Patient Blood Management and transfusion services in the UK

Dr Suzy Morton
Consultant in haematology and transfusion medicine
University Hospitals Birmingham & NHS Blood and Transplant
Overview

• Patient blood management
• UK transfusion services
• NHS Blood and Transplant PBM initiatives
• Key messages
Patient Blood Management

• Resource
• Hazards
• Cost

“multidisciplinary, evidence-based approach to optimising the care of patients who might need a blood transfusion”
Moving Annual Total of Red Cell Issues to Hospitals - 000s

MAT Total

MAT O Neg

PBM 2012

Blood and Transplant
Moving Annual Total of Platelet Issues to Hospitals - 000s

PBM 2012
Hospital teams:
Haematology consultant
Other doctors
Transfusion practitioners
Clinical nurse educators
Biomedical scientist/blood bank manager
Quality manager

NHSBT PBM teams:
PBM practitioners
Consultant Haematologists

Education and Audit Team
Research and Development

Transfusion Evidence Library and Systematic Reviews Initiative
National Audits

Recent examples

- Transfusion Associated Circulatory Overload
- Red Cell & Platelet transfusion in adult haematology patients
- Patient Blood Management in adults undergoing elective, scheduled surgery (+repeat)
- Palliative care
- Patient information and consent

Benchmarking
Evidence to support change
Single unit transfusions

Pilot study in London

28 → 55% single unit transfusions
“do once and share”

“Transfuse one dose of blood component at a time e.g. one unit of red cells or platelets in non-bleeding patients. Reassess the patient clinically and with a further blood count to determine if further transfusion is needed.”

SINGLE Unit Blood Transfusions reduce the risk of an adverse reaction

Don’t give two without review

THINK!
- Is your patient symptomatic?
- Is the transfusion appropriate?
- What is the haemoglobin trigger level?
- What is the patient’s target haemoglobin level?

Each unit transfused is an independent clinical decision

DO!
- Clinically re-assess the patient after each unit transfused.
- Only one unit should be ordered for non-bleeding patients.
- Document the reason for Transfusion.
O RhD negative blood demand remains constant
Continual demand > supply
National guidelines on strategies to reduce use
O D negative shortages 2016

• 33 hospitals selected; stocks, % O D neg

• Hospital transfusion team contacted by regional PBM consultant

• Positive engagement process and feedback – avoid them/us

![Diagram showing blood plan metrics]

- Emergency Blood Plan?
- O Pos for male Trauma?
- Review of stock in last 6/12?
- GS in <15 mins?
- Ix cases > 2 U O Neg
- stocksharing?
- O neg 12 h or less?
Improving health and social care through evidence-based guidance

Blood transfusion

NICE guideline [NG24]  Published date: November 2015

Quality statements

Statement 1 People with iron-deficiency anaemia who are having surgery are offered iron supplementation before and after surgery.

Statement 2 Adults who are having surgery and expected to have moderate blood loss are offered tranexamic acid.

Statement 3 People are clinically reassessed and have their haemoglobin levels checked after each unit of red blood cells they receive, unless they are bleeding or are on a chronic transfusion programme.

Statement 4 People who may need or who have had a transfusion are given verbal and written information about blood transfusion.

Recommendations

The guideline includes recommendations on:

- alternatives to transfusion for patients having surgery
- thresholds, targets and doses for red blood cells, platelets, fresh frozen plasma, cryoprecipitate, and prothrombin complex concentrate
- patient safety
- patient information

Who is it for?

- healthcare professionals who assess for and manage blood transfusions and their alternatives
- commissioners and providers of transfusion services
- people over 1 year old who may need a blood transfusion, their families and carers

- Baseline assessment tool
- Guideline algorithm
- Costing statement
- Key priorities for implementation
Serious Hazards of Transfusion = national reporting scheme
3. Only consider transfusing platelets for patients with chemotherapy-induced thrombocytopenia where the platelet count is < 10 x 10^9/L except when the patient has clinical significant bleeding or will be undergoing a procedure with a high risk of bleeding.

4. Use restrictive thresholds for patients needing red cell transfusions and give only one unit at a time except when the patient has active bleeding.

Evidence/guidance

- **NICE Guidance: Blood transfusion**

5. Only transfuse O Rh D negative red cells to O Rh D negative patients and in emergencies for females of childbearing potential with unknown blood group.
Success of UK PBM relies on:

- PBM practitioners who have ‘seen it all’ providing support for hospital teams
- Sharing of resources and ideas
- Support and drive at a regional level
- Leadership at a national level - engagement with government/national organisations

Patient blood management focuses on patient care

Principles are evidence-based but simple

Communication and education are key
Thank you
Patient Blood Management – What Difference Does The Transfusion Practitioner Make?

Rachel Moss
Transfusion Practitioner
Great Ormond Street Hospital for Children London
In the Beginning

Blood Transfusion Laboratory

Clinical Areas
Then came the TPs!

Blood Transfusion Laboratory

Clinical Areas
From there to here

- Better Blood Transfusion 1998
- Better Blood Transfusion II 2002
- Better Blood Transfusion III 2007
- BSQR 2005
- NPSA SPN 14 “Right patient right blood” 2006
- CNST
- NHSLA standards for acute Trusts
- NICE 2015
- National Comparative Audit programmes
- BSH Guidelines

- Then along comes Patient Blood Management........
Patient Blood Management

• Patient Blood Management is an evidence-based, multidisciplinary approach to optimising the care of patients who might need transfusion.

• It puts the patient at the heart of decisions made about blood transfusion to ensure they receive the best treatment and avoidable, inappropriate use of blood and blood components is reduced.

• It represents an international initiative in best practice for transfusion medicine.

NHS England National Transfusion Committee 2014
Where does the TP fit in?
4. **Transfusion nurse/practitioner**

- Provide and/or facilitate transfusion-related education including for PBM throughout the hospital
- Ensure clinical transfusion incidents, transfusion reactions, specimen labelling errors are investigated
- Submit data to haemovigilance programmes
- Develop constructive working relationships with the many clinical users of blood products, and assist with the implementation of PBM programme
- Support local, regional and national transfusion audits by involving appropriate stakeholders to undertake data collection and implement quality improvements arising from audits.
4. Transfusion nurse/practitioner

• Provide and/or facilitate transfusion-related education including for PBM throughout the hospital

• Ensure clinical transfusion incidents, transfusion reactions, specimen labelling errors are investigated

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• Develop constructive working relationships with the many clinical users of blood products, and assist with the implementation of PBM programme

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So what's new in PBM?

2015 UK Survey of PBM
So what's new in PBM?

2015 UK Survey of PBM

“Lack of Transfusion Practitioner time to support PBM”.

“Only one TP in very high use hospital”.
Marginal Gains!

Dave Brailsford, Principle, Team Sky Cycling

The 1 percent margin for improvement in everything you do. If you improved every area related to cycling by just 1 percent, then those small gains would add up to remarkable improvement.
3 Pillars of PBM
Recommendations

Recommendations for the implementation of Patient Blood Management (PBM)

A. General considerations

Establishment of PBM programme and raising awareness amongst clinicians and patients

- All NHS Trusts should establish a multidisciplinary PBM programme through the Hospital Transfusion Committee (HTC) or as a subgroup of the HTC
- Education of all clinicians involved in the decision to transfuse blood components should be provided to enhance clinician awareness about good patient blood management including avoidance of blood wherever possible
- Education of patients for whom transfusion may be a treatment option about individualised blood management and blood avoidance should be an integral part of relevant care pathways

Issues in patient testing

- The volume and frequency of blood samples should be minimised to prevent iatrogenic anaemia
- Use of near patient haemostasis and haemoglobin (Hb) testing should be undertaken to guide blood component therapy in patients with haemorrhage in conjunction with the Trust Point of Care Testing (POCT) committee/Pathology laboratory

Use of appropriate dose and thresholds for transfusion

- Use locally agreed triggers for transfusion based on national guidelines and use National Blood Transfusion Committee (NBTC) indication codes when requesting blood from the transfusion laboratory and when prescribing blood components
- Develop systems and protocols that empower transfusion laboratory staff to question requests that do not conform with these triggers and where inadequate clinical explanation is given
- Regularly audit transfusion requests against these triggers
- Transfuse one dose of blood component at a time e.g. one unit of red cell products or platelets in non-bleeding patients and reassess the patient clinically and with a further blood count to determine if further transfusion is needed

B. Specific aspects of surgical PBM

Preoperative Management of Anaemia and Haemostasis

- Provide arrangements for the timely identification and correction of anaemia before elective surgery which is likely to involve significant blood loss using WHO definitions of anaemia i.e. Hb in adult males <130g/L and adult females <120g/L
- Develop and implement protocols for the management of patients taking anticoagulants and anti-platelet drugs that may increase the risk of bleeding
- Avoid transfusion for managing anaemia if alternatives are available e.g. oral iron for iron deficiency anaemia and intravenous iron for functional iron deficiency

Intraoperative Management

- Use intraoperative cell salvage for appropriate procedures
- Use pharmacological agents to reduce blood loss e.g. tranexamic acid
- Maintain physiologic homeostasis (normothermia, acid-base management, normocalcaemia, avoid over-treatment with intravenous fluids)
- Use controlled hypotension whenever indicated and safe
- Position patients to minimise central venous pressure and capillary oozing
- Minimise surgical blood loss through use of new technologies (argon beam coagulator, radiofrequency dissecting sealer, etc.)

C. Specific aspects of medical PBM

Postoperative Management

- Use postoperative blood salvage (washed/unwashed) where indicated
- Consider alternatives to transfusion for postoperative anaemia management (volume expanders, intravenous iron)
- Consider the effects of intra-operative fluid administration e.g. haemodilution leading to false Hb estimation

Management of abnormal haemostasis

- Develop and implement a protocol for the management of reversed of warfarin, including the use of vitamin K and prothrombin complex concentrates
- Develop and implement a protocol for the management of abnormal haemostasis in patients with major haemorrhage e.g. acute upper gastrointestinal haemorrhage
- Develop and implement a protocol for the management of bleeding in patients taking novel anticoagulants (e.g. dabigatran, rivaroxaban and apixaban) and potent antiplatelet agents (e.g.prasugrel and ticagrelor)
- Use anti-fibrinolytics, e.g. tranexamic acid, for major bleeding
- Develop and implement a protocol for the management of severe thrombocytopenia in patients undergoing stem cell transplantation or intensive chemotherapy for malignant disease

Management of anaemia

- Identify and correct the underlying cause of the anaemia before considering transfusion, wherever possible
- Avoid transfusion for managing anaemia if alternatives are available e.g. oral iron for iron deficiency anaemia, intravenous iron for functional iron deficiency
- Make individualised plans for patients needing regular transfusion and consider the potential for complications of transfusion such as red cell alloimmunisation and iron overload and their management

D. Implementation of PBM

Implementation of good practice for blood avoidance and the use of blood

- Analyze casemix and clinical services to determine the main targets for PBM
- Identify PBM champions to help educate staff and patients
- Establish a PBM committee (either stand-alone or within the Hospital Transfusion Committee) to oversee the PBM programme
- Obtain a mandate for PBM from hospital management
- Educate clinicians about PBM and evidence-based transfusion practice
- Adopt a PBM scorecard to share with senior NHS Trust members to monitor adherence to guidelines for blood avoidance and the use of blood, including the use of benchmarking to identify clinicians/clinical teams who are consistently well outside of average blood use for a specific procedure
Where to start?
Do What We Do Best

Blood Transfusion Laboratory

Clinical Areas
Where TPs can add to PBM

<table>
<thead>
<tr>
<th>Reduce O Negative Usage</th>
<th>Improve Pre-Operative Anaemia</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reduce Iatrogenic Anaemia</td>
<td>Improve Patient Information</td>
</tr>
</tbody>
</table>

*Remember Marginal Gains*
## Reduce O Negative Usage

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
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<tbody>
<tr>
<td><strong>Save one a week:</strong> use campaign materials on <a href="http://www.hospital.blood.co.uk">www.hospital.blood.co.uk</a></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Store emergency O Neg blood in red bags and O Pos blood in blue bags in ED to show difference to clinical staff when they take it in an emergency</strong></td>
<td>O Positive Red cells</td>
<td>O Negative Red cells</td>
</tr>
<tr>
<td><strong>Audit O negative usage and compare against other hospitals within the region. Develop as a local regional audit. Use previously written audit tools</strong></td>
<td></td>
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</tr>
</tbody>
</table>
### Pre-operative Anaemia

<table>
<thead>
<tr>
<th>Use materials on <a href="http://www.hospital.blood.co.uk">www.hospital.blood.co.uk</a></th>
</tr>
</thead>
<tbody>
<tr>
<td>Do a retrospective audit of pre-operative haemoglobins and related transfusions of different patient groups (cardiac, orthopaedic, gynaecology) and present to Transfusion Committee</td>
</tr>
<tr>
<td>Consider alternatives to blood tests – use of HemoCue or Masimo monitoring</td>
</tr>
<tr>
<td>Ask Pharmacy which iron preparations available in hospital. Discuss with a (sympathetic) Haematologist how they might be used. Make a list available for interested clinical staff</td>
</tr>
</tbody>
</table>
Iatrogenic Anaemia

<table>
<thead>
<tr>
<th>Consider which clinical area might take a high number of samples. Discuss whether they would work on a partnership project</th>
</tr>
</thead>
<tbody>
<tr>
<td>Look at hospital polices, is iatrogenic anaemia addressed? Consider writing a good practice guideline</td>
</tr>
<tr>
<td>Work with Pathology Laboratories, identify what test can be done on which samples. Produce this information for clinical staff.</td>
</tr>
<tr>
<td>Look at number of mis-labelled and rejected samples. Identify high error areas. Establish a “correctly labelled sample” target. Encourage competition between wards</td>
</tr>
</tbody>
</table>
# Patient Information

| Audit what patient information is given in which areas e.g. surgery, maternity, paediatrics |
| Consider part of document control system with version numbers and 2 yearly review trigger |
| Use national literature from Blood Services if available |
| Consider prompt stickers for clinical staff to give information |
The TP and PBM

• The TP cannot change the way a surgeon operates or the culture of a hospital

• By focussing on small achievable PBM elements which work as part of the TP role small changes can be made

• Small changes all add up to the start of a PBM culture
<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>14:00-15:30</td>
<td><strong>Transfusion Practitioners Session</strong></td>
</tr>
<tr>
<td></td>
<td>- Challenges of PBM</td>
</tr>
<tr>
<td></td>
<td>- Iatrogenic Anaemia</td>
</tr>
<tr>
<td></td>
<td>- Maintaining a sustainable O Negative supply</td>
</tr>
<tr>
<td>15:30-17:30</td>
<td><strong>TP afternoon tea. Networking and Q&amp;A session</strong></td>
</tr>
<tr>
<td></td>
<td>Meet, chat and ask questions with a room full of people who are part</td>
</tr>
<tr>
<td></td>
<td>of the TP and PBM world, over a cup of tea!</td>
</tr>
</tbody>
</table>
Time for Ask the Audience
PBM survey 2015

In 2015, the PBM survey was repeated to evaluate progress towards PBM implementation. The survey was an initiative between NHS Blood and Transplant and the National Blood Transfusion Committee.

Organisational survey of

1. Resource to support PBM
2. Laboratory systems
3. Consent
4. Identification and management of anaemia
5. Identification and management of bleeding patients
6. Appropriate transfusion

91% of NHS Trusts responded.
Q1: How many Transfusion Practitioners are there in your hospital?
1. Q1: How many Transfusion Practitioners are there in your hospital?

- 1: 66.7%
- 2: 13.3%
- 3: 6.7%
- >3: 13.3%

75 users voted

[Results live voting]
TP support

- 99% trusts have transfusion practitioner support
- 70% had at least 1 full time TP
- Additional support staff for many
  – most <50% full time
Q2: Is intravenous iron readily available in your hospital?
Q2: Is intravenous iron readily available in your hospital?

- Yes: 80.3%
- No: 2.8%
- I don't know: 16.9%

71 users voted

Vote on go.voxvote.com or download app. PIN: 48805
## IV iron

### Use of oral and I.V. iron by Specialty

<table>
<thead>
<tr>
<th>Specialty</th>
<th>2013</th>
<th>2015</th>
</tr>
</thead>
<tbody>
<tr>
<td>Use of oral and I.V. iron by Specialty</td>
<td>114</td>
<td>126</td>
</tr>
<tr>
<td>Medicine</td>
<td>67%</td>
<td>79%</td>
</tr>
<tr>
<td>Elective general Surgery</td>
<td>56%</td>
<td>65%</td>
</tr>
<tr>
<td>Elective orthopaedic surgery</td>
<td>No Data</td>
<td>64%</td>
</tr>
<tr>
<td>Paediatrics</td>
<td>13%</td>
<td>25%</td>
</tr>
<tr>
<td>Elderly care</td>
<td>No Data</td>
<td>55%</td>
</tr>
<tr>
<td>Emergency admissions</td>
<td>16%</td>
<td>36%</td>
</tr>
<tr>
<td>Obstetrics</td>
<td>61%</td>
<td>77%</td>
</tr>
<tr>
<td>Other</td>
<td>16%</td>
<td>27%</td>
</tr>
</tbody>
</table>

98% of Trusts are able to offer both oral and IV iron to correct anaemia.

There has been an increase in the use of oral and intravenous iron across all specialties.
Q3: Do you have a single unit red cell transfusion policy in your hospital?
Q3: Do you have a single unit red cell transfusion policy in your hospital?

- Yes: 40.5%
- No: 56.8%
- I don't know: 2.7%

74 users voted.
Lower Transfusion Threshold

- 51% of respondents have either implemented a lower transfusion threshold policy or are planning to.
- 12 organisations did have a policy that covered specific clinical areas. Where this was the case, 46% covered critical care and 46% covered clinical haematology.

Single Unit

- 27% of Trusts have a single unit red cell policy and 8% have it in specific areas.
- 53% of Trusts have said they are planning to introduce a single unit red cell policy.
Q4: Do you use anti fibrinolytics (e.g. tranexamic acid) routinely in major haemorrhage?

A. Yes, for all patients
B. Yes, for some patients
C. Not routinely
Q4: Do you use anti fibrinolytics (e.g. tranexamic acid) routinely in major haemorrhage?

A. Yes, for all patients  19.0%
B. Yes, for some patients  55.6%  (63 users voted)
C. Not routinely  25.4%
# Anti fibrinolytics

<table>
<thead>
<tr>
<th></th>
<th>2013</th>
<th>2015</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trauma</td>
<td>74%</td>
<td>91%</td>
</tr>
<tr>
<td>Surgical</td>
<td>71%</td>
<td>91%</td>
</tr>
<tr>
<td>General medical</td>
<td>44%</td>
<td>46%</td>
</tr>
<tr>
<td>Obstetric</td>
<td>60%</td>
<td>71%</td>
</tr>
<tr>
<td>Other</td>
<td>-</td>
<td>15%</td>
</tr>
</tbody>
</table>
"Lack of Transfusion Practitioner time to support PBM".

"Only one TP in very high use hospital".

"Lack of engagement in a large teaching hospital".

"Lack of allocated laboratory staff time to support this programme."
Summary 2015

Blood and Transplant

- Cell Salvage
- Anaemia Management
- Single Unit PLT Policy
- Single Unit RBC Policy
- Near Patient Testing e.g. TEG/RoTEM
- Surgical Blood Order Schedules Revised
- PCC Used when Appropriate
- Indication Codes Used
- Major Haemorrhage Policies Updated
- Waste Reduction Strategies
- Lab Challenging Requests
- Greater Patient Involvement
- Increased Patient Involvement in Consent
- HTC ToR Reviewed
- Electronic Systems Introduced to support PBM
- Blood Data Used to Inform Clinicians
- Education of Medical Staff

[Bar chart showing progress of implemented and working towards initiatives]

- Implemented
- Working Towards
Thank you from both of us
Patient Blood Management in Belgium: A Personal Experience

Philippe Van der Linden MD, PhD
Conflict of Interest Disclosure

In the past 5 years, I have received honoraria or travel support for consulting or lecturing from the following companies:

Fresenius-Kabi GmbH
Nordic Pharma
From “Bloodless Surgery”…
To
…“Patients Blood Management”

“A mean to promote the availability of transfusion alternatives”

Patient-Focused Blood Management

✓ Defined as the timely application of evidence-based medical and surgical concepts designed to maintain Hb concentration, optimize hemostasis and minimize blood loss in an effort to improve patient outcome

✓ Multidisciplinary by definition

✓ Continuous process initiated early in the preoperative period and continued intra and postoperatively

Patient Blood Management: Motivation

✓ Known (and unknown) risk associated with blood products

✓ Constraints from escalating costs

✓ Preservation of the national blood inventory
  • Decreased donors' population
  • Increased demand of products
  • Mismatch between recipients and donors regarding ABO blood groups
    (i.e. sickle cell disease)

Supporting Patient Blood Management (PBM) in the EU

A Practical Implementation Guide for Hospitals

March 2017
RBC units issued in EU per 1,000 Population
Patient Blood Management in Europe

“There is a pressing need for European healthcare providers to integrate PBM strategies in routine care for patients undergoing orthopaedic and other type of surgeries in order to reduce the use of unnecessary transfusions and improve the quality of care”

Prospective observational cohort study: patients who received at least one PRBC unit intraoperatively (5803 patients – 126 EU centres)

Intraop transfusion rate: 1.8%, 59% of them initiated at least partially as a result of a physiological transfusion trigger

Mean number of intraop transfused PRBC units: 2.5 ± 2.7 U

PBM Implementation Strategy

1. Create urgency for PBM
2. Form a powerful PBM group as guiding coalition
3. Create a vision for PBM
4. Communicate the PBM vision
5. Empower the PBM group and remove obstacles
6. Create short-term wins of PBM
7. Build on the change
8. Anchor PBM in culture
Primary PBM Stakeholders

- Physicians
- Hospital Administrators
- Patients
- Nurses, Perfusionists
- Clinical Pharmacists
## Key PBM Stakeholders: Roles & Responsibilities

<table>
<thead>
<tr>
<th>Clinical department heads</th>
<th>Patient organisations</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Taking the clinical lead to implement PBM as the hospital’s standard of care</td>
<td></td>
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<tr>
<td>- Educating peers about PBM</td>
<td></td>
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<tr>
<td>- Disseminating PBM guidance based on peer-reviewed evidence</td>
<td></td>
</tr>
<tr>
<td>- Recruiting more champions</td>
<td></td>
</tr>
<tr>
<td>- Networking active primary stakeholders</td>
<td></td>
</tr>
<tr>
<td>- Ensuring continuity and sustainability of PBM</td>
<td></td>
</tr>
<tr>
<td>- Giving patients a “voice”</td>
<td></td>
</tr>
<tr>
<td>- Publicly formulating the need for PBM to improve patient safety and outcome</td>
<td></td>
</tr>
</tbody>
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<table>
<thead>
<tr>
<th>Transfusion medicine departments/hospital blood bank heads, blood services</th>
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<tbody>
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<td>- Taking the clinical lead to implement PBM as the hospital’s standard of care</td>
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<tr>
<td>- Educating peers about PBM</td>
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<tr>
<td>- Disseminating PBM guidance based on peer-reviewed evidence,</td>
</tr>
<tr>
<td>- Taking the lead in restructuring of hospital blood bank to meet changing transfusion needs</td>
</tr>
<tr>
<td>- Expanding from transfusion consultation to PBM consultation with appropriate training where necessary</td>
</tr>
</tbody>
</table>
A pragmatic approach to embedding patient blood management in a tertiary hospital

- Implementation and impact of a PBMP in an Australian teaching hospital (2009)

First 3 years of interventions:
- Effective use of preoperative clinics
- Management of perioperative anemia
- Improved perioperative hemostasis
- Implementation of restrictive transfusion triggers
- Development of a single-unit transfusion policy

A pragmatic approach to embedding patient blood management in a tertiary hospital

- Implementation and impact of a PBMP in an Australian teaching hospital (2009)

A pragmatic approach to embedding patient blood management in a tertiary hospital

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A pragmatic approach to embedding patient blood management in a tertiary hospital

Implementation and impact of a PBMP in an Australian teaching hospital (2009)

Patient Blood Management Program In Major Orthopedic Surgery: Effects on Outcome

✓ Retrospective audit: primary hip or knee arthroplasty (N=717)
✓ Development of a specific algorithm (N=281)
  • Preoperative anaemia management program
  • Intraop blood conservation measures at the discretion of the clinician

All-cause readmission rate within 90 days decreased from 13.5 to 8.2 % (p=0.02)

Autotransfusion Programs: The "Hawthorne Effect"

Allogeneic Blood Transfusion Requirements

Group 1: 340 units in 108 patients

Group 2: 161 units in 57 patients

Perioperative Allogeneic Transfusion: Predicting Factors

- Preoperative Red Blood Cell Mass
  (weight, height, hematocrit, gender)

- Blood loss
  (pre-, intra-, and post-operative)

- Transfusion trigger
  (biological AND clinical data)
Preoperative RBC mass

Perioperative blood loss

Transfusion Trigger !!!
Intraoperative Hemoglobin Management in Cardiac Surgery: Impact on RBC Transfusion

- Retrospective, before and after study: implementation of measures aiming at reducing hemodilution volume:
  - Decrease in intravenous fluid volume
  - Reduction of CPB circuit size
  - Use of retrograde autologous priming

- Total IV fluids reduced by 974 ml (672-1276): p<0.001
- Mean on-pump increase in Hct > 2%

![Graph showing comparison between before and after scenarios](image)

Intraoperative Hemoglobin Management in Cardiac Surgery: Impact on RBC Transfusion

✓ Retrospective, before and after study: implementation of measures aiming at reducing hemodilution volume:
  • Decrease in intravenous fluid volume
  • Reduction of CPB circuit size
  • Use of retrograde autologous priming

✓ Variability in transfusion rate among anesthesiologists

Changing Clinicians’ Transfusion Practices

- Adoption of local transfusion guidelines
- Educational initiatives: group didactic sessions or direct education of individuals
- Reminders of appropriate use: predominantly associated with a new transfusion request form or with a computer order entry system
- Retrospective audits with feedback
- Pre-transfusion audit & approval

Changing Clinicians’ Transfusion Practices: Impact on Inappropriate Transfusion

## Changing Clinicians’ Transfusion Practices: Comparing Different Interventions

<table>
<thead>
<tr>
<th>Inappropriate</th>
<th>Audit and approval</th>
<th>Others</th>
</tr>
</thead>
<tbody>
<tr>
<td>RBCs</td>
<td>81%</td>
<td>12-73%</td>
</tr>
<tr>
<td>PLTs</td>
<td>2-81%</td>
<td>ND*</td>
</tr>
<tr>
<td>FFP</td>
<td>(+4)-82%</td>
<td>48-58%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Units transfused</th>
<th></th>
<th></th>
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<tbody>
<tr>
<td>Alone</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RBCs</td>
<td>ND</td>
<td>17%</td>
</tr>
<tr>
<td>PLTs</td>
<td>55%</td>
<td>ND</td>
</tr>
<tr>
<td>FFP</td>
<td>ND</td>
<td>14-20%</td>
</tr>
<tr>
<td>In combination</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RBCs</td>
<td>27%</td>
<td>12-79%</td>
</tr>
<tr>
<td>PLTs</td>
<td>35-52%</td>
<td>9-77%</td>
</tr>
<tr>
<td>FFP</td>
<td>17-22%</td>
<td>15-44%</td>
</tr>
</tbody>
</table>

Changing Clinicians’ Transfusion Practices: Multiple Vs. Single Interventions

<table>
<thead>
<tr>
<th>Interventions</th>
<th>Units</th>
<th>Products</th>
<th>Solitary intervention</th>
<th>In combination</th>
</tr>
</thead>
<tbody>
<tr>
<td>Guideline</td>
<td>Proportion</td>
<td>RBC</td>
<td>−17%</td>
<td>−43%</td>
</tr>
<tr>
<td></td>
<td>Transfused</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Units/patient</td>
<td>PLT</td>
<td>−20%</td>
<td>−23%</td>
</tr>
<tr>
<td></td>
<td>Units</td>
<td>PLT</td>
<td>−14%</td>
<td>−15%</td>
</tr>
<tr>
<td>Audit and approval</td>
<td>Units/patient</td>
<td>FFP</td>
<td>−55%</td>
<td>−35 to −52%</td>
</tr>
<tr>
<td>Reminder</td>
<td>Proportion</td>
<td>RBC</td>
<td>No change</td>
<td>−27%</td>
</tr>
<tr>
<td></td>
<td>Transfused</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Inappropriate</td>
<td>FFP</td>
<td>+4%</td>
<td>−52 to −82%</td>
</tr>
<tr>
<td></td>
<td>Inappropriate</td>
<td>PLT</td>
<td>−2%</td>
<td>−45 to −81%</td>
</tr>
<tr>
<td></td>
<td>Units</td>
<td>FFP</td>
<td>No change</td>
<td>−9 to −52%</td>
</tr>
<tr>
<td></td>
<td>Units</td>
<td>PLT</td>
<td>+5%</td>
<td>−15 to −17%</td>
</tr>
</tbody>
</table>

Changing Clinicians’ Transfusion Practices: Effectiveness over Time

Durability of change in transfusion practice
(Lam HT et al. Transfusion 37:577-84, 1997)

Durability of change in transfusion practice: inappropriate transfusions
Changing Clinicians’ Transfusion Practices

Element for changes
- A desire for change
- Providing a new behavior / practice
- The change must be viewed as safe and simple
- The change must be viewed as non-threatening to autonomy


“The only sure way of achieving long-lasting change in PBM is to embed teaching into medical student curricula and postgraduate programs in the specialties of anesthetics, surgery and hematology-oncology”

(Leahy MF et al. Transfusion 54:1133-45, 2014)
Benchmark: Application to Transfusion Medicine

“Benchmark is a structured continuous collaborative process in which comparisons for selected indicators are used to identify factors that, when implemented, will improve transfusion practices”

Use comparison to identify practice differences

Benchmarking is a structured process
Key feature is identification of best practices
Identify associated factors
Analyze information to identify factors associated with difference in practice

Select benchmarking indicator
Identify comparator(s)
Access/retrieve information
Analyze information to identify factors associated with difference in practice

Re-evaluation of performance
Introduce factors associated with best practices

Benchmark Models

Blood Use in Elective Surgery: The 2 Austrian Benchmark Studies

**Prospective observational multicenter studies**
April 04–February 05 (N=3366) / July 09–August 10 (N=3164)

**2nd study:** less women, longer surgery & higher use of platelets inhibitors

<table>
<thead>
<tr>
<th></th>
<th>1st benchmark</th>
<th>2nd benchmark</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preop anemia (%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CABG</td>
<td>24</td>
<td>27</td>
<td>0.257</td>
</tr>
<tr>
<td>THR</td>
<td>16</td>
<td>18</td>
<td></td>
</tr>
<tr>
<td>TKR</td>
<td>18</td>
<td>18</td>
<td></td>
</tr>
<tr>
<td>Blood loss (%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CABG</td>
<td>45</td>
<td>43</td>
<td>0.515</td>
</tr>
<tr>
<td>THR</td>
<td>39</td>
<td>32</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>TKR</td>
<td>35</td>
<td>31</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Transfusion rate (%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CABG</td>
<td>55</td>
<td>57</td>
<td>0.465</td>
</tr>
<tr>
<td>THR</td>
<td>41</td>
<td>30</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>TKR</td>
<td>41</td>
<td>25</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

> 80% of all transfusions involved at least 2 RBC units


**treated in 1-3 % of patients**
Implementation of patient blood management remains extremely variable in Europe and Canada

The NATA benchmark project

Prospective observational study with online data collection in 11 institutions interested in developing PBM (2010-2011)

<table>
<thead>
<tr>
<th>THR</th>
<th>Independent variable</th>
<th>$r$</th>
<th>$P$</th>
<th>OR (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimal postoperative Hb, %</td>
<td>0.3401</td>
<td>0.0000</td>
<td>1.4 (1.3; 1.6)</td>
<td></td>
</tr>
<tr>
<td>Preoperative Hb, %</td>
<td>-0.3556</td>
<td>0.0000</td>
<td>0.7 (0.6; 0.8)</td>
<td></td>
</tr>
<tr>
<td>Lost RBC volume, %</td>
<td>0.5360</td>
<td>0.0000</td>
<td>1.7 (1.5; 1.9)</td>
<td></td>
</tr>
<tr>
<td>General anaesthesia</td>
<td>1.8731</td>
<td>0.0000</td>
<td>6.5 (2.7; 15.7)</td>
<td></td>
</tr>
<tr>
<td>Sex (female)</td>
<td>0.8718</td>
<td>0.0391</td>
<td>2.4 (1.0; 5.5)</td>
<td></td>
</tr>
<tr>
<td>Percentage correctly classified</td>
<td>96.3%</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TKR</th>
<th>Independent variable</th>
<th>$r$</th>
<th>$P$</th>
<th>OR (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimal postoperative Hb, %</td>
<td>0.7150</td>
<td>0.0000</td>
<td>2.0 (1.6; 2.6)</td>
<td></td>
</tr>
<tr>
<td>Preoperative Hb, %</td>
<td>-0.6396</td>
<td>0.0000</td>
<td>0.5 (0.4; 0.6)</td>
<td></td>
</tr>
<tr>
<td>Lost RBC volume, %</td>
<td>1.0035</td>
<td>0.0000</td>
<td>2.7 (2.0; 3.7)</td>
<td></td>
</tr>
<tr>
<td>General anaesthesia</td>
<td>1.1383</td>
<td>0.0404</td>
<td>3.1 (1.1; 9.3)</td>
<td></td>
</tr>
<tr>
<td>Sex (female)</td>
<td>1.4037</td>
<td>0.0328</td>
<td>4.1 (1.1; 14.8)</td>
<td></td>
</tr>
<tr>
<td>Percentage correctly classified</td>
<td>97.5%</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CABG</th>
<th>Independent variable</th>
<th>$r$</th>
<th>$P$</th>
<th>OR (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preoperative Hb, %</td>
<td>-0.1595</td>
<td>0.0000</td>
<td>0.9 (0.8; 0.9)</td>
<td></td>
</tr>
<tr>
<td>Lost RBC volume %</td>
<td>0.2377</td>
<td>0.0000</td>
<td>1.3 (1.2; 1.3)</td>
<td></td>
</tr>
<tr>
<td>Sex (female)</td>
<td>2.6031</td>
<td>0.0000</td>
<td>13.5 (6.0; 30.6)</td>
<td></td>
</tr>
<tr>
<td>Cell saver used</td>
<td>1.6963</td>
<td>0.0000</td>
<td>5.5 (2.7; 11.2)</td>
<td></td>
</tr>
<tr>
<td>Tranexamic acid used</td>
<td>1.1681</td>
<td>0.0367</td>
<td>3.2 (1.1; 9.6)</td>
<td></td>
</tr>
<tr>
<td>Percentage correctly classified</td>
<td>90.1%</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Prospective observational study with online data collection in 11 institutions interested in developing PBM (2010-2011)

Variables significantly different between centers:
- Patients and surgical characteristics
- Incidence of preoperative anaemia and its treatment
- Evolution of haemoglobin concentration
- Blood losses
- Incidence of RBC transfusion, volume of RBC transfused
Implementation of Patient Blood Management in Europe and Canada: the NATA benchmark project

✓ Prospective observational study with online data collection in 11 institutions interested in developing PBM (2010-2011)

✓ Implementation of PBM remains extremely variable between centers, despite major educational efforts aimed at disseminating knowledge in this area

✓ The development of PBM strategies should take into account not only the individual needs of patients but also the specificities of the individual healthcare facilities

NATA Benchmark Project

- Step 1: Evaluation of transfusion practices in different interested centers across Europe and Canada
- Step 2: Implementation of measures of improvement in these different centers according to their results
- Step 3: Re-evaluation of the practices – development of “NATA centers of excellence“
- Step 4: Enlargement of the project to additional centers under the coordination of these centers of excellence.
Patient-Focused Blood Management

depending on:

- Surgical procedure and technique
- Patients limitations
- Health Care environment
- Immediate and long term costs

Preop RBC mass

Periop blood loss

Restrictive Transfusion Trigger
Effect of a standardized multidisciplinary approach of blood conservation program on allogeneic transfusion exposure?
Perioperative Blood Conservation Strategy

Preop RBC mass
Standardized preop treatment (antiplatelets, iron...)

Periop blood loss
Standardized blood conservation programs

Reduce the Transfusion Trigger
Standardized transfusion trigger
Standardized Blood Transfusion Strategy

✓ Control group: September 97 - August 98
  N = 321 (group 1)

✓ Treated group: September 98 - August 99
  N = 315 (group 2)

✓ Data analyzed using analysis of variance, Student's t test, $\chi^2$, and Fisher's exact test where applicable

✓ Data expressed as percentage of the total or mean ± SD
Standardized Blood Transfusion Strategy

Patients (%)

<table>
<thead>
<tr>
<th></th>
<th>Aprotinin</th>
<th>Cell Saver</th>
<th>Ultrafiltration</th>
</tr>
</thead>
<tbody>
<tr>
<td>group 1</td>
<td>48.6</td>
<td>5.4</td>
<td>20.5</td>
</tr>
<tr>
<td>group 2</td>
<td>51.4</td>
<td>13.7</td>
<td>14.4</td>
</tr>
</tbody>
</table>

*p< 0.05, ** p<0.01 vs group 1
Standardized Blood Transfusion Strategy

Allogeneic blood transfusion (%)

- Group 1: 33 units (108 patients)
- Group 2: 18.1 units (57 patients)

Allogeneic blood (U)

- Group 1: 3.6 units
- Group 2: 0.6 units

p < 0.001 for both comparisons.
Standardized Blood Transfusion Strategy

Patients transfused (%)

- Perop: 5.6 (group 1) and 3.2 (group 2)
- JPO 1: 17.5 (group 1) and 8.9 (group 2) with p=0.001
- JPO 2-7: 23.4 (group 1) and 13 (group 2) with p=0.001

PRBC
Standardized Blood Transfusion Strategy

Group 1: 145 units in 28 patients; Group 2: 54 units in 15 patients
Standardized Blood Conservation Strategy

Patients transfused (%)

Perop

JPO 1

JPO 2-7

FFP

0.31

7.79

1.87

0.63

0.63

3.49

p = 0.019

[Legend: group 1, group 2]
Perioperative Hemoglobin Level

Hemoglobin (g/dL)

* $p<0.05$, **$p<0.01$ vs previous measurement

Group 1: N=321
Group 2: N=315
Developing a Blood Conservation Strategy

✓ Reliable data base

✓ Choice of alternative techniques
  ▶ Surgical procedure and technique
  ▶ Patients limitations
  ▶ Health Care environment
  ▶ Immediate and long term costs

✓ Continuous monitoring

✓ Multidisciplinary approach: anesthesiologists, surgeons, blood bankers...

Patient-Focused Blood Management: Conclusions

✓ Evidence-based approaches
  • Optimization of preoperative RBC mass
  • Perioperative cell salvage and anti-fibrinolytics use

✓ Clinically-based approaches
  • Meticulous surgical hemostasis and optimal anesthetic management

✓ Evidence-based and clinically-based approaches
  • Perioperative restrictive transfusion policy based on Hb level and clinical symptoms of anemia intolerance
“Patient blood management” is a multidisciplinary multimodal approach aiming at reducing transfusion requirements in order to improve health outcomes.

Changing clinician’s transfusion practices is a long lasting endeavor.

It is best achieved through benchmarking, providing its integration within a comprehensive and participatory policy of continuous quality improvement.
Primary PBM Stakeholders

CLOSE COLLABORATION BETWEEN:
- Anesthesiologists
- ICU Doctors
- Surgeons
- Blood Bankers

Blood Saving Techniques in the Perioperative Period