Anaemia Study Day
South West Regional Study Day
25th March 2015

Pre Operative Optimisation

Mr John Faulds
Patient Blood Management Coordinator
Royal Cornwall Hospital
Why Pre Optimisation and what is Patient Blood Management?
Our reason for Pre op Optimisation and PBM

Primary aim to reduce the need for red blood cell transfusion, in those patients where transfusion can be avoided, through the use of other treatment/interventions modalities and interventions
What is Patient Blood Management?

Patient blood management (PBM) views a patient’s own blood as a valuable and unique natural resource that should be conserved and managed appropriately.

PBM is a multidisciplinary, multimodal, evidence based, patient centred approach to optimising, conserving and managing the patient’s own blood.

PBM puts the patient at the centre of decisions made about transfusion.
Key benefits of a surgical patient blood management service

- Reduced risk for patients and improved patient care
- Reduced demand on blood banks and associated costs
- Reduction in last minute cancelled operations
- Reduced risk of peri-operative operative complications leading to reduce length of stay.
Blood Conservation Service Pledge
Royal Cornwall Hospital

The Royal Cornwall Hospital employs and supports a patient blood management programme.

Background
Since 2003 Blood Conservation strategies have been implemented within the Royal Cornwall Hospital to support the reduction of allogeneic (donor) blood transfusion peri-operatively. Initially focussed on conserving blood during orthopaedic surgery, the service has since expanded to include all surgical specialties, and evolved into a Patient Blood Management Programme.

The current blood management programme aims to reduce the consumption of allogeneic blood in the surgical setting, in the following ways:

1. **Optimise patients’ Hb (blood count) levels before surgery.**
2. Use appropriate cell salvage techniques to collect patients’ own blood for re-infusion peri-operatively.
3. Implement a comprehensive blood conservation, competency based training program for all staff involved in cell salvage and blood conservation.
4. When indicated, support the use of blood transfusions, ensuring that updated and current practice is employed and patient consent is sought whenever possible.
5. Educate staff to always consider the use of alternatives to blood transfusion when appropriate.
6. Monitor the use of cell salvage, audit interventions, collect and disseminate data relating to blood conservation.
7. Undertake research and publish outcomes in relevant areas of blood conservation.
Transfusion / Anaemia
Headlines
Patient Blood Management – The Future of Blood Transfusion
A joint initiative with The Department of Health and The National Blood Transfusion Committee

What is being done?
A panel of experts and influencers in the field are being invited to consider international best practice and what can be done to ensure a Patient Blood Management approach is adopted across England and North Wales.

Blood Matters: doing nothing is not an option
Sir Bruce Keogh, NHS Medical Director

Sustainability of the blood supply

While the demand for red cells is stable, the demand for platelets increased by 8% in the last year. The recent increase in the use of platelets is projected to continue due to a number of factors such as medical advances and an aging population. Only 4% of the eligible population give blood, and new donors are always needed to replace regular donors who can no longer donate.
Killed by a needless blood transfusion!!!
www.telegraph.co.uk/health

- Deryck Kenny – First person in the world, recorded as dying of vCJD in 2003
- Sir Bruce Keogh, NHS Medical Director – one in five blood transfusions “unnecessary”
- Prof Mike Murphy – Most blood transfusions are non-urgent, used routinely to ‘top up’ patients about to undergo planned surgery.
- Dr Paula Bolton-Maggs, medical director of SHOT – “inappropriate” transfusions are due to errors made in measuring Hb levels.
- Low iron levels, which cause low Hb levels, are a common reason for blood transfusions?
- All patients preparing for elective surgery should have their blood tested beforehand, so that any iron deficiency can be identified and treated.
Enhanced Recovery After Surgery

Optimising patients with anaemia prior to surgery

What should be done and why?

- General health check including full blood count
  - If anaemic (haemoglobin in females below 12.5g/dL and males below 13.5g/dL) look for a cause.
  - If iron deficient, treat with oral iron and look for cause.

- Benefits of detecting anaemia prior to surgery
  - Earlier detection, more opportunity to treat anaemia and raise haemoglobin.
  - Higher haemoglobin at surgery, less chance of anaemia. Less to need blood transfusion. Own red cells physiologically better than transfused red cells.

Where and when is best?

- GP surgery
  - Optimise prior to referral.
  - Early detection of anaemia.
  - Time to treat iron deficiency or refer other anaemias.

- Pre-op clinic
  - Optimise prior to surgery.
  - Treat iron deficiency.
  - Identify those who might need transfusion.
  - Specialist referral for cause of anaemia.

- Admissions for surgery
  - Anaemic patients likely to be transfused or cancelled.
  - Can still target blood.

Cost of detecting anaemia prior to surgery

- Detection of anaemia may lead to delay or cancellation of surgery to investigate and manage anaemia.
- Investigation of anaemia may be costly and require specialist input.
- Treatment of iron deficiency takes time (oral quicker than iron)
- Detecting another illness causing anaemia may change priorities but patient remains symptomatic from joint disorder.

Delivering enhanced recovery

Helping patients to get better sooner after surgery

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www.dh.gov.uk/publications
The Three Pillars of Multidisciplinary Multimodal Patient Blood Management

1st Pillar
Optimise red cell mass
- Detect, diagnose and treat reversible anaemia (eg iron deficiency)
- Identify underlying cause for the anaemia (eg NAIDs or occult GIT malignancy)
- Refer for further evaluation if necessary
- Note: Reversible anaemia is generally a contraindication for elective surgery

2nd Pillar
Minimise blood loss
- Identify and manage bleeding risk
- Minimising iatrogenic blood loss
- Procedure planning and rehearsal
- Preoperative autologous blood donations (in selected cases)
- Other
- Meticulous haemostasis and surgical techniques
- Blood sparing surgical techniques
- Anaesthetic blood conserving strategies
- Autologous blood options
- Pharmacological haemostatic agents

3rd Pillar
Harness and optimise physiological tolerance of anaemia
- Assess optimise patient’s physiological reserve and risk factors
- Compare estimated blood loss with patient-specific tolerable blood loss
- Formulate patient-specific management plan using appropriate blood conservation modalities to minimise blood loss, optimise red cell mass and manage anaemia
- Restrictive transfusion strategies
- Optimise cardiac output
- Optimise ventilation and oxygenation
- Restrictive transfusion strategies
- Harness physiological tolerance of anaemia
- Maximise oxygen delivery
- Minimise oxygen consumption
- Avoid treat infections promptly
- Be aware of adverse effects of medication

Figure courtesy of the Western Australian Patient Management Program from a presentation given by Dr Simon Towler, Chief Medical Officer, WA Department of Health
Department of Health Efficiency Programme

10% cut in A&E attendance
20% reduction in unplanned admissions
Cut length of stay by 25%
RCHT
Pre Optimisation Service
Pre op Anaemia – The Risks?

- Independent risk factor for allogenic blood transfusion
- Increased perioperative morbidity and mortality
- Increased length of stay
- Increased risk of infections
Targeted Cases

Orthopaedics
- THR
- TKR
- Revision Joint Surgery
- Trauma

Gynaecology
- TAH
- Cancer Surgery

General Surgery
- Hemicolecotomy
- Splenectomy
- Emergency Surgery

Urology
- TURP
- TURBT
- Nephrectomy

Vascular
- AAA
- Emergency Surgery

Obstetrics
- PPH
- ELCS
RCHT PBM Service

- Successfully running for past 3 years
- Team – x1 PBM Coordinator, x2 Registered Nurses, A&C support

Pre optimisation
Intraoperative Cell Salvage
Point of Care Testing
Pre surgery Optimisation Objectives

- Preferred Hb prior to surgery – 120 g/l
- Male and Females
- Patient’s referred via PAC for elective surgery
- Blood results required - Hb, Ferritin, CRP, also consider MCH

Also note WCC and neutrophils
Pre – Op Referral Algorithm
IV Iron Clinics

- Integrated into pre assessment clinic
- Dedicated clinic area and staff
- Clinics run over 4 days
- Nurse led
Patient pathway for referral of treatment of anaemia

- Pre assessment normally 2-4 weeks before surgery
- Blood results normally checked within two days
- Patients flagged up by Pre assessment nurses
- Blood Conservation contacted –
  - Email
  - Telephone
  - In person
  - Netpage
### IV Iron Referral Database

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<th>Ref Details</th>
<th>Patient Details</th>
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<th>Outcome</th>
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<td>FDI WCC</td>
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**Print Record**

**Comments**
# Transfusion Data – Elective Cases

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<th>Cases</th>
<th>Avg Pre Hb</th>
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<th>Total Surgical Cases</th>
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Primary Hip Data

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Primary Total Hip replacements = 406 cases
% of Total cases Tx = 2.7%
SMH – 1.3%
RCHT – 4.2%
### Pre Operative Optimisation Clinic Data

#### Total Clinic Intervention cases 2014/15

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<th>Jan</th>
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<td>EPO Only - pre op</td>
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#### Speciality

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**Note:** The data shows the number of cases for each category by month, with the total for the year given at the bottom.
# Peri/Post Operative IV Iron

## Peri/Post Operative Interventions

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<th>July</th>
<th>Aug</th>
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<th>Oct</th>
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## Speciality

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# IV Iron - In Patient Interventions

## In Patient Interventions

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Iron Deficiency
and
IV Iron in Practice
Iron Deficiency

- Occurs in 2-5% of adult men and post menopausal women in the developed world.
- Anaemia defined by WHO 130g/l for men, 120g/l in non pregnant women, 110g/l in pregnant women.
- Menstrual blood loss is the most common cause of IDA in premenopausal women, while blood loss from the GI tract is the most common cause in men and post menopausal women.
- The lower the Hb the more urgent the investigation.
- Ferritin levels <12mcg/l are indicative of absent iron stores.
- Hepcidin has recently been shown to play a vital role in regulating iron availability to the bone marrow – however assays monitoring its levels are currently being restricted to research investigation.
IV Iron choice at RCHT

**Ferric Carboxymaltose®** (Black Triangle) – Normally only used pre operatively (dose not exceeding 15mg/Kg body weight/week) max 1000 mg in one dose

**Venofer®** (Black Triangle) - normally used peri operatively (200 mg daily, max 600 mg per week).

Iron sucrose is well tolerated - though there is a suggestion that 35% of patients have mild side effects.

Serious ADR’s – 0.03-0.04%

Dextran irons – Serious ADR’s 0.6-0.7% (with fatalities noted)

GI team moving to Sucrose from Dextran - Cosmofer
IV Iron Special Warnings and Precautions for use

- Parenterally administered iron preparations can cause hypersensitivity reactions including anaphylactoid reactions, which may be potentially fatal. Therefore, facilities for cardio-pulmonary resuscitation must be available.

- In patients with liver dysfunction, parenteral iron should only be administered after careful risk/benefit assessment.

- Parenteral iron must be used with caution in case of acute or chronic infection, asthma, eczema or atopic allergies. It is recommended that the administration of Ferinject is stopped in patients with ongoing bacteraemia.

http://www.medicines.org.uk/EMC/medicine/24167/SPC/Ferinject+(ferric+carboxymaltose)/
ADR’s

Common (≥1/100, <1/10)
Headache, dizziness Nausea, abdominal pain, constipation, Diarrhoea, Rash, Injection Site Reactions

Uncommon (≥1/1000, <1/100)
Hypersensitivity including anaphylactoid reactions, hypotension, hypertension, flushing, dysgeusia, vomiting, dyspepsia, flatulence, pruritus, urticaria, myalgia, back pain, arthralgia, pyrexia, fatigue, chest pain, rigors, malaise, oedema peripheral

Rare (≥1/10000, <1/1000)
Dyspnoea

http://www.medicines.org.uk/EMC/medicine/24167/SPC/Ferinject+(ferric+carboxymaltose)/
ADR’s in Practice?

- Flushing / Feeling hot
- Dizziness / Lightheaded + (Nausea + Hypotension)
- Metal taste in mouth
- Rash – hours post iron??
- Headaches – Normally 24hrs post iron
- Injection site reactions
- Hypersensitivity
Outcomes
Current Value to Trust of PBM looking at Primary THR

- Key Performance Indicators – Length of Stay and Red Cell Transfusion
- Length of stay – National 4.2-15 days (average 9.6 days)  
  - RCHT average 5.4 days
- Reduction in Red Cell Transfusion
  - Before PBM 47%
  - Now <2.7%
PATIENT BLOOD MANAGEMENT IN ELECTIVE ORTHOPAEDIC SURGERY:
OUR 10 YEAR EXPERIENCE IN 4500 PATIENTS
Dr Catherine Ralph, Dr Lars Jakt, Mr John Faulds, Dr Julie Sanders, Mr Toby Richards
Blood Conservation Team, Royal Cornwall Hospital Trust, Truro, UK
and University College London, London, UK

Introduction
Orthopaedic operations are the largest user of blood transfusion in surgery. In 2007 the UK national comparative audit identified that 25% of all patients undergoing THR received a blood transfusion. As a strategy to reduce transfusion, Patient Blood Management (PBM) involves identification and treatment of anaemia in patients prior to operation and blood conservation strategies. We sought to determine the efficacy of a PBM programme at the Royal Cornwall Hospital Trust (RCHT). Further to assess if intervention for anaemia increased preoperative haemoglobin.

Methods
Patients from the RCHT, UK were assessed. A PBM programme was introduced in 2003 with peri-operative cell salvage (PCS) in orthopaedic surgery. PBM included preoperative review in orthopaedics from 2006 and expanded to all surgeries from 2008. The PBM identified patients with preoperative anaemia (Hb<12g/dl) or iron deficiency (Ferritin<30 or <70 if GFR<20).

Results
In Orthopaedic Surgery blood transfusion rates fell sequentially from 58% in 2002; 21-30% in 2004, 6-15% from 2004-2008, to 5-6% from 2008-2012. The use of PCS steadily increased from 25% to over 90% over the same period.

Conclusion
Introduction PBM reduced blood transfusion in orthopaedic surgery and intervention for preoperative anaemia increased Hb levels. This model was successfully developed to include other surgical areas.
Types of Iron Deficiency Anaemia

Iron deficiency can be differentiated into three types –

1. Absolute Iron deficiency - (AID)
2. Functional Iron deficiency – (FID)
3. Iron sequestration due to inflammation – (IS)
Iron Physio-Chemical properties

**Ferinject®**
Type 1 complex
Polynuclear iron(III)- hydroxide carbohydrate complex
Designed to enable controlled systemic release of iron.
Minimising the risk of releasing large amounts of iron into the serum

**Venofer®**
Venofer® (iron sucrose injection, USP) is a brown, sterile, aqueous complex of polynuclear iron (III) hydroxide in sucrose, containing 20 mg elemental iron per mL.
The Challenge?

Is to identify how the respective types of Iron deficiency contribute to iron restricted erythropoiesis.
Absolute Iron Deficiency

- Most common nutritional deficiency
- Deficit in total body iron stores
- Develops when bodily iron exceed Iron supply or when losses exceed dietary intake
Functional Iron Deficiency

- Manifests when mobilisation of iron is not rapid enough to meet demand e.g. treatment with erythropoietin stimulating agents
Iron Sequestration or Anaemia of Chronic Disease

- Commonly seen in patients with chronic inflammatory disease when the release of iron from the reticuloendothelial macrophages (iron recycling), enterocytes (dietary iron absorption) and hepatocytes (iron storage) is blocked and the available supply of iron in plasma is decreased.
Pre op – Intervention required?

Low Hb, Low ferritin, Normal CRP, low MCH = Iron (pre op)
Low Hb, Ferritin less 70, CRP greater than 20 = Iron (pre op)
Low Hb, Ferritin normal, CRP normal = Iron and Darbepoetin (pre op)
Normal Hb, low Ferritin with or without Low MCH = Peri op Iron (recovery or ward)
Low Hb, Ferritin greater than 500 mcg/l, CRP and MCH normal = Darbepoetin only (pre op)

All interventions have follow up bloods at around two weeks, and letters to GP
RCHT strategic objectives 2012-17

- Focus relentlessly on quality of care and patient safety
- Remain the preferred provider of acute and specialist healthcare to the people of Cornwall and the Isles of Scilly
- Work as a constructive partner in the community, promoting the integration of health and social care
- Value and improve the working lives of our staff, promoting education, training and research
- Work towards a sustainable, low carbon future
- Deliver financial surplus annually.
The Hurdles

- Having the service acknowledged at the appropriate level within the trust
- Reduction in transfusion is not a measurable outcome
- Data collection - what do you want/need to know/collect, how do you collect it?
- Who do you present the data to?

Cultural Change
Why IV Iron?

**Oral Iron** – Compliance low
side effects
timely
absorption rates

**IV Iron** – Compliance 100%
Timely
Patients treated pre op operatively

**May 2011 – April 2012**
- 185 patients treated pre operatively
- No Major ADR's (to date)
- Mild reactions – Flushing, Headache, Rash

**April 2012 – (End) Oct 2012**
- 133 patients treated pre operatively
  (Predicated patients 228)
- One Major ADR (to date)
- Mild reactions – Flushing, Headache, Rash
PBM The Future

Government Strategies
To integrate Patient Blood Management into the wider trust objectives
Working within the Primary Care
Further research
Data analysis
Make it personal - Hb optimisation is key

Education, education, education
What are ACS Conditions?

Ambulatory care sensitive (ACS) conditions are chronic conditions for which it is possible to prevent acute exacerbations and reduce the need for hospital admission through active management.
Anaemia at RCHT

Vifor Pharma

anaemia impact dashboard
Royal Cornwall Hospitals NHS Trust

ACS Conditions/100,000 Population (Provider)

Dental conditions
Dehydration and gastrointestinal disorders
Influenza and pneumonia
Ear, nose, and throat infections
Iron-deficiency anemia
Anemia
Constrictive pericarditis
Heart failure
Constrictive/obstructive cardiomyopathy
Cellulitis
Asthma
Diabetes complications
Perforated ulcer
Pyloroduodenal ulcer
Proliferative disease
Hypertension
Gangrene
Gastrointestinal conditions
Non-cardiac defects

UK/FER/13/0058(1) Date of Preparation: July 2013
Feinject® Prescribing Information
anaemia impact dashboard
Royal Cornwall Hospitals NHS Trust

IDA Activity
- Total Spells
- Non-Elective Spells
- Elective Spells
- Day Case Spells

IDA Costs
- Total Costs
- Non-Elective Costs
- Elective Costs
- Day Case Costs

Age Distribution of IDA Activity
- Males
- Females

Top 3 Providers (Spells)
- NHS Kernow CCG: 411
- NHS North West Surrey CCG: 2
- NHS Coastal West Sussex CCG: 1
- Other Providers: 0

UK/FER/12/0058(1) Date of Preparation July 2013
Patient Flow chart
RCHT Top 10 30-day re-admissions resulting in no payment – HES Data Qtr3

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<td>D649</td>
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<td>R101</td>
<td>Pain localized to upper abdomen</td>
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Building the Business Case for Iron
IDA HRG Codes

SAO4F (without CC) - £292 per episode

SAO4D (with CC) - £388 per episode
Cost of current service

- Patient transport costs = 32% of patients requiring transport at an average of £54 per return visit, = £17.28 per return visit
- Nursing costs = 1x band 6 nurse per patient = £107 per hour
- Infusion costs = giving set (£2.22), 4 cannula (£2.16), 5 dressings (£0.36), 6 swabs x2 (£0.72), 7 saline (£1.27) = £6.73 per infusion
- Injection costs = butterfly (£0.85), 10 dressings (£0.36), 6 swabs x2 (£0.72), 7 syringe (£0.12) = £2.05 per injection

www.pssru.ac.uk
www.stjohnsupplies.co.uk
Current IV Iron costs within secondary care

200 patients (presuming 1 gm)

All with CC (HRG £388 per patient)
  Total Income – £77,600

Service cost - 241.76 per patient
  Total Iron cost – £48,352

Difference - £29,248
Physical resources required to implement this proposed integrated service?

Requirements
Anemia Service – personnel, database, location, referral facility.

What’s currently available? personnel, database, location, referral facility.
Is this Affordable and Appropriate?

Current HRG codes cover the implementation of this proposed service!

**Strategic Objectives**

Focus relentlessly on quality of care and patient safety
Work as a constructive partner in the community, promoting the integration of health and social care
Deliver financial surplus annually.