Special Lecture:

Patient Blood Management

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Patient blood management is key before elective surgery


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Patient Blood Management

The Lancet

Clinical Crossroads
Conferences with Patients and Doctors

Patient Blood Management

JAMA®
The Journal of the American Medical Association

Five Drivers Shifting the Paradigm from Product-Focused Transfusion Practice to Patient Blood Management

Axel Hofmann, a,b, Shannon Farmer, b,c,d, Aryeh Shander e

The Oncologist

Transfusion

Editorial

Patient blood management: a growing challenge and opportunity

Leithema

Anemia and Patient Blood Management in Hip and Knee Surgery

A Systematic Review of the Literature

Donat R. Spahn, M.D., F.R.C.A.*
The rationale behind PBM is that **optimal clinical outcomes** can be achieved when the **optimization and preservation of a patient’s own blood** takes priority over the transfusion of **donor blood**.
Two Conditions of Clinical Significance

Anaemia and ID

Bleeding
Two Conditions of Clinical Significance

**Anaemia and ID**

*Highest prevalence of all diseases worldwide*, caused by:
- absolute iron deficiency (50% of all causes)
- functional iron deficiency
- severe hemorrhage
- chemotherapy (CIA) and/or radiation
- medication
- congenital disorders
- other

**Bleeding**
Two Conditions of Clinical Significance

**Anaemia and ID**

*Highest prevalence of all diseases worldwide*, caused by
- absolute iron deficiency (50% of all causes)
- functional iron deficiency
- severe hemorrhage
- chemotherapy (CIA) and/or radiation
- medication
- congenital disorders
- other

**Bleeding**

*Very high prevalence caused by*
- local surgical or vessel interruption
- therapeutic and diagnostic interventions
- trauma
- anticoagulant drugs
- obstetric complications
- congenital disorders
- other
Problem 1
Anemia & ID
## Anemia Prevalence in Surgical Populations

<table>
<thead>
<tr>
<th>Type of surgery</th>
<th>Prevalence of pre-operative anaemia (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elective surgery¹</td>
<td>19-75</td>
</tr>
<tr>
<td>Cardiac surgery¹,⁶</td>
<td>24-26</td>
</tr>
<tr>
<td>Non-cardiac surgery²,⁷</td>
<td>30-40</td>
</tr>
<tr>
<td>Orthopaedic surgery¹,³-⁵</td>
<td>19-38</td>
</tr>
<tr>
<td>Colorectal surgery⁵</td>
<td>70</td>
</tr>
</tbody>
</table>


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Independent Risk Factor for Adverse Outcomes

Anemia & Iron Deficiency

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Anemia independently associated with increased:
• morbidity
• hospital length of stay
• Mortality
• likelihood of transfusion (2-9 fold)

Mussallam KM et al. Lancet 2011
Spahn DR. Anesthesiology 2010; 113(2) 1-14
Beattie WS, et al Anesthesiology 2009; 110(3) 574-81
Shander A. Am J Med 2004; 116(7A) 58S-69S
Problem 2

Blood Loss & Bleeding
Independent Risk Factor for Adverse Outcomes

Blood Loss & Bleeding

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Bleeding associated with increased
• Morbidity
• ICU and hospital length of stay
• Mortality
  • Elective & emergency surgery ~0.1%
  • Subgroups:
    • Vascular 5-8%
    • Up to 20% with severe bleeding
    • Major organ damage 30-40%

Causes
• On average 75 - 90% local surgical interruption or vessel interruption
• 10-25% acquired or congenital coagulopathy

Shander A. Surgery 2007
Vivacqua et al Ann Thorac Surg 2011
Christensen et al J Thorac Cardiovasc Surg 2009
Ye, X., et al BMC Health Serv Res, 2013
Independent Risk Factor for Adverse Outcomes

Blood Loss

Anemia & Iron Deficiency

Iron Deficiency
How to Fix Anemia and Bleeding?

For decades RED BLOOD CELL TRANSFUSION was considered the optimal treatment for anemia and bleeding.
How to Fix Anemia and Bleeding?

STOP and evaluate outcome data!
Blood transfusion was the most common procedure performed during hospitalizations in 2011 (12 percent of stays with a procedure); the rate of hospitalizations with blood transfusion more than doubled since 1997.

http://www.hcup-us.ahrq.gov/reports/statbriefs/sb165.pdf
Problem

Transfusion and Outcome
Large observational studies show RBC txn is independently associated in a dose-dependent relationship with
- Morbidity
- ALOS
- Mortality

Shaw et al. Transfusion 2014
Parsons J et al. Crit Care 2013
Horvath K et al. Ann Thorac Surg 2013
Linder et al. BJU Int 2013
Al-Refaie et al Surgery 2012
Stone GW et al. Am Heart J 2012
Xenos et al. Thromb Res 2012
Glance L et al. Anesthesiol 2011
Haijar LA et al. JAMA 2010
Beattie et al. Anesthesiology 2009
Bursi et al. Eur J Vasc Endovasc Surg 2009
Chaiwat O et al. Anesthesiology 2009
Karkouti et al. Circulation 2009
Gauvin et al Transfusion 2008
Ho et al. Spine 2007
Rogers et al. Am Heart J 2006
Surgenor SD, et al Circulation 2006
Leal-Noval et al. Anesthesiology 2003
Malone DL et al. J Trauma 2003
Chang et al. Vox Sang 2000
Vignali et al. Vox Sang 1996
Large observational studies show RBC txn is independently associated in a dose-dependent relationship with

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Malone DL et al. J Trauma 2003
Chang et al. Vox Sang 2000
Vignali et al. Vox Sang 1996

RCTs and meta-analyses thereof show that liberal transfusion strategies appear to offer no benefit but result in increased adverse patient outcomes.

Carson et al. Cochrane Review 2012
Triad of Independent Risk Factors for Adverse Outcomes

- Anemia & Iron Deficiency
- Blood Loss & Bleeding
- Transfusion


Triad of Independent Risk Factors for Adverse Outcomes

Anemia & Iron Deficiency

Induces or exacerbates anemia

Blood Loss & Bleeding

Transfusion

Triad of Independent Risk Factors for Adverse Outcomes

Anemia & Iron Deficiency

Induces or exacerbates anemia

Trips transfusion

Blood Loss & Bleeding

Associated w/ increased rebleeding

Transfusion

Restellini S, AP&T 2012
Hearnshaw SA, et al Aliment Pharmacol Ther 2010


State of the Art in PBM = Coping with the Triad
Optimise red cell mass

Minimise blood loss & bleeding

Harness & optimise physiological reserve of anaemia

Anemia, Iron Deficiency

Blood Loss & Bleeding

Transfusion

1st Pillar

2nd Pillar

3rd Pillar

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Optimise red cell mass

Blood Loss & Bleeding

Harness & optimise physiological reserve of anaemia

Transfusion

1st Pillar

2nd Pillar

3rd Pillar

EORTC 03-2015 Madrid
1st Pillar: Optimise red cell mass

2nd Pillar: Minimise blood loss & bleeding

3rd Pillar: Harness & optimise physiological reserve of anaemia

Transfusion

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1st Pillar

Optimise red cell mass

2nd Pillar

Minimise blood loss & bleeding

3rd Pillar

Harness & optimise physiological reserve of anaemia

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The Rationale of Patient Blood Management

“PBM ... preempts and significantly reduces the resort to transfusions by addressing modifiable risk factors that may result in transfusion long before a transfusion may even be considered”

2008

Government of Western Australia
World’s First Statewide PBM Program
“... the Government of Western Australia is to be congratulated ... to sustainably implement patient blood management. ... they are leading the world in the battle against unnecessary erythrocyte transfusions and their burden—financially and in terms of morbidity and mortality.“


“The WA PBMP is the first proposed on a jurisdictional system-wide basis“

*Farmer SF et al. Drivers for change: Western Australia Patient Blood Management Program (WA PBMP), World Health Assembly (WHA) and Advisory Committee on Blood Safety and Availability (ACBSA). Best Pract Res Clin Anaesthesiol 2013;27(1): in press*
RBC Issuance Comparison between Australia’s Five Largest Jurisdictions
2006/07-2013/14

Units issued per 1,000 population

Financial year

Implementation of WA PBM program

NSW
QLD
SA
VIC
WA

Source: National Blood Authority, 2014

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Platelet Issuance Comparison between Australia's Five Largest Jurisdictions
2006/07-2013/14

Implementation of WA PBM program

Source: National Blood Authority, 2014

EORTC 03-2015 Madrid
FFP Issuance Comparison between Australia's Five Largest Jurisdictions
2006/07-2013/14

Source: National Blood Authority, 2014

Implementation of WA PBM program

Source: National Blood Authority, 2014
WHA63.12 adopted by resolution May 21, 2010:

„Bearing in mind that patient blood management means that before surgery every reasonable measure should be taken to optimize the patient’s own blood volume, to minimize the patient’s blood loss and to harness and optimize the patient-specific physiological tolerance of anaemia following WHO’s guide for optimal clinical use (three pillars of patient blood management)“
2011

Dubai, UAE
WHO Global Forum on Patient Blood Management
Organized by WHO HQ/Geneva and Sharjah Blood Transfusion and Research Centre and co-sponsored by the Government of United Arab Emirates (UAE)

**Priorities for Action**

8. Conduct multi-centric studies
   a. Patient outcomes
   b. Alternatives
9. Conduct benchmarking studies to compare practices in different hospitals and clinicians
10. Start hospital accreditation programmes, including clinical transfusion as part of this programmes
11. Provide training for clinicians, nurses and midwives on blood use
12. Develop professional leadership skills to lead and manage hospitals across the country to strengthen hospital transfusion systems
13. Develop educational curriculum
   a. Pre-service
   b. In-service
   c. Post graduate educations (multiple discipline)
14. Focus on outcome research
15. Translate - Make available current evidence through desk research - meta analysis
   a. Move forward on randomized control trials (RCT)
   b. Need more funding for RCT in Patient Blood Management
1. Introduction

Patient blood management aims to improve clinical outcomes by avoiding unnecessary exposure to blood components. It includes the three pillars of:

- optimisation of blood volume and red cell mass
- minimisation of blood loss
- optimisation of the patient's tolerance of anaemia.

These principles apply in the management of any haematological disorder. Patient blood management optimises the use of donor blood and reduces transfusion-associated risk.

If blood components are likely to be indicated, transfusion should not be a default decision. Instead, the decision on whether to transfuse should be carefully considered, taking into account the full range of available therapies, and balancing the evidence for efficacy and improved clinical outcome against the potential risks.
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Patient Blood Management Guidelines: Module 2

Perioperative

Introduction

Patient Blood Management aims to improve clinical outcomes by avoiding or reducing reliance on blood components. It includes the three pillars of: Optimise haemopoiesis, Minimise blood loss & bleeding and Harness & optimise physiological tolerance of anaemia.

Multidisciplinary team approach

Patient Blood Management

1st Pillar 2nd Pillar 3rd Pillar

Optimise haemopoiesis

Minimise blood loss & bleeding

Harness & optimise physiological tolerance of anaemia

Medical

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The establishment of coordinated patient blood management programs will help organisations to attain accreditation against national standards such as the new Blood and Blood Products Standard developed by the Australian Commission on Safety and Quality in Health Care.
National Priorities

The Commission leads and coordinates improvements in safety and quality in health care across Australia, including the promotion, support and encouragement of the implementation of safety and quality initiatives.

A collaborative and consultative approach is undertaken in priorities of the health system that benefit from national coordination. Under its legislation the Commission has wide ranging functions that also include the formulation of safety and quality standards and indicators.

National Patient Blood Management Collaborative

The Commission has been engaged by the Department of Health to lead the National PBM Collaborative, in consultation with the National Blood Authority and the states and territories, to promote appropriate care in relation to the use of blood across Australia.
PBM takes an individualised, multidisciplinary approach to the management of a patient’s blood, through assessment and the development of a management plan to:

- Optimise a patient’s own blood (identify and address the health conditions that might lead to a blood transfusion such as anaemia or iron deficiency);
- Minimise blood loss (such as surgical techniques that reduce blood loss); and
- Optimise tolerance of anaemia (with appropriate management, the body may tolerate anaemia without resorting to blood transfusion).

PBM should be the standard of care applied by all clinicians for patients facing a medical or surgical intervention who are at high risk of significant blood loss.

The best and safest blood for patients is their own circulating blood.

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

Appropriate patient management requires a patient’s blood (circulatory system) to be considered in the same way as the management of all other body systems.
European Patient Blood Management (PBM) Project started

Good Practices in the Field of Blood Transfusion

Vienna (pts006/21.03.2014/09:50) - The AIT Austrian Institute of Technology has been awarded a contract to develop "Good Practices in the Field of Blood Transfusion" by the Consumers, Health and Food Executive Agency (CHAFEA) of the European Commission. AIT will be joined by a group of three leading experts to jointly develop an "EU Guide for Member States on Good Practices for Patient Blood Management (EU-PBM)".
Patient safety is of primary concern to the European Commission. An important element related to patient safety is the safe and adequate use of substances derived from human blood. In autumn 2013, the Commission launched a tender on “Good practices in the field of blood transfusion” via its Consumers, Health and Food Executive Agency (Chafea).

**Definition and Rationale of Patient Blood Management**

PBM is a multidisciplinary concept that primarily focuses on patient safety by avoiding and/or treating anaemia, minimising blood loss and bleeding and optimising the physiological reserve of anaemia. Studies have shown that this comprehensive strategy significantly minimises the use of allogeneic blood products and therefore reduces their adverse effects on patient outcome. It has also been demonstrated that PBM saves costs for health care systems.

**Aims**

The aims of the project are to:
- study and map blood use for different medical disciplines
- identify and map local and national differences in PBM strategies and blood utilisation.
- identify good practices in PBM and
- develop an EU guide on good practices for PBM based on the three pillars PBM concept
- implementing a PBM pilot program in 5 European teaching hospitals

**Teaching Hospitals (Coordinator)**

- Rigshospitalet / University Hospital Copenhagen (Axild Norgaard)
- University Hospital Centre Zagreb (Branka Golubić-Čepulić)
- Hospital Universitario de Santa Maria, Lisbon (Lucinda Otomonde)
- Medical University of Vienna / Vienna General Hospital (Klaus Markstaller)
- University Hospital Frankfurt (Kai Zacharowski)

**Core Project Team**

- Hans Gombotz, Linz
- Axel Hofmann, Zurich
- Kai Zacharowski, Frankfurt
- Gunter Schreier, Graz
- Peter Kastner, Graz

**EU-PBM project office**

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Project eMail: office@europe-pbm.eu
EC EMail: Chafea@ec.europa.eu
Website: www.europe-pbm.eu
PATIENT BLOOD MANAGEMENT

IMPROVES PATIENT OUTCOMES  LOWERS RISKS  REDUCES COSTS

NATIONAL STATS

Nearly 14 million allogeneic red cell units transfused per year at a direct cost to hospitals of over $9 billion (average red cell $225/unit).

Blood transfusion is the most common procedure performed during hospitalizations.

Average consumption red cell 10-50K units per facility.

59% of RBC transfusions were found inappropriate.

Transfusion guideline implementation associated with 47% reduction in the odds of death and 50% decrease of total hospitalization cost after cardiac surgery.

Implementation of an Anemia Management program resulted in a reduction of RBC transfusion by 29%.

25% reduction in hospital stay for non-transfused vs. transfused patients.

First year of implementation expenses for blood products decreased $550,000 in the first year.

WHAT'S YOUR BLOOD USAGE?

PATIENT BLOOD MANAGEMENT 2015 Madrid  www.aabb.org/PBM
Transfused RBCs per Admissions in the Eight Largest Public Austrian Hospitals (Admissions w/ >0 ALOS)

- Publication of the results of the Austrian Benchmark Study (blood utilization in public hospitals)

RBC Issuance Comparison between Germany, Australia and WA
2004-2013

(Australia and WA financial year 2013-14, Germany calendar year 2013)

Source: National Blood Authority, 2014; Paul Ehrlich Institut, Germany

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Benefits of PBM Programs

- reduction by 10 - 95%
- reduction up to 68%
- reduction by 16-33%
- reduction up to 43%
- reduction up to 43%
- reduction of composite morbidity up to 41%, and infection rate up to 80%
- reduction by 10-24%
Problem:

Solution:

Benefit:

↑ Safety

↓ Mortality & Morbidity

↓ ALOS

↓ Health Care $$$
The Five Biggest Problems In Health Care Today

1. Too much unnecessary care
2. Avoidable harm to patients
3. Billions of dollars wasted
4. Perverse incentives in how we pay for care
5. Lack of transparency

All addressed by PBM