Patient Blood Management (PBM)

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Agenda

- Introduction
- Three findings with significant impact
- Concept of PBM and our approach
- Appraisal of the recently published first prospective multicenter PBM-study
- Closing remarks
PBM – “old fashioned” synonym may be Optimal Hemotherapy & Blood Saving Measures*

- Optimal blood component use (as much as needed / as little as possible)
- If planning elective surgery
  - Treat iron-deficiency ± anemia in advance → iron ± Erythropoetin
  - Treat possible coagulopathies in advance
  - Consider autologous donation ± Erythropoetin
  - (Consider acute normovolemic Hemodilution)
- Optimize surgical techniques → „bloodless surgery“
- Intra-operative blood salvage
- Local and/or systemic measures for improving hemostasis
- Minimizing the volume of withdrawn blood samples (saving blood loss!)
- …

“Hip”: Patient Blood Management

“The three pillars of PBM”

- Management of Anemia & Coagulation
- Minimizing blood loss
- Optimal blood use
- Improved patient care
Donor

Red Blood Cells

Platelets

Plasma / -factors

(Stem-) Cell products

Donor Apheresis

Patient

Anemia

Low count / dysfuntion

Coagulopathy

SC-TX / Cell-therapy

Therapeut. Apheresis

**Transfusion Medicine**

- **Safety**
- **Availability**
- **Compatibility**
- **Optimal Use**

Introduction - TM
Risks of transfusions in CH (2008-13), all BP, grade 3&4

Total risk of TR: ~ 1:15’000
Allergic TR: ~ 1:30’000
TACO: ~ 1:80’000
TRALI: ~ 1:300’000
Acute HTR: ~ 1:350’000
Hypotensive TR: ~ 1:400’000
Bacterial infection: ~ 1:400’000
TAD: ~ 1:500’000
Hyperkalemia: ~ 1:12.5 Mio
Delayed HTR: ~ 1:2.5 Mio

Risk of IBCT in 2014:
~ 1:7’000 transfusions

Swissmedic 2014/5
Adverse effects of RBC transfusion contrasted with other risks


©2012 by American College of Physicians
USA population:
319,000,000 (2014)

Death from medical error:
251,000/Y:
→ 1 in 1,271 residents/Y

Makary M, Daniel M: Medical error - the third leading cause of death in the US. BMJ 2016;353:1-5
LAWS OF THE HOUSE OF GOD: § XIII

“The delivery of good medical care is to do as much nothing as possible”

Samuel Shem, M.D., 1978
Blood use in elective surgery: the Austrian benchmark study

n=2600 TKP & THP; 04/2004 – 02/2005; Transfusion 2007;47:1468-80

Three findings with significant impact - #1 variation
Randomized Transfusion-Trigger-Studies for RBC (n>40)

TRICC

TRIPICU

Villanueva

FOCUS

FOCUS

3yr follow up

MINT

(pilot)

TRACS

TITRe2

Almeida

e tc., etc., ...
“How low can we go”
Mortality rate (% & #) and postop Hb-Nadir

Carson et al 2002; n=300
Shander et al 2014; n=293

Three findings with significant impact – #2 Hb-Trigger
Conclusions of Randomized Transfusion-Trigger-Studies for RBC

- Restrictive strategy decreased exposure to RBC-transfusion by 43% &…
- Transfusions can be mostly avoided in case of Hb > 70-80 (-90) g/L.
- Restrictive strategy was without impact on 30-day mortality or morbidity.
- Insufficient data in acute coronary syndrome, myocardial infarction, acute neurological disorders, neurological injury/traumatic brain injury, stroke, thrombocytopenia, solid/hematological malignancies, bone marrow failure.
- Restrictive strategy: caution in high-risk patients with major surgery.
- Broad-based adherence to guideline approaches of therapy must respect the individual patient condition …


FINDINGS: ... 227,425 patients, of whom 69,229 (30.44%) had preoperative anaemia....

INTERPRETATION: Preoperative anaemia, even to a mild degree, is independently associated with an increased risk of 30-day morbidity and mortality in patients undergoing major non-cardiac surgery.

FUNDING: Vifor Pharma.
Correlation ≠ Causation

**Observation #1**
Decline of storks 1800-1980

**Observation #2**
Decline of birth rate 1800-1980

Correlation!

Joint Causation (= Causality)

INDUSTRIALISATION
“Three Pillars of PBM”

1. Pre-operative Management of Anemia & Coagulation
   PBM-ambulatory: Diagnosis and treatment of anemia and coagulopathy in elective surgery (risk of transfusion >10%). Utilization of waiting time until surgery.

2. Optimal Blood Use / Use of RBC
   Adherence to implemented guidelines for transfusion

3. Further Blood Saving Measures
   Restrictive taking of blood samples, blood-less surgery, Cell-Saver, management of body temperature, point-of-care diagnostic, management of coagulation
Pre-operative Patient Pathway in PBM

„Elective“ Surgery
Planning > 4 (ideally ≥ 14) days

„Non-elective“ Surgery ≤ 4 d

Probability of Transfusion < 10%*
♂ Hb ≥ 130 g/L
♀ Hb ≥ 120 g/L

Probability of Transfusion ≥ 10%*
♂ Hb ≤ 130 g/L
♀ Hb ≤ 120 g/L

Signs / symptoms of Coagulopathy

*S has to be analyzed for individual hospital

Surgery

PBM-Ambulatory

*Has to be analyzed for individual hospital
Surgical Procedures with Transfusion Probability ≥ 10%

Inselspital 2014

Herz- und Gefäßeingriffe
- Eingriffe an Herz, Perikard, Aorta ± ECC
- Re-Sternotomie, Rethorakotomie
- Transkatheter-Klappenimplantationen
- Aorteneingriffe (offen, endovaskulär)
- Iliaco-femoro-politeale Eingriffe

Orthopädie
- Wirbelsäulen-OP (offen)
- Becken-OP (Prothetik, Osteosynthese, Re-OP)
- Hüft-OP (Prothetik, Osteosynthese, Re-OP)
- Femur- oder Knie-OP (Prothetik, Osteosynthese, Re-OP, Amputation)

Thoraxchirurgie
- Erweiterte Pleuropneumonektomie

Urologie
- Offene Tumorchirurgie der Nieren, Nebennieren
- Radikale Zystektomie
- Blasenersatzplastik
- Suprapubische Prostatektomie

HNO, Schädel-, Gesichts- und Kieferchirurgie
- Free-Flap-Chirurgie grosser Tumoren

Säuglings- und Kinderchirurgie
- Skoliose Aufrichtung
- Kraniosynostosen

Viszeralchirurgie
- Lebertransplantation
- Offene Leberteilresektion grosser Tumoren
- Resektion grosser retroperitonealer Tumoren
- Resektion grosser intraperitonealer Tumoren ± intraoperativer Chemotherapie-Perfusion
- Ösophagusresektion

H.U. Rieder, 15.01.2015; ergänzt / modifiziert B. Eberle 20.9.16

Patient blood management / B. Mansouri Taleghani

Concept of PBM and our approach 18
Surgical Consultation: anemia and/or coagulopathy?
Transfusion probability ≥ 10%

- yes

Pre-operative Administration

- no

Anesthesiological Consultation: anemia and/or coagulopathy?
Transfusion probability ≥ 10%

- yes

- Same day referring to our PBM-ambulatory by the surgeons/anesthetists (beeper PBM-nurse) possible
- The patient is ideally seen at the PBM-ambulatory on the same day or very contemporary
- Reporting to referring physicians and involved units
- In case of follow-on surgeries or multiple surgeries the process starts again from the beginning

- no

Pre-operative surgical consultation

Hospital Admission
"Three Pillars of PBM"

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## Adopted* Recommendations of RBC Transfusions in Normovolemic Surgical Patients

<table>
<thead>
<tr>
<th>Hemoglobin</th>
<th>Compensation capacity risk factors</th>
<th>Transfusion: YES/NO</th>
<th>Evidence</th>
</tr>
</thead>
</table>
| ≤ 60 g/L  
(≤ 3,7 mmol/L) | – | YES (exceptions possible) | 1 C+ |
| > 60 – 80 g/L  
(> 3,7 – 5,0 mmol/L) | Adequate compensation and no risk factors | NO | 1 C+ |
| | Reduced compensation risk factors present | YES | 1 C+ |
| | Signs and symptoms of anemic hypoxemia | YES | 1 C+ |
| > 80 – 100 g/L  
(> 5,0 – 6,2 mmol/L) | Signs and symptoms of anemic hypoxemia | YES | 2 C |
| > 100 g/L  
(> 6,2 mmol/L) | – | NO (exceptions possible) | 1 A |

*“Querschnitts-Leitlinien zur Therapie mit Blutkomponenten und Plasmaderivaten; Herausgeber: BÄK; 2016“ (under review)
“Three Pillars of PBM”

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Hemoglobin of patients in an intensive care unit after cardio-thoracic surgery
Restrictive taking of blood samples
First multi-center, prospective study of PBM


RESULTS: A total of 129,719 patients discharged between July 2012 and June 2015 with different inclusion periods for pre-PBM (54,513 patients) and PBM (75,206 patients) were analyzed. … The non-inferiority aim was achieved (P < 0.001). Incidence of acute renal failure decreased in the PBM cohort (2.39% vs 1.67%; P < 0.001, regression model). The mean number of red blood cell transfused per patient was reduced from 1.210.05 to 1.000.05 (relative change by 17%, P < 0.001). (But cave at: On average a comparable reduction was also observed in all other regions of Germany)

CONCLUSIONS: The data presented show that implementation of PBM with a more conscious handling of transfusion practice can be achieved even in large hospitals without impairment of patient’s safety. Further studies should elucidate which PBM measures are most clinically and cost effective.
Development of RBC-Transfusion in Switzerland

(Delivered! units to hospitals)

-28.1%
-19.5%

RBC/1000 inhabitants
RBC total

Development of RBC-Transfusion per 1000 inhabitants in 9 European Countries

-15%

-28.1%
Requirements for Implementing PBM Programs

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- …

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