

# Patient Blood Management: Moving Beyond Red Cells

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1

## Disclosures

No relevant financial disclosures

I will be previewing some of our data to be presented at AABB 2022

2

A transfusion is a transplant.

What really is patient blood management (PBM)?

3

4

## PBM – A History

*Histor J. Updates in Blood Conservation and Transfusion Alternatives. 2005;7 Dec: 3-7*

### Why Should Health Professionals be Concerned about Blood Management and Blood Conservation?

James Ishister

Royal North Shore Hospital of Sydney  
Clinical Professor of Medicine, University of Sydney



“Blood Conservation”

Conserve the precious blood supply → Conserve the patient’s blood

“Blood Management”

Manage the inventory → Manage the patient’s O2 carrying capacity

5

## PBM – A History

“This is not to deny the importance of the multiple issues and challenges facing the provision of an adequate and safe blood supply, but rather to ensure the horse is in front of the cart, willing and able to **address the needs of patients, with the supply chain appropriately responding to clinical needs.**”

6

## PBM – A History

Key point:

Transfusion decisions should be supported by evidence of patient benefit

7

## PBM – A History

Sentinel events predating “PBM”

- Cooley Et al (1977) → Cardiac surgery in Jehovah's Witnesses
- HIV/AIDS epidemic and transfusion transmitted infection

How did we respond (by 2005)?

- Still priming cardiac pumps...
- Rise (and fall) of autologous donations

8

## PBM – A history

5 Questions Challenges posed by Isbister:

1. Are we making progress in transfusion medicine?
2. How beneficial is blood component therapy in specific clinical circumstances?
3. How should we cost transfusion medicine?
4. What are the “real” hazards of blood component therapy?
5. Is the quality of blood components adequate?

## Jump Forward 17 years

9

10

## What is PBM In 2022?

“PBM is a multimodal, multidisciplinary patient-centered strategy aimed at minimizing the use of blood products and improving patients' outcomes”

1. Improve red cell mass
2. Minimize blood loss
3. Restrictive transfusion

We tend to think of PBM as a red cell thing for surgery patients

11

## What really is patient blood management (PBM)?

In practice, the scope of “PBM” can be hard to define. But you know PBM activities when you see them.

12

How have we pulled off (Red Cell) PBM since 2005?

Answer: Evidence (Progress)

13

Red Cell Progress: Evidence

- Indication: Restrictive transfusion thresholds (7-8 g/dL)
- Dosage: Single unit transfusions ("Why give two...")
- Attributes: Prestorage leukoreduction, age of units, indications for irradiation, washing, etc.

**Special Communication**  
November 15, 2016

**Clinical Practice Guidelines From the AABB**  
Red Blood Cell Transfusion Thresholds and Storage

John C. Coan, MD, Gordon Cooper, MD, Nancy H. Habesh, MD, T. Jay  
▶ [View this document in its entirety](#)  
JAMA. 2016;316(20):2532-2535. doi:10.1001/jama.2016.20495

14

Red Cell PBM: Real World Application

- Understand: Indication, dosage, outcomes
- Recognized benefits: PATIENTS, laboratory, clinicians, administrators
- Do cool stuff:
  - EHR Clinical Decision Tools
  - Preoperative anemia clinics
  - Cell saver, bloodless surgeries (circa 1977...)

High Priority (1)

**No Hemoglobin exists within the last 36 hours**

- Select the Open Order Set button (and click Accept to order a Hemoglobin, CR)
- Click the Reason to Order link to review the transfuse order, CR
- Click the Reason for Transfusion and enter a reason to proceed

Last HGB: c0b6d3dheadid CDDMMYYYY \* Result value

[Open Order Set](#) [Do Not Open](#) [PRETRANSFUSION LAB ORDERS](#) [Preview](#)

[Return to Order to remove transfuse order](#)

Acknowledge Reason  
Reason for Transfusion

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Important (1)

**This patient may be at risk for Transfusion Associated Circulatory Overload due to any of the following**

- History of Transfusion Associated Circulatory Overload (TACO)
- History of Congestive Heart Failure (CHF)
- Abnormal Brain Natriuretic Peptide Level (BNP)

**RECOMMEND MONITORING TOTAL FLUID INTAKE/OUTPUT**  
**A SLOW TRANSFUSION RATE IS RECOMMENDED (1 mL/kg of Body Weight/Hour or 2-4 mL/min).**

Last BMP: c0b6d3dheadid CDDMMYYYY \* Result value

15

16

This is great. But Isbister never mentions "packed red cells."

17

PBM for non-pRBC. Does it exist?

▶ [Transfus Med. 2016 Dec;26\(6\):422-431. doi: 10.1111/trms.12331. Epub 2016 Aug 10.](#) [Review](#) ▶ [Crit Care Clin. 2012 Jul;28\(3\):413-26. vi-vi. doi: 10.1016/j.ccl.2012.04.002.](#)

**Effective implementation of a patient blood management programme for platelets**

Al Galim <sup>1</sup>, S Clark <sup>2</sup>, R Abagana <sup>3</sup>, A Lu <sup>4</sup>, Z Chaudry <sup>5</sup>

Affiliations ▶ expand  
PMID: 27511318 DOI: 10.1111/trms.12331

[Lawrence Tim Goodrough](#)<sup>6</sup>  
Affiliations ▶ expand  
PMID: 23713651 DOI: 10.1016/j.jam.2013.04.002

▶ [On Microbiol Infect. 2021 Jul;21\(7\):987-992. doi: 10.1016/j.sm.2021.04.005.](#) [Epub 2021 Sep 01.](#)

**Patient- blood management for COVID-19 convalescent plasma therapy: relevance of affinity and donor-recipient differences in concentration of neutralizing antibodies**

Daniela Foroni <sup>1</sup>, Fatima Hagg <sup>2</sup>, Massimo Franchini <sup>3</sup>, Adriano Agosti <sup>4</sup>, Maria-Luisa <sup>5</sup>, Alessandro Messori <sup>6</sup>, Francesco Mecenate <sup>7</sup>

Affiliations ▶ expand  
PMID: 33870020 PACTD: PACTD020208 DOI: 10.1016/j.sm.2021.04.002

▶ [Thorax Cardiovasc Surg. 2020 Aug;168\(2\):437-445.e05. doi: 10.1016/j.jtcvs.2019.09.102. Epub 2019 Oct 7.](#)

**Impact of patient blood management guidelines on blood transfusions and patient outcomes during cardiac surgery**

Adam H Isbister <sup>1</sup>, Anthony Harris <sup>2</sup>, Dennis Petrie <sup>3</sup>, Alan Higgins <sup>4</sup>, Julian Smith <sup>5</sup>, Zhi E McQuillan <sup>6</sup>

Affiliations ▶ expand  
PMID: 31711621 DOI: 10.1016/j.jtcvs.2018.10.102

18

### Have Plasma/Platelets been overlooked?

1. Transfused less often (1 unit for every 5-6 pRBC)
2. Narrower scope of use?
3. Smaller line item?
4. "Blood" = Red blood cells?

**Biggest culprit: We still don't fully understand best use of these products**

19

### Platelet/FFP Stalling: (Lack of) Evidence

RBC Indication	Hgb Threshold	AABB Recommendation, Evidence Quality
Most hospitalized patients	<7 g/dL	Strong, moderate quality
Cardiovascular disease	<8 g/dL	Strong, moderate quality
Orthopedic surgery		
Cardiac surgery		

Platelet Indications	PLT Count Threshold	AABB Recommendation, Evidence Quality
Chemotherapy (non-bleeding)	<10 /uL	Strong, moderate quality
Minor procedure (Central line)	<20 /uL	Weak, low quality
Lumbar puncture	<50 /uL	Weak, very-low quality
Pre-major surgery	<50 /uL	Weak, very-low quality

Plasma (FFP) Indications

A series of suggestions, cannot recommends, and you probably should avoid, based on low to very-low quality evidence

**Clinical Practice Guidelines From the AABB**  
 Red Blood Cell Transfusion Thresholds and Storage  
2016, 2017, 2021. DOI: 10.1111/trf.15406. <https://doi.org/10.1111/trf.15406>

**Platelet Transfusion: A Clinical Practice Guideline From the AABB**  
2016, 2017, 2021. DOI: 10.1111/trf.15407. <https://doi.org/10.1111/trf.15407>

**Transfusion Practice**  
2016, 2017, 2021. DOI: 10.1111/trf.15408. <https://doi.org/10.1111/trf.15408>

20

### Current State of the FFP Evidence

THE JOURNAL OF ABB transfusion.org

# TRANSFUSION

TRANSFUSION MEDICINE | Full Access

**Plasma trial: Pilot randomized clinical trial to determine safety and efficacy of plasma transfusions**

Jeffrey L. Carson, Paul M. Ness, Monica B. Pagano, Claire S. Philipp, Arthur W. Bracey Jr, Maria Mori Brooks, John L. Noshier, Lauren Hogshire, Helaine Noveck, Darrell J. Trulizi

First published: 31 May 2021 | <https://doi.org/10.1111/trf.16508> | Citations: 2

21

### Current State of FFP Evidence

THE JOURNAL OF ABB transfusion.org

# TRANSFUSION

EDITORIAL | Free Access

**Prophylactic plasma: Can we finally let go?**

Nicole P. Juffermans, Marcella M. Muller

First published: 17 July 2021 | <https://doi.org/10.1111/trf.16546>

22

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First published: 17 July 2021 | <https://doi.org/10.1111/trf.16546>

underlying the clinical practice of pre-procedural plasma transfusion. To start with, risk of bleeding following an invasive procedure (such as an endoscopy, paracentesis, catheter insertion or biopsy) in patients with a prolonged INR is low, with incidences ranging between 0% and 1%.<sup>2-10</sup> Also, inclusion of patients with a prolonged INR assumes that an INR reflects an increased risk of bleeding. As the authors acknowledge, this is not the case. In patients reactions. Therefore, there is no equipoise about the question whether prophylactic plasma is beneficial. In line with this, current guidelines do not support the use of prophylactic plasma.

23

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clinicians that it is safe to abandon the practice of prophylactic plasma. But let us not use resources to perform another trial on prophylactic plasma. We propose that efforts should be made to improve identification of patients who indeed have an increased bleeding risk.

24

## Current State of Platelet Evidence

Literature Review

### The Role of Platelet Transfusions After Intracranial Hemorrhage in Patients on Antiplatelet Agents: A Systematic Review and Meta-Analysis

Eloisa Brugi<sup>1,2,3,4,5</sup>, Davide Carbelli<sup>2</sup>, Federico Coccolini<sup>1</sup>, Emiliano Gamberini<sup>1</sup>, Emanuele Russo<sup>6</sup>, Yanni Agnolotti<sup>1</sup>, Francesco Forlani<sup>1</sup>

25

## So what have we learned?

- RBC PBM has been mostly successful
  - Good evidence → Good guidelines → Adoption
- Plt/FFP PBM has been overshadowed
  - Historical practice → Low-quality evidence → Limited guidelines
  - Hard to “disprove the negative”

**We struggle with change, and don't learn well from our peers [outside of the USA].**

27

## How do we try to do PBM without good evidence?! We *needed* it for RBCs

We have things we (think) we know, and we need to act on them

- Timing
- Dosage
- Contraindications/useless interventions

29

## Current State of Platelet Evidence

The evidence suggests that antiplatelet agents (APA) slightly increase the risk of death and disease progression in patients with traumatic brain injury or spontaneous intracranial hemorrhage (ICH). There is little evidence that APA reversal with platelet (PLT) transfusion may improve the outcome. In this systematic

type of bleeding mechanism, we observed the same results. The use of PLT in patients on APA affected by ICH seemed to have no clear beneficial effect for the outcomes evaluated; conversely, PLT seemed to slightly increase the odds for adverse events of thromboembolic origin, even although not significantly.

26

## The Pressure Is On

1. Cost of platelets has rapidly increased
2. Disconnect between historical and current practice
  - New blood products
  - New pharmacologics
  - New laboratory assays
3. Change in risk profile
  - ↓TRALI, ↓TT-Infection, ↑Severe TACO

28

## So what can We do about it?

(In the laboratory)

30

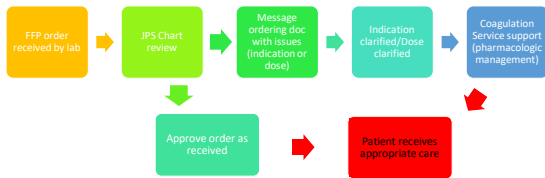
I'm crazy so I happily volunteered to review all FFP orders in real time.

Not massive transfusion/trauma, emergency release, OR/immediately post op, etc. (it wasn't so bad)

31

### PBM FFP Intervention

Three month intervention period:



33

### PBM FFP Intervention

**Findings:**

- About 1 in 3 orders were *appropriate*.
- Significant overuse of FFP
  - Absolute indications
  - Urgency of INR reversal
- Significant underdosing of FFP
  - Increased chances of wrong indication
- Clinicians very happy to have help → real time review makes a **major** difference

35

### What can We do?

**Common Order:**

- Prepare: 1 unit plasma
- Indication: INR over 1.7 going to surgery



**What is wrong?**

1. Inadequate adult dose
2. Questionable indication

What is the INR? Why is the INR elevated? How urgent is surgery? What other interventions have been made?

32

Morning. The transfusion service has received an order for 1 unit of FFP, indication is INR >1.7 and serious bleeding. I see on coumadin and most recent INR is 2.5 and vitamin K was just ordered, and possible going to OR is this urgent/emergent reversal? In addition 1 unit is inadequate dose for meaningful correction of a clinically significant coagulopathy. Dose is 10-15 cc/kg, usually 2-3+ units. Happy to discuss. John Sherbeck MD medical director transfusion service x24081

Thu 12:48 PM

Martin J Magers, MD  
will do sounds good

Thu 2:00 PM

Hey Dr. Sherbeck. Patient may be going to OR late today or tomorrow but not emergently -hip fracture, stable. Should I order 2 units?

Thu 2:44 PM

follow up INR is 1.73, patient going to OR this evening, we are comfortable foregoing FFP.

Thu 2:41 PM

Awesome! Thanks for the f/u. Anne they will be cancelling no need to thaw.

Thu 2:49 PM

If not urgent we recommend avoiding transfusion. We have time to see if vitamin K will work -get that in STAT and recheck INR in the early PM

Thu 12:50 PM

34

### Transfusion Service Impact

- ✓ **Engagement**
- ✓ **Education**
- ✓ **Empowerment**

36

## The START Study

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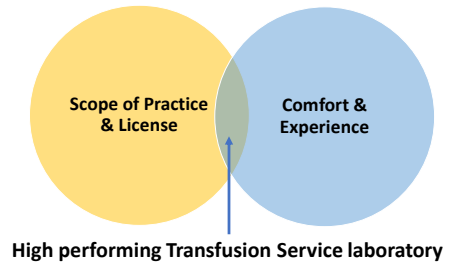
**A prospective multi-faceted interventional study of blood bank technologist screening of red blood cell transfusion orders: The START study**

Aimee T. Kwon, Allison Collins, Christine Carter-Goodrich, Jacob Pendragon, Kathryn Weibert, Law Liberman, Michele P. Zoller, Sheila S. Harding, Susan Nahrman. — See all authors —

First published: 10 January 2021 | <https://doi.org/10.1111/xfm.14243> | Citations: 2

fewer than 2000 RBCs annually. Second, all hospital sites had willing local champions to oversee intervention implementation and promote an institutional culture of restrictive transfusion. The results of this study may not be generalizable to institutions less willing to modify their attitudes and prescribing practices to improve the

ments. Despite this limitation, other blood components such as plasma and platelets have high rates of inappropriate utilization (53% and 22%) that may benefit from this intervention.<sup>32,34</sup>



37

38

## Recap

- PBM for pRBCs has been widely & successfully adopted
  - Improvements for patients, doctors, labs, administrators
- PBM for non-pRBCs hasn't received the same attention
  - Not transfused as much
  - Low quality evidence/guidelines
- We need to act now
  - Rapidly changing knowledge of coagulation
  - Rapidly changing blood and pharmaceutical products
- TS laboratory scientists are uniquely equipped to help improve utilization
  - Last line of defense
  - Experts in blood products!

## Questions?

39

40