Blood Conservation at Royal Cornwall Hospital – The Story so Far!

Mr John Faulds
Blood Conservation Co-ordinator
Outcome for Today

To show how we have implemented a program of Surgical Blood Conservation, with the aim of reducing blood Tx in the surgical setting.

Moving from a total cost service to income generator

Challenges Faced

The Future
Challenges for Blood Conservation

Reduce Tx?
Decrease length of stay?
Financially viable?
Cultural Change?
Why Blood Conservation at RCHT?

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’

To support Dr Lars Jakt in his vision!!

Business Case 2009 approved
How was this achieved?

- Trust invested in Blood Conservation as real alternative.
- IOCS integrated into Job Descriptions of Operating Department Practitioners
- Ethical research — contamination of salvaged maternal blood by amniotic uid and fetal red cells during elective Caesarean section, BJA 2008
- Implementing Government guidelines – SHOT, NICE, BBT3
- Further ethical Research – New Obstetric paper Investigating Alloimunisation 2011- Intraoperative Cell salvaged blood and its use as part of a blood conservation strategy in Obstetrics – Is fetal red cell contamination important?
Pre Blood Conservation

- Pre 2002
- Very Limited ICS
- No Optimisation
- Transfusion rates in THR

Blood usage between RCHT and St Michaels

THR 2002 47%

Blood Tx cost’s £98,700 (THR)

Length of stay – 7, 10, 12 ??? days
The Team

- Dr Cathy Ralph – Clinical Lead
- Dr Lars Jakt – Clinical Lead
- John Faulds – Blood Conservation Coordinator
- Carol McGovern – BC Practitioner
- Sara Staddon – BC Practitioner
- Karen Barclay - Administrator
  - Ian Sullivan - BMS
Key benefits of Introducing a Blood Conservation 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.
Surgical Blood Conservation

- **BLOOD CONSERVATION IN ELECTIVE ORTHOPAEDIC SURGERY** - British Orthopaedic Association, April 2005

  - Pre-operative assessment and optimisation
  - Intra-operative blood conservation, and cell salvage
  - Post-operative conservation, including indications for transfusion, and postoperative cell salvage

“Good transfusion management should be viewed as good management of the patient who is at risk of transfusion (Ref. 1). Success is to transfuse only when the benefits outweigh the risks. Good practice implies that measures to prevent or pre-empt the need to transfuse should be fully utilised. This statement embraces many aspects of routine clinical management as well as the use of specific blood conservation measures”

**The Three Pillars of Multidisciplinary Multimodal Patient Blood Management**

**1st Pillar: Optimise red cell mass**
- Detect, diagnose and treat reversible anaemia (e.g., iron deficiency)
- Identify underlying cause for the anaemia (e.g., NSAIDs or occult GI 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
- Minimise iatrogenic blood loss
- Procedure planning and rehearsal
- Preoperative autologous blood donations (in selected case)
- Other
  - Meticulous haemostasis and surgical techniques
  - Blood-sparing surgical techniques
  - Anaesthetic blood conserving strategies
  - Autologous blood options
  - Pharmacological haemostatic agents

**3rd Pillar: Harness & 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

*Figure courtesy of the Western Australian Patient Management Program from a presentation given by Dr. Simon Towler, Chief Medical Officer, WA Department of Health*
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 and patient centred approach to optimising, conserving and managing the patient’s own blood. It aims to identify patients at high risk of transfusion and provide a management plan aimed at reducing the need for blood transfusion and improving patient outcomes.
Patient blood management

- Anaemia management to optimise the red cell mass
- Minimise blood loss
- Tolerance of anaemia (appropriate transfusion decision and optimising the patient’s physiological tolerance of anaemia).
The Service

- Optimisation – Pre surgery
- Intra Operative Cell Salvage
- Quality assurance
- Point of care testing
- Research
- Advice

- Audit
- Total Cost Service?
• **Objective**

  Ensure the appropriate use of blood and the use of effective alternatives in every clinical practice where blood is transfused

  Secure appropriate and cost-effective provision of blood transfusion and alternatives in surgical care

  Ensure patients who are likely to receive a blood transfusion are informed of their choices

• **Action**

  Develop a blood conservation strategy including the use of point-of-care testing for haemoglobin concentration and haemostasis and alternatives to donor blood such as peri-operative cell salvage and pharmacological agents such as anti-fibrinolytics and intravenous iron

  Ensure that the blood conservation strategy is implemented

  Ensure that timely information is made available to patients, informing them of the indication for transfusion, the risks and benefits of blood transfusion, and any alternatives available
Time Line

- Pre 2002 = No Program
- Sep 04 – Aug 05 = ICS Program
- Mar 06 – Feb 07 = Change in ICS criteria which should an increase in Tx
- Mar 07 – Feb 08 ICS program re instated
- Feb 08 – To date = Optimisation program and ICS program
Time Line Graph

Tx Units per 100 cases

SMH

RCH
Referral Algorithm

Pre-operative Assessment and Haemoglobin Optimisation for Elective Surgery
Early Identification and Management of Iron Deficiency
and Erythropoietin Use to Improve Haemoglobin in Non-Iron Deficient Anemic Patients

Patient Care Pathway

GP Refers for Elective Surgery

Patient Accepted onto Elective Surgery List

GP Informed

GP asked to perform baseline blood tests: FBC, CRP, Ferritin

% hypochromia, reticulocyte Hb, iron studies, transferrin receptor

and GP to consent for additional tests on existing blood specimens

Iron deficient, with or without anaemia, as defined by:
Ferritin <30 CRP > 20 OR Ferritin > 70 CRP > 20
Or anaemia with hypochromia or microcytosis.
Or anaemia with or without Iron deficiency.
OR Additional tests above if anaemic or microcytic
-Deficiency by any of the additional tests

Refer back to GP to decide whether investigation merited
and whether elective surgery should proceed
Ask GP to start oral iron replacement

Pre-Admission Clinic 3-4 weeks before surgery
Recheck FBC, retic count and iron status

Hb < 12 g/dl but not iron deficient
Consider erythropoietin

Iron deficient (w or w/o anaemia)

Normal FBC (w or w/o Iron deficiency)

Replace iron IV

On admission:
Check response:
FBC and retic count

No action

Proceed to surgery
Audit transfusion requirement and post-operative Hb
Guidelines for blood transfusions in pregnancy.

- Ante-, peri- and post-partum management of fluid and blood status includes careful consideration of the need for red cells and other fluid replacement.
- The patient’s volume status needs careful assessment with special attention in pre-eclampsia.
- Asymptomatic patients with normo-volaemic anaemia do not need blood transfusion if the haemoglobin level is above 6 g/100ml.
- All Hb levels referred to below are in grams per 100 ml.

1. Signs of Hypervolaemia
   - Peripheral oedema
   - Tachypnoea
   - Pulmonary oedema
   - Elevated jugular pressure
   - (1) Hypervolaemia
     - Give diuretics and O2.
     - Hb<6: No action
     - Hb>6: 1-2 units red cells
   - Healthy patient: O2 and Fluid
   - Hb re-check
     - Yes
     - No

2. Signs of Hypovolaemia
   - Thirsty/dry mouth
   - Reduced urine output
   - Tachycardia/Hypotension
   - Orthostatic dizziness
   - Cold extremities/Capillary refill > 3 sec.
   - Patient normovolaemic?
     - Yes
     - (2) Hypovolaemia
       - Fluid replacement
     - No
       - (3) Signs of anaemia/hypovolaemia?
         - Yes
         - (4) Patient at risk
           - Give O2 and 1-2 Units of red cells
           - Hb re-check
             - Yes
             - No
           - Check Hb
             - Yes
             - No
           - Give oxygen and 1-2 units of red cells
   - No
     - (3) Signs of anaemia
       - Angina
       - Post-operative Confusion
       - Tachypnoea
       - Tachycardia
     - (4) Patient at risk
       - Give O2 and 1-2 Units of red cells
       - Hb re-check
         - Yes
         - No
       - Check Hb
         - Yes
         - No

Note: High risk patients need special thresholds for red cell transfusion.

Not an indication for transfusion:
- Anaemia with patient feeling well.
- Prophylactic substitution.
- Top up of Hb in asymptomatic anaemia.
- Hypervolaemia, i.e. use of plasma expander.
Guidelines for peri-operative blood transfusions in adults.
(not suitable for acute massive haemorrhage)

- RCHT Blood transfusion policy states: "Transfusion should only be given when there is no alternative"
- Peri-operative management of fluid and blood status includes careful consideration of the need for red cells and fluid replacement
- The patient’s volume status needs careful assessment.
- Asymptomatic normal risk patients with normo-volaeic anaemia do not need blood transfusion if the haemoglobin level is above 7 g/dl.
- Don’t give more blood than necessary to achieve the Hb level you are aiming for.
  - Calculate one g/dl Hb per unit of blood. Single unit transfusion is perfectly acceptable.
  - IV Iron Sucralfate, Venoferr, 200 mg can increase Hb 1 g/dl within a few days of an acute bleed. Max 200 mg/day, max 600 mg/week.
  - Hb levels given in g/dl

1. Signs of Hypovolaemia
   - Peripheral oedema
   - Tachycynia
   - Pulmonary oedema
   - Elevated jugular pressure
   - Hb < 10

2. Signs of Hypovolaemia
   - Thirsty/dry mouth
   - Reduced urine output
   - Tachycynia/Hypotension
   - Orthostatic/dizziness
   - Cold extremities/Capillary refill > 3 sec.

3. Signs of anaemia/hypovolaemia
   - Extreme tiredness
   - Angina
   - Post-operative Confusion
   - Tachycynia
   - Tachyurina

4. Patients at risk:
   - Coronary heart disease
   - Relevant cardiac valve disease
   - H/o Stroke
   - Severe pulmonary disease

Healthy patient:
- O2, Fluid and IV Iron
- Not an indication for transfusion:
  - Anaemia with patient feeling well.
  - Prophylactic substitution.
  - Top up of Hb in asymptomatic anaemia.
  - Hypovolaemia, i.e. use as plasma expander.

- Re-check Hb
- Start again!

Note: High risk patients need special thresholds for red cell transfusion

REMEMBER
A blood transfusion will ban the recipient from donating blood!

Not an indication for transfusion:
- Anaemia with patient feeling well.
- Prophylactic substitution.
- Top up of Hb in asymptomatic anaemia.
- Hypovolaemia, i.e. use as plasma expander.

Management of Hypovolaemia:
- Oxygen 2-4 l/min
- Fluid replacement/challenge with crystalloid (Hartmann’s), starch (Volvaren®) or gelatine (Gelifoamine®)

Lans Jaki/HTT August 2004
Version 4
Revised Lans Jaki May 2010
To be revised May 2013
Patient pathway

- Patients flagged up by Pre assessment
- Blood results normally checked within two days
- Blood Conservation contacted –
  - Email
  - Telephone
  - In person
  - Netpage
Pre op iron choice

- Ferinject now the iron of choice pre surgery
  - 400mg    600 mg    1000mg
  - +/- Darbepoetin 300 mcg
- Patient only has to attend once
- Follow up bloods – normally two weeks following iron
- Intervention outcome - HRG 4
  - Patient discharged
Delivery of Iron

- All Iron interventions are undertaken in the pre op assessment clinic
- Out patient setting
- Dedicated member of staff
- Iron given as slow IV infusion via Baxter pump
- One to one nursing
Follow up bloods

- Normally at two weeks
- Normally taken at GP’s
- Maybe taken on admission (day of surgery)
- Require – FBC
  - Reticulocyte’s
  - Ferritin (sometimes)
  - CRP
Peri op Iron

- Iron Sucrose (Venofer) iron of Choice
- Iron given during surgery or immediately post operatively
- Undertaken by anaesthetists or recovery nurses
- Given as a slow IV bolus
- Offered to patients who have normal Hb low ferritin.
Post Operative Iron

- Iron Sucrose (Venofer iron of choice)
- Given within 24 hrs post
- Given by Baxter IV pump
- Patients flagged up at Pre assessment
- Follow up results in two weeks
- Letters to GP
Optimisation Costs + Income

• HRG 4
• Coded – QZ14B (Tariff of £199)
• Predicted yearly costs - £31,000 approx
• Predicted yearly income - £44,000 approx
• Income generation - £12,500 approx

Predicted on 218 interventions
ICS Training

- No longer “see one, do one, teach one” now “competency training”.
- Endorsed by the UK Cell Salvage Action Group
- Skills for Health

**ICS RCHT**

- Dedicated trainer
- ODP’s operate machines as part of their anaes role

Future will see legislation with MHRA?
Training Issues

- Surgical interventions
- Staffing
- Sickness
- Cancellations
ICS Usage

April – Dec 2011

- OrthoPat – 369
- Electa – 340
- Cell Saver 5+ (Obs) - 502
  (Gen) – 16

Total – 1227 ICS cases

(Collection and processing)
ICS Training/Usage Cont

- Training sessions met
  - Average 75%

- Trained ICS staff allocated to lists
  - Average 96.4%
ICS Funding (PLICS)

- For the last year or so we have been using the PLICS (patient-level information and costing systems), which shows our ICS activity month on month within the trust and allows for appropriate funding of our service.
What is Quality Control?

• Quality control (QC) is a procedure or set of procedures intended to ensure that a manufactured product or performed service adheres to a defined set of quality criteria or meets the requirements of the client or customer.

• In order to implement an effective QC program, an enterprise must first decide which specific standards the product or service must meet.

• The QC process must be ongoing to ensure that remedial efforts, if required, have produced satisfactory results and to immediately detect recurrences or new instances of trouble.
## Data

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<tr>
<th></th>
<th>Number Of cases</th>
<th>Mean wash volume (mls) Range</th>
<th>Mean RBC volume (mls) Range</th>
<th>Mean Haemoglobin (g/dL) Range</th>
<th>Mean Haematocrit (L/L) Range</th>
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<tbody>
<tr>
<td>Obstetrics</td>
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<td>7.2 – 21.4</td>
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<td>14.4 – 16.6</td>
<td>0.485 – 0.494</td>
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Point of Care

- Point of care Hb testing – HemoCue (X5 analysers)

- Investigating - Haemostasis analyser (Rotem/TEG)
Research

- Dr Richard Noble – Looking at best diagnosis for IDA
- ICS

- QA - Benzene Level
  - Vaginal Loss
Blood Conservation Budgets

- Total Budget for 2010 – 2011
  £191,000

- Total Budget for 2011 – 2012
  £216,000

- My Predicted Budget for 2012 – 2013
  Approx £280,000

- Quarter on Staffing costs this year
Evidence (To date)

- Transfusion Rates (THR)
  - 2% AT St Michaels
  - 5% overall

- Hb of 12 and ICS appears to reduce length of stay
Blood Conservation Future

- To integrate Blood Conservation into the wider trust objectives
- Consider moving from Blood Conservation to Patient Blood Management
- Increase in staff to support the service
- Further ethical research
  - Medical patients??