)
[A and B] All patients		33% (2451/7437)	28% (13/46)

1. Of 7128 patients with anaemia, 55 could not be classified because the pre-transfusion Hb was not known and 2 because age was not known.

#### [A and B] All patients

*Consultants* making decision to transfuse: 34.7% (831/2396) more than 2g above the pre transfusion threshold

*Other grades* making decision to transfuse: 31% (989/3194) more than 2g above the pre transfusion threshold

*Unknown grade* making decision to transfuse: 34.2% (631/1847) more than 2g above the pre transfusion threshold

#### Site variation: All possible reversible anaemia patients transfused to >2g/dl above pretransfusion Hb (using eGFR≤30 and chronic renal failure as only diagnosis)

Site median 61%, IQR 46-80%, 10-90th centiles 29-100%, n=185 sites. The dotted line in figure 23 below depicts 59% (911/1535) national statistic.

For 60 sites having 10 or more cases: site median 59%, IQR 50-73%, 10-90<sup>th</sup> centiles 37-83%.

For 125 sites having less than 10 cases the overall % of transfusions more than 2g/dl above the pre-transfusion Hb was 59% (367/619).

There were no sites with audit results that are inconsistent (p<0.01) with the overall rate (59%) in relation to their sample size.





# Site variation: All anaemia patients transfused to >2g/dl above the post-transfusion threshold trigger

Site median 41%, IQR 33-52%, 10-90th centiles 24-64%, n=193 sites. The dotted line in figure 24 below depicts 40% (2335/5773) national statistic.

For 172 sites having 10 or more cases: site median 36%, IQR 32-50%, 10-90<sup>th</sup> centiles 23-58%.

For 21 sites having less than 10 cases the overall % of transfusions more than 2g/dl above the post-transfusion Hb trigger was 58% (62/107).

The shaded circles indicate sites with audit results that are inconsistent (p<0.01) with the overall rate (40%) in relation to their sample size; they may have more of a problem than sites not shaded.



#### COMMENT:

33 % of patients were transfused >2g/dl above the Hb threshold set by the audit algorithm (40% of patients with anaemia and 7% of patients with blood loss). Transfusion to a increment of > 2g/dl may be acceptable in patients on a chronic out patient transfusion programme, in order to reduce the frequency of transfusion. When looking at patients with reversible anaemia, 59% were transfused to more than 2g/dl above the pre transfusion Hb. This suggests that there is a significant amount of over-transfusion. For patients with reversible anaemia, it should be sufficient to raise the Hb to a level that resolves symptoms, following which definitive treatment of the anaemia should be used to correct the Hb level. There may be other reasons for transfusing to a higher threshold in this group of patients (e.g. reversible cause of anaemia not correctable). The majority of patients received 2 units, suggesting that 1 unit transfusions may be appropriate in many. In Part 2 of the audit, a random selection of patients who have been defined as 'over-transfused' will be reviewed to check body weight to assess whether this has a bearing in the Hb increment.

#### Final Summary statistics

#### Table 29

	National	Your site
1. Patients who have a possible reversible cause of anaemia (using eGFR≤30 and chronic renal failure as only diagnosis for renal anaemia)	20% (1791/9126)	24% (17/72)
2. Patients (with anaemia or blood loss) transfused above the pre-transfusion Hb trigger level	29% (2533/8820)	20% (14/71)
Patients who fitted into both the above	5% (403/8820)	6% (4/71)
3. Patients who were over-transfused (Anaemia patients: post-transfusion Hb was > 2g/dl above threshold trigger; Blood loss patients: post-transfusion Hb was > 2g/dl above pre-transfusion Hb)	33% (2451/7437)	28% (13/ 46)
ANY OF 1, 2, 3. ABOVE	53% (4818/9126)	44% (32/72)

#### ANY OF 1,2,3 ABOVE

*Consultants* making decision to transfuse: 53.3% (1654/3090) *Other grades* making decision to transfuse: 51.7% (1954/3776) *Unknown grade* making decision to transfuse: 53.9% (1218/2260)

### CONCLUSIONS & COMMENTARY

There was an excellent participation rate with 86.5 % of NHS trusts and 15 independent hospitals submitting between 1 and 165 cases and there were 9126 cases in total. Transfusion was given for anaemia in 78% of cases, for blood loss in 19% and as prophylaxis before procedure in 2% of cases. The commonest reasons for transfusion were: haematological malignancy (despite only 1 in 3 cases of haematological malignancy transfused being audited), gastrointestinal blood loss and anaemia under investigation. The median age was 73 years; the median pre transfusion Hb was 7.8 g/dl and at post transfusion was 9.9 g/dl. The median number of units transfused was 2 units.

Standard 1 A pre-transfusion haemoglobin (Hb) is taken in 100% of cases within 3 days of transfusion (and preferably the same day)
93% of cases had pre-transfusion Hb taken within 3 days before transfusion, with 51% on the same day as transfusion
Standard 2 No non-radiotherapy patient should have a pre transfusion Hb > 10g/dl
3.6% of non-radiotherapy cases had a pre transfusion H > 10g/dl
Standard 3 A post-transfusion Hb is taken in 100% of cases within 3 days following transfusion (and preferably the same day) to assess the effectiveness of the red cell transfusion
84% of cases had a post transfusion Hb taken and of these, 84% had the Hb taken within 3 days after transfusion (12% on the same day)

**Standard 4 No non-radiotherapy patient should have a post transfusion Hb > 12 g/dl** 5.9% of patients had a post transfusion Hb of > 12g/dl

The audit suggests that there is excessive transfusion of red cells to patients under the care of physicians in the UK because of:

- Transfusion in cases with possible reversible anaemia (20%)
- Transfusion above the Hb threshold defined by the audit algorithm (29%)
- Over-transfusion i.e. transfused to more than 2g/dl above the Hb threshold set for each case by the audit algorithm (33%)

Cases may fall into any one of or any combination of groups 1,2&3 and the overall 'inappropriate' transfusion rate as defined in Part 1 of the audit was 53 % There was a wide variation in practice between sites.

It seems that UK physicians do not practice restrictive transfusion practice in a significant number of cases. In patients with chronic transfusion dependent anaemia, it is important to alleviate the patients' symptoms to improve quality of life and restrictive practice may not be appropriate in this group of patients.

Part 2 of the audit is currently in progress. 2000 cases have been selected randomly to review the recognition, investigation and treatment of anaemia, and whether patients who



were transfused above the audit threshold had documented significant symptoms / signs of anaemia.

In addition, information will be collected on the patient's body weight to help to assess the reason for overtransfusion. It has been recommended that data should be collected by a foundation doctor and following discussion with a designated consultant physician on each site, a final decision with regards to the appropriateness of the transfusion will be recorded.

A 2 unit transfusion is the most common prescription; it may be that single unit transfusion is sufficient to bring the Hb above the threshold.

44% of transfusion decisions in Part 1 were made by consultants, with 19% by SpRs and other middle grades, 13% by SHOs and core medical trainees and 12% by foundation doctors. Awareness raising, education and training on management of anaemia and transfusion thresholds must to directed at all levels of medical staff and also at the nurse practitioners who are gradually taking on this role in certain circumstances (e.g. haematological malignancy). With regards to the management of anaemia, it is imperative to engage with primary care and GPs in particular so that anaemia is recognised, investigated and treated in a timely manner.

#### Limitations of the audit

The audit algorithm has used the Hb concentration as the key indicator of appropriate transfusion, however in practice many other features need to be taken into account: chronicity of the anaemia, patients' symptoms and signs, rate and volume of blood loss if present, reversibility of the anaemia, etc.

The definition of possible reversible anaemia was based on the results available. With regards to haematinic measurements, these were only available in 30-40% of the cases; the use of MCV as surrogate marker for iron deficiency is not perfect as the cut-off of 78fl chosen may also include some anaemia of chronic disorder and thalassaemia trait cases. Cases of potential B12 and folate deficiency may have been missed and macrocytosis was not used as a surrogate marker in view of the multiple different causes of macrocytosis. The selection of a standardised cut off level to diagnose haematinic deficiency was hampered by the fact that there is a recognised wide variation in normal ranges of haematinic assays in UK laboratories depending on the techniques and reagents used. A few cases where the levels were lower than the cut off chosen by the audit group may have been in the normal range in a few laboratories. The use of a one-off eGFR reading is not the sole indicator of whether a patient has a renal anaemia potentially treatable with IV iron and EPO. The eGFR calculation did not take ethnicity into account as this information was not available: race can have a significant impact on the eGFR result.

The Hb thresholds have been developed by consensus opinion and are based on the National Indication codes. More recently, other national guidelines have been published that are supportive of a restrictive approach to red cell transfusion, although the results of



randomised trials have been extrapolated to cover medical patients. Hb level alone is an imperfect trigger for transfusion and Part 2 of the audit has been designed to understand the population of patients falling outside the audit algorithm who may well have valid documented reason for transfusion, in particular significant symptoms and signs of anaemia. This may be especially true of patients with chronic anaemia where transfusion to a higher transfusion threshold may improve quality of life.

The definition of overtransfusion of > 2g/dl increase in Hb and or 2g/dl above the threshold set for that patient is derived from consensus opinion rather than evidence base. The audit has not attempted to define under transfusion – this may also be a significant problem that has not been analysed here.

#### Next steps

Part 2 of the audit is being conducted April – June 2012 and will be reported in 2013.



## **RECOMMENDATIONS & ACTION PLAN**

A full final audit report incorporating the findings of Part 1 and Part 2 will contain a detailed list of recommendations and actions. It is likely that the recommendations will include the following:

- Develop tools to guide appropriate transfusion decisions for physicians
- Develop tools to support the recognition, investigation and effective treatment of anaemia
- Promote use of single unit transfusion then check Hb when transfusing for anaemia
- Promote development of anaemia management services to provide a resource for effective and timely anaemia management (which may help to avoid emergency admission and unnecessary transfusion) and education and training for staff in both primary and secondary care
- Ensure reason for transfusion is documented in the notes; the patient should be consented and given the option of alternatives to transfusion if indicated, e.g. IV iron of oral iron fails

## SUPPLEMENTARY FINDINGS

## Table 30 - Supplementary data findings (the following data is not analysed by site)

	Pre-Hb threshold (g/dl)	Inappropriate transfusion: Above pre-Hb threshold	Post-Hb threshold (g/dl)	Over- transfused: >2g/dl above post-Hb threshold	Reversible anaemia (using eGFR≤30 and chronic renal failure was only diagnosis)	ANY: Inappropriate transfusion OR over-transfused OR reversible anaemia (using eGFR≤30 and chronic renal failure was only diagnosis)
[A] Patients with anaemia <sup>1</sup>		34% (2427/7071)		40% (2335/5773)	21% (1452/7071)	61% (4294/7071)
1. Radiotherapy	11.0	7% (7/102)	13.0	11% (10/89)	9% (9/102)	21% (21/102)
2. Thalassaemia	10.0	39% (40/103)	12.0	13% (6/46)	8% (8/103)	46% (47/103)
3. Age > 65 with bone marrow failure	9.0	18% (231/1295)	11.0	13% (115/882)	7% (95/1295)	29% (378/1295)
4. Age > 65 with chemotherapy	9.0	24% (59/245)	11.0	34% (66/192)	11% (28/245)	48% (118/245)
5. Age >65 without bone marrow failure or chemotherapy or comorbidity <sup>2</sup>	8.0	32% (160/502)	10.0	45% (183/406)	26% (133/502)	69% (345/502)
<ol> <li>Any age with comorbidity</li> </ol>	8.0	34% (1224/3633)	10.0	44% (1384/3152)	26% (955/3633)	68% (2454/3633)
7. Age ≤65 with bone marrow failure	8.0	46% (185/400)	10.0	36% (127/355)	6% (23/400)	58% (232/400)
8. Age ≤65 with chemotherapy	8.0	74% (138/186)	10.0	65% (95/147)	10% (18/186)	85% (158/186)
9. Age ≤65 without bone marrow failure or chemotherapy or comorbidity <sup>1</sup>	7.0	63% (383/605)	9.0	69% (349/504)	30% (183/605)	89% (541/605)
[B] Patients with blood loss <sup>3</sup>	10.0	6% (106/1749)	12.0	7% (116/1664)	16% (282/1749)	26% (461/1749)
[A and B] All patients with anaemia or blood loss		29% (2533/8820)		33% (2451/7437)	20% (1734/8820)	54% (4755/8820)

Notes to table 30 (previous page)

1. Of 7128 patients with anaemia, 55 could not be classified because the pre-transfusion Hb was not known and 2 because age was not known.

2. Co-morbidity defined as cardiac, respiratory or vascular disease (Q13) or on any of the drugs (Q13b)

3. Of 1773 patients with blood loss, 10 having radiotherapy were excluded and 14 could not be classified because the pre-transfusion Hb was not known

# 2. GI blood loss (Q6B1, Q6B2, Q6B3) and transfusion thresholds of % transfused above 10g/dI, % transfused above 8g/dI and % with iron deficiency anaemia & blood loss

N=1785. Acute GI bleed, Upper – Haematemesis or melaena, or Lower – Bleeding per rectum. % iron deficiency anaemia = 14% (253/1785).

% blood loss as reason for red cell use = 74% (1325/1785).

% iron deficiency anaemia in those with blood loss as reason for red cell use = 12% (165/1325).

Figure 25













#### 3. Menorrhagia (Q6G1)

N=73. % possible iron deficiency anaemia = 64% (47/73)

Figure 27

Pre-Hb: median 6.9, IQR 5.9-7.5, n=72 % transfused above 10g/dl = 1.4% (1/72) % transfused above 8g/dl = 8.3% (6/72) Post-Hb: median 9.8g/dl, IQR 8.9-10.4, n=65 (Post minus Pre)Hb: median 2.6g/dl IQR 1.7-4.0, n=64 (Post minus Pre)Hb>2g/dl: 69% (44/64)

#### 4. Patients with bone marrow failure

Figure 28

Age ≤65, N <b>=</b> 670	Age >65, N=1369
Pre-Hb: median 7.9g/dl, IQR 7.5-8.5, n=667	Pre-Hb: median 8.2g/dl, IQR 7.4-8.8,
% transfused above 10g/dl = 2.5% (17/667)	n=1355
% transfused above 8g/dl = 46% (306/667)	% transfused above 10g/dl =
	4.1% (56/1355)
Post-Hb: median 9.7g/dl, IQR 8.9-10.5, n=578	% transfused above 8g/dl = 54%
(Post minus Pre)Hb: median 1.8g/dl IQR 1.0-2.4,	(725/1355)
n=577	
(Post minus Pre)Hb>2g/dl: 40% (231/577)	Post-Hb: median 9.7g/dl, IQR
	8.9-10.5, n=938
	(Post minus Pre)Hb: median 1.6g/dl
	IQR 0.8-2.5, n=928
	(Post minus Pre)Hb>2g/dl: 37%
	(340/928)







#### **5.** Possible iron deficiency patients – picked out by algorithm N=1201 Figure 30

Pre-Hb: median 7.3g/dl, IQR 6.2-8.0, n=1199 % transfused above 10g/dl = 1.0% (12/1199) % transfused above 8g/dl = 24% (282/1199) Post-Hb: median 9.8g/dl, IQR 9.0-10.7, n=1012 (Post minus Pre)Hb: median 2.6g/dl IQR 1.8-3.6, n=1010 (Post minus Pre)Hb>2g/dl : 66% (667/1010)

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## 6. Possible B12/folate patients- picked out by algorithm N=232

7. Possible renal anaemia patients-picked out by algorithm using eGFR≤30 with chronic renal failure ticked ONLY and no other diagnosis ticked N=293 (definition 2)

Figure 33

# ${\bf 8.~\%}$ cases with cardiac disease, respiratory disease and vascular disease individually, two or all three

All combinations given below:

#### Table 31

Q13C Cardiac disease on admission	Q13R	Q13VD		
	Respiratory	Vascular	N	0/
	disease on	disease on	IN	/0
	admission	admission		
No	No	No	4665	51
No	No	Yes	396	4
No	Yes	No	572	6
No	Yes	Yes	57	0.6
Yes	No	No	2372	26
Yes	No	Yes	452	5
Yes	Yes	No	474	5
Yes	Yes	Yes	138	2
			9126	

#### 9. % cases with fatigue and SOB individually,

31% cases with fatigue 30% cases with SOB

16% cases with fatigue only15% cases with SOB only14% cases with BOTH

46% cases with either fatigue or SOB 54% cases with NEITHER

#### Table 32

	Q13aSOB Shortness of breath symptoms			
		No	Yes	Total
Q13aF Fatigue	No	4926	1402	6328
symptoms	Yes	1486	1312	2798
	Total	6412	2714	9126

#### 10. Drug therapy:

% on no drugs: 38% (3511) % on 1 drug: 16% (1460) % 2-4 drugs: 36% (3281) % 5-9 drugs: 10% (871) % > 10 drugs: <0.1% (3)

#### Table 33

				Cumulative
		Frequency	Percent	Percent
Drugs	0	3511	38.5	38.5
	1	1460	16.0	54.5
	2	1356	14.9	69.3
	3	1106	12.1	81.4
	4	819	9.0	90.4
	5	453	5.0	95.4
	6	260	2.8	98.2
	7	93	1.0	99.3
	8	45	.5	99.7
	9	20	.2	100.0
	10	3	.0	100.0
	Total	9126	100.0	

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## ABBREVIATIONS

- A&E Accident and emergency department
- AABB (formerly the American Association of Blood Banks)
- AIHA Auto Immune Haemolytic Anaemia
- B12 Vitamin B12
- BCSH British Committee for Standards in Haematology
- CQC Care Quality Commission
- CRP C Reactive Protein
- DAT Direct Antiglobulin Test
- DH Department of Health
- eGFR estimated Glomerular Filtration Rate
- EAU/MAU Emergency Assessment Unit / Medical Assessment Unit
- ERCP Endoscopic retrograde cholangiopancreatography
- EPO Erythropoietin
- ESR Erythrocyte Sedimentation Rate
- fl femolitres
- g/dl Grammes per decilitre ( a measure of the amount of haemoglobin in the blood)
- GI Gastrointestinal
- GP General Practitioner
- Hb Haemoglobin
- IQR Inter-quartile range
- ITU Intensive Care Unit
- IV Intravenous
- MCV Mean corpuscular volume
- mcg/I microgrammes per litre
- MDS Myelodysplasia
- NCA or NCABT National Comparative Audit of Blood Transfusion
- ng/ml nanogrammes per millilitre
- NHS National Health Service
- NHSBT NHS Blood and Transplant
- pg/ml picagrammes per millilitre
- pH The **pH** scale measures how acidic or basic a substance is.
- RTC Regional Transfusion Committee
- SHOs Senior House Officers
- SHOT Serious Hazards of Transfusion
- SpRs Specialist Registrars
- SPSS The statistical package used to analyse data for this audit
- TIBC Total Iron Binding Capacity
- TRICC Transfusion Requirements in Critical Care Investigators
- TSAT Transferrin saturation

# APPENDIX A – PATIENT AUDIT TOOL

1. Patient's year of birth			
2. What is the patient's gender?	Female	Male	
3. Date of transfusion			
4. Time of transfusion			
(24 hour clock)	H H:mm		
4a. Was this transfusion still running	ng at 01:00 the following day?	Yes [	] No 🗌
5. Reason for red cell use			
Anaemia 🗌 🛛 Blood loss 🛛 [	Prophylactic prior to procedu	ire [	]
If prophylactic prior to procedure	please indicate which by ticking a	a circle:	
<ul> <li>Endoscopy with biopsy</li> <li>Endoscopy without biopsy</li> <li>ERCP without sphincteroto</li> <li>ERCP with sphincterotomy</li> <li>Liver biopsy</li> <li>Surgery</li> </ul>	omy ,		
If Surgery, what was the operation	ו?		

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«Name»

## 6. Clinical presentation - Please tick a circle or circles as appropriate

## a) General

O Anaemia under investigation - cause not yet known

## b) Gastro-intestinal

- O Acute GI bleed
- O Upper Haematemesis or melaena
- O Lower Bleeding per rectum
- O Liver failure
- O Pancreatitis

#### c) Haematology

- O Iron deficiency (not acute GI bleed)
- O B12/folate deficiency
- O Anaemia of chronic disorder
- O Haemolysis acquired autoimmune
- O Haemolysis congenital spherocytosis
- O Sickle cell disease acute transfusion
- O Sickle cell disease chronic transfusion programme
- O Thalassaemia

## d) Bone marrow failure

- O Aplastic anaemia
- O Acute myeloid leukaemia
- O Acute lymphoblastic leukaemia
- O Myelodysplasia
- O Myeloproliferative disease (myelofibrosis)
- O Chronic leukaemia any type
- O Lymphoma any type
- O Myeloma
- O Non-haematological malignant infiltration

## e) Nephrology

- O Chronic renal failure
- O Acute renal failure as primary diagnosis

## f) Oncology

- Chemotherapy
- O Anaemia of malignancy
- O Radiotherapy

## g) Other bleeding

- O Menorrhagia
- O Epistaxis
- O Haemoptysis
- O Retroperitoneal bleeding
- O Other (please state)

## h) Other reason for transfusion if not listed above (please state)

7. Date of Pre-transfusion Hb (dd/mm)	Not done
8. Pre-Transfusion Hb g/dl	
9. Date of Post-transfusion Hb (dd/mm)	Not done
=	
10. Post-Transfusion Hb g/dl	
11. Number of units transfused	

## 12. Place of transfusion

- O Ward
- O Day Unit
- O EAU/MAU
- O Hospice
- O Home
- O Other

Other details

**13.** Please indicate which diseases the patient had on admission (*Tick as many as apply or leave blank*)



13a. Did the patient have either of these symptoms? (if neither, leave blank)

Fatigue	Sho

ortness of breath



**13b.** Was the patient on any of these drugs on admission? (*Tick as many as apply or leave blank*)

Amiloride	Isosorbide Mononitrate (ISMN)	
Aminophylline	Lercanidipine	
Amlodipine	Lisinopril	
Aspirin	Losartan	
Atenolol	Metolazone	
Atorvastatin	Nebivilol	
Bendroflumethiazide	Nifedipine	
Bisoprolol	Oxprenolol	
Bumetanide	Perindopril	
Candesartan	Prasugrel	
Captopril	Pravastatin	
Carvidolol	Prednisolone	
Clopidogrel	Ramipril	
Coamilofruse	Rosuvastatin	
Diltiazem	Salbutamol	
Dypiridamole	Salmeterol	
Enalapril	Simvastatin	
Eplerenone	Spironolactone	
Felodipine	Terbutaline	
Furosemide	Theophylline	
Glyceryl trinitrate (GTN)	Tiotropium	
Ipratropium (Atrovent)	Verapamil	
Irbesartan	Warfarin	
Isosorbide Dinitrate		

## 14. Laboratory tests

Please provide the following information, if available. (Use results **nearest** to before the date/time of transfusion, but no earlier than 3 months before the date of transfusion). If the test results are not available, please indicate with a tick if the test was not done or was not available.

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15. Is it clear which grade of physician is making the prescription decision?

Yes

No



«Name»

15a. If yes, which grade of staff made the decision?

- O Consultant
- Other (please record name and then check grade with HR if not clear from notes. NB When entering this information online please do not enter the name of the doctor – only enter that doctor's grade)

Other details

## **APPENDIX B – PART 2 PATIENT AUDIT TOOL**

# Section One – Patients who have received a transfusion and who have a potentially reversible cause of anaemia

1. On what date was this patient's anaemia first noted?

2. Which clinical service first noted the anaemia?

Primary Care, A&E, Outpatient (state specialty), Inpatient (state specialty)

Other, please state

2a. Were investigations undertaken to find the cause of the anaemia? If yes, complete questions 3 to 6 as appropriate. If no, go to question 7.

3. Which investigation for **iron deficiency** was undertaken and by which clinical service?

3a) If gastrointestinal investigations were carried out, please state which *(otherwise, leave blank and go on to question 3b)*:

3b) If gynaecological investigations were carried out, please state which *(otherwise, leave blank and go on to question 3c)*:

3c) If other investigations were carried out, please state which *(otherwise, leave blank and go on to question 4)*:

4. Which investigation for **B12 / Folate deficiency** was undertaken and by which clinical service? (

4a) If other gastrointestinal investigations were carried out, please state which *(otherwise, leave blank and go to Q4b)*:

4b) If other investigations were carried out, please state which *(otherwise, leave blank and go to Q5)*:

5. Which investigation for **Autoimmune Haemolytic Anaemia (AIHA)** was undertaken and by which clinical service?

5a. If other investigations were carried out, please state which *(otherwise, leave blank and go to Q6)*:

6. Which investigation for **Renal anaemia** was undertaken and by which clinical service?

6a. If other investigations were carried out, please state which *(otherwise, leave blank)*:

#### Now please go to Q7

## Summary of the diagnosis

- 7. What was the documented cause of anaemia? (Tick as many as apply)
- 7a. Iron deficiency
- 7b. B12 and/or folate deficiency
- 7c. Anaemia of chronic disease
- 7d. Renal anaemia
- 7e. Autoimmune Haemolytic Anaemia
- 7f. Other cause of anaemia (state which)
- 7g. Cause not documented
- 7h. Not diagnosed because not investigated
- 7i. Not diagnosed because results of investigations were not reviewed
- 7j. Not diagnosed because investigations were inconclusive



If anaemia was diagnosed, what treatment was prescribed? (If anaemia was not diagnosed, leave blank and move to Q15

8. For iron deficiency:				
8a. Iron Therapy Yes	No			
8b. If yes, was it: Oral [				
8c. If oral, was the patient	intolerant or non-co	ompliant Yes	No No	
with treatment?				
8d. If yes, was the patient	offered IV iron?	Yes	No 🗌	
9. For B12/Folate deficient	су			
9a. Was B12 prescribed?	Yes	No 🗌		
9b. Was folic acid prescrib	ed? Yes	No		
10. For AIHA				
10a. Were steroids prescri	bed?	Yes	No 🗌	
10b. Was any other treatment prescribed?		Yes	No 📃	
10c. If yes, please give de	tails:			
11. For renal anaemia				
11a. Was IV iron prescribe	ed? Yes	No 🗌		
11b. Was EPO prescribed	? Yes	No 🗌		
What treatment was give	n for the underlyi	ng cause of t	he anaemia?	
12. For iron deficiency				
12a. Dietary advice	Yes	No 🗌		
12b. Treatment of GI disor	der Yes	No 🗌		
12c. If yes, please give de	tails:			



12d. Treatment of menorrhagia	Yes	No 🗌
12e. If yes, please give details:		
12f. Other, please state:		
13. For B12 / Folate deficiency		
13a. Dietary advice	Yes	No 🗌
13b. Treatment of GI disorder	Yes	No 🗌
13c. If yes, please give details:		
13d. Other, please state:		
14. For renal anaemia		

14a. Was the patient referred to a nephrologist for further management of the anaemia and chronic kidney disease?

Yes No	
--------	--

According to the data supplied to us in Part 1 of this audit, it is our opinion that this patient was transfused with red cells in order to treat a potentially reversible cause of anaemia.

15. Is there a documented reason for transfusion in the case notes?

Yes No

16. Are any of the following symptoms documented:

- 16a. Palpitations?
- 16b. Breathlessness at rest / on minimal exertion?
- 16c. Chest pain?
- 16d. Postural hypotension?
- 16e. Tachycardia?
- 16f. Acute blood loss?
- 16g. Please give details of any other symptoms documented:

17. In your opinion, could this transfusion have been avoided?

(discuss with your consultant supervisor)

	lf yes, explain h	now the trans	fusion could ha	ave been avoideo	d (tick one option)	)
	Anaemia not identified prior to transfusion (no blood tests performed or performed but results not received) despite risk of anaemia from e.g. low grade bleeding, dietary issues or previous history)					ormed g,
	Anaemia identil	fied but not ir	nvestigated for	treatable cause		
	Anaemia identified and investigated but not adequately treated (e.g. failure to move to IV iron if oral iron not effective; failure to treat underlying cause)					
	Other, please s	tate:				
18. Following transfusion, which of these, if any, definitive treatments for the anaemia were started? (Tick as many as apply or leave blank if treatment was not started)						
	Oral iron	IV iron	B12	Folate	EPO	
	] Other, please s	state:				

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## **SECTION TWO**

## This patient was, in our opinion, transfused above the threshold set.

19. Is there a documented reason for this in the case notes?

Are any of the following symptoms documented:

- 19a. Palpitations?
- 19b. Breathlessness at rest / on minimal exertion?
- 19c. Chest pain?
- 19d. Postural hypotension?
- 19e. Tachycardia?

20. In your opinion, was this an appropriate transfusion? *(discuss with your consultant supervisor)* 

## SECTION THREE

## This patient was, in our opinion, overtransfused.

21. What was the weight of this patient, in Kg?

it tool



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# **APPENDIX C – INTERIM REPORT**



National Comparative Audit Of Blood Transfusion



## Introduction

This is an interim report on the data you contributed to the 2011 Audit of the transfusion of red cells in medical patients

. It is meant to provide an early insight into 4 aspects of medical transfusion: The need to take a pre-transfusion haemoglobin (Hb) value, a post-transfusion Hb (so the need for red cells can be established and the expected rise in Hb confirmed), the unnecessary use of red cells because a patient had a pre-transfusion Hb of 10 or more and was not receiving radiotherapy, and finally the excessive use of red cells because the patient had a post-transfusion Hb of 12 or more.

These quality indicators are derived from The British Committee for Standards in Haematology guidelines, conclusions from previous audits and R codes.

You contributed <<ncases>> to the 2011 Medical Use of Blood audit.

#### **Pre-Transfusion Hb recorded**

BCSH guidelines recommend that a pre-transfusion Hb is taken so that the need for red cells can be justified on the basis of that reading. N & % of your cases had a pre-transfusion Hb recorded, but X did not. These were your audited patient numbers nn,nn.nn, etc. If you used a Linkage Record during the audit, you will have an opportunity to trace back to the patient's notes should you wish to investigate the reasons for this finding.

#### Post Transfusion Hb recorded

There is a need to record a post-transfusion Hb so that it can be demonstrated that the expected rise in Hb has occurred, which should be of benefit to the patient. N & % of your cases had a post-transfusion Hb recorded, but X did not. These were your audited patient numbers nn,nn.nn, etc.

The lack of a post transfusion Hb may be acceptable in some circumstances such as routine transfusion in a long term patient on the Haematology day ward; this will be reflected in the final report.

## Pre-Transfusion Hb was >10 and patient was NOT receiving radiotherapy

The standards set for this audit suggest that a patient with a pre-transfusion Hb of 10 or more does not need a red cell transfusion except in the case of those patients receiving radiotherapy. N & % of your cases had a pre-transfusion Hb of 10 or more and were receiving radiotherapy, but X were not. These were your audited patient numbers nn,nn.nn, etc.

## Post-Transfusion Hb was >12

The standards set for this audit suggest that a patient with a post-transfusion Hb of 12 has been given too much blood. N & % of your transfused cases had a post-transfusion Hb of 12 or more. These were your audited patient numbers nn,nn.nn, etc.

## Conclusions

This is an interim report based on the initial download of data, and represents the data as keyed in by your hospital or Trust.

The reason for apparent non-compliance with the taking of blood samples for the purposes of obtaining a pre and post-transfusion haemoglobin value may be that it simply was not done, or that there was no evidence in the patient's records or other information systems that these tests were performed. In some cases the data supplied suggested that the Hb readings supplied were either not pre or post transfusion, because of the way the dates of the Hb tests related to the date of transfusion. If these dates were entered incorrectly, it is possible that the number of patients without these Hb tests is being overstated.

This report is issued now to give you an opportunity to engage your physicians in dialogue about the patients who may be transfused without Hb testing, and about those patients who may have been transfused above the recommended Hb threshold.

The main report will be available during April 2012 and will supercede this report, after which this report should be disregarded. The main report will analyse cases in much greater detail and therefore will provide a more useful insight into medical transfusion practice.

This report is only made available to your Trust or Hospital – the National Comparative Audit Programme never reports your results elsewhere without your prior agreement.

## **APPENDIX D – PARTICIPATING HOSPITALS**

Addenbrooke's Hospital Airedale NHS Foundation Trust Altnagelvin Area Hospital Antrim Area Hospital Barnet and Chase Farm Hospitals NHS Trust **Barnsley Hospital** Basildon and Thurrock University Hospitals NHS Foundation Trust Basingstoke and North Hampshire NHS Foundation Trust Bedford Hospital NHS Trust Betsi Cadwaladr University Health Board **Birmingham City Hospital Birmingham Heartlands Hospital** Blackpool Teaching Hospitals NHS Foundation Trust **BMI** The Priory Hospital **BMI The Saxon Clinic** Borders General Hospital Bradford Teaching Hospitals NHS Foundation Trust Brighton and Sussex University Hospitals NHS Trust **Buckinghamshire Healthcare NHS Trust** Burton Hospitals NHS Foundation Trust Calderdale and Huddersfield NHS Foundation Trust **Causeway Hospital** Chelsea and Westminster Hospital NHS Foundation Trust Chesterfield Royal Hospital NHS Foundation Trust City Hospitals Sunderland NHS Foundation Trust Clatterbridge Centre for Oncology NHS Foundation Trust Colchester Hospital University NHS Foundation Trust Conquest Hospital Countess of Chester Hospital NHS Foundation Trust Craigavon Area Hospital **Croydon Health Services NHS Trust** Cumberland Infirmary **Darlington Memorial Hospital** Dartford and Gravesham NHS Trust **Derby Hospitals NHS Foundation Trust** Dumfries and Galloway Royal Infirmary Ealing Hospital NHS Trust East Cheshire NHS Trust East Lancashire Hospitals NHS Trust



Erne Hospital Fairfield General Hospital Frimley Park Hospital NHS Foundation Trust Gartnavel General Hospital Gateshead Health NHS Foundation Trust George Eliot Hospital NHS Trust **Glasgow Royal Infirmary Gloucestershire Hospitals NHS Foundation Trust** Good Hope Hospital Great Western Hospitals NHS Foundation Trust Guys and St Thomas' NHS Foundation Trust Hammersmith Hospital Harrogate and District NHS Foundation Trust Heatherwood and Wexham Park Hospitals NHS Foundation Trust Hexham General Hospital Hinchingbrooke Health Care NHS Trust Homerton University Hospital NHS Foundation Trust Hull and East Yorkshire Hospitals NHS Trust Inverclyde Royal Hospital James Paget University Hospitals NHS Foundation Trust Kent and Canterbury Hospital Kettering General Hospital King Edward VIIs Hospital Sister Agnes King's College Hospital NHS Foundation Trust King's Mill Hospital Kingston Hospital Surrey Lancashire Teaching Hospitals NHS Foundation Trust Lincoln County Hospital Lister Hospital Liverpool Heart and Chest Hospital London Bridge Hospital Luton and Dunstable Hospital Manchester Royal Infirmary Marie Curie Hospice Medway NHS Foundation Trust Mid Cheshire Hospitals NHS Foundation Trust Mid Essex Hospital Services NHS Trust Mid Staffordshire NHS Foundation Trust Milton Keynes NHS Foundation Trust Monklands Hospital Morriston Hospital Neath Port Talbot Hospital Nevill Hall Hospital NHS Fife



NHS Lothian NHS Western Isles Noble's Hospital Norfolk and Norwich University Hospital North Bristol NHS Trust North Manchester General Hospital North Middlesex University Hospital North Middlesex University Hospital London North Tees and Hartlepool NHS Foundation Trust North Tyneside General Hospital North Shields Northampton General Hospital NHS Trust Northern Devon Healthcare NHS Trust Northern General Hospital Northern Lincolnshire and Goole Hospitals NHS Foundation Trust Nottingham University Hospitals NHS Trust Oxford Radcliffe Hospitals NHS Trust Papworth Hospital NHS Foundation Trust Peterborough City Hospital **Pilgrim Hospital Poole Hospital NHS Foundation Trust** Prince Charles Hospital Princess Alexandra Hospital Princess of Wales Hospital Queen Alexandra Hospital Queen Elizabeth Hospital Birmingham Queen Elizabeth The Queen Mother Hospital Queen's Hospital Romford **Rochdale Infirmary** Royal Alexandra Hospital **Royal Bolton Hospital** Royal Cornwall Hospitals NHS Trust Royal Devon and Exeter Hospital **Royal Free Hospital** Royal Glamorgan Hospital **Royal Gwent Hospital** Royal Marsden Hospital Chelsea **Royal Marsden Hospital Sutton** Royal Oldham Hospital Royal Surrey County Hospital NHS Foundation Trust Royal United Hospital Salford Royal NHS Foundation Trust Salisbury NHS Foundation Trust Sandwell General Hospital Singleton Hospital



Solihull Hospital South London Healthcare NHS Trust South Tyneside NHS Foundation Trust South Warwickshire NHS Foundation Trust Southend University Hospital NHS Foundation Trust Southport and Ormskirk Hospital NHS Trust Spire Hull and East Riding Hospital Spire Dunedin Hospital Spire Leeds Hospital Spire Little Aston Hospital Spire Parkway Hospital Spire Southampton Hospital Spire Tunbridge Wells Hospital St Anthonys Hospital St. George's Healthcare NHS Trust St. Mary's Hospital Paddington St. Peter's Hospital Stepping Hill Hospital Surrey and Sussex Healthcare NHS Trust **Taunton and Somerset Hospital** The Christie NHS Foundation Trust The Dudley Group of Hospitals NHS Foundation Trust The Harley Street Clinic The Hillingdon Hospitals NHS Foundation Trust The Ipswich Hospital NHS Trust The James Cook University Hospital The Leeds Teaching Hospitals NHS Trust The Mid Yorkshire Hospitals NHS Trust The Newcastle upon Tyne Hospitals NHS Foundation Trust The North West London Hospitals NHS Trust The Princess Grace Hospital The Queen Elizabeth Hospital Kings Lynn NHS Foundation Trust The Queen Elizabeth II Hospital The Rotherham NHS Foundation Trust The Royal Bournemouth and Christchurch Hospitals NHS Foundation Trust The Royal Hallamshire Hospital The Royal Liverpool University Hospital The Royal Wolverhampton Hospitals NHS Trust The Shrewsbury and Telford Hospital NHS Trust The Wellington Hospital The Whittington Hospital NHS Trust Trafford Healthcare NHS Trust University College London Hospitals NHS Foundation Trust University Hospital Aintree



University Hospital of North Durham University Hospital of North Staffordshire NHS Trust University Hospital of South Manchester NHS Foundation Trust University Hospital Southampton NHS Foundation Trust University Hospitals Bristol NHS Foundation Trust University Hospitals Coventry and Warwickshire NHS Trust University Hospitals of Leicester NHS Trust University Hospitals of Morecambe Bay NHS Foundation Trust Vale of Leven District General Hospital Walsall Healthcare NHS Trust Wansbeck General Hospital Warrington and Halton Hospitals NHS Foundation Trust West Hertfordshire Hospitals NHS Trust West Middlesex University Hospital NHS Trust West Suffolk Hospital Western Sussex Hospitals NHS Trust Weston General Hospital William Harvey Hospital Winchester and Eastleigh Healthcare NHS Trust Wishaw General Hospital Withybush General Hospital Worcestershire Acute Hospitals NHS Trust Wrightington, Wigan and Leigh NHS Foundation Trust Wye Valley NHS Trust Yeovil District Hospital NHS Foundation Trust York Teaching Hospital NHS Foundation Trust

# **APPENDIX E – QUALITY ACCOUNT STATEMENT**

We have prepared this section in case you would like to use it your Quality Account for 2011/12.

## **Quality Account statement**

In 2011, **St. Elsewhere's Hospital** contributed **72** to the National Comparative Audit of Blood Transfusion audit "2011 Medical Use of Blood - Part 1. This was 100% of the sample required.

## Resources

Department of Health. Quality Accounts aim to enhance accountability to the public and engage the leaders of an organization in their quality improvement agenda. <u>http://www.dh.gov.uk/en/Healthcare/Qualityandproductivity/Makingqualityhappen/quality accounts/index.htm</u>

Healthcare Quality Improvement Partnership. National audits for inclusion in quality accounts and guidance for preparation of quality accounts statement. <u>http://www.hqip.org.uk/national-clinical-audits-for-inclusion-in-quality-accounts-portal-goes-live</u>

