Cost Effectiveness of Patient Blood Management: What is the evidence?

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Western Australia PBM Group Committee Member

THE UNIVERSITY OF WESTERN AUSTRALIA

Outline

1. Economic evaluation of transfusion

2. Does PBM represent good value for money – NO

3. Does PBM represent good value for money – YES

1. Costing transfusion

Cost of Blood (AAA)

Acquisition

Cost of RBCs - Acquisition

Purchase AU **$ 370 - $446**

(leucodepleted & washed, leucodepleted**)**

Table 1 Comparison of acquisition cost

Acquisition cost for leukodepleted PRBCs in several European Union member states (2001) (€)	
Austria[a]	120·00
Belgium[b]	91·72
France[c]	165·65
Germany, DRK[d]	75·00
Germany, other suppliers	85·00
Ireland[e]	223·07
Spain[f]	94·36
United Kingdom[g]	135·30

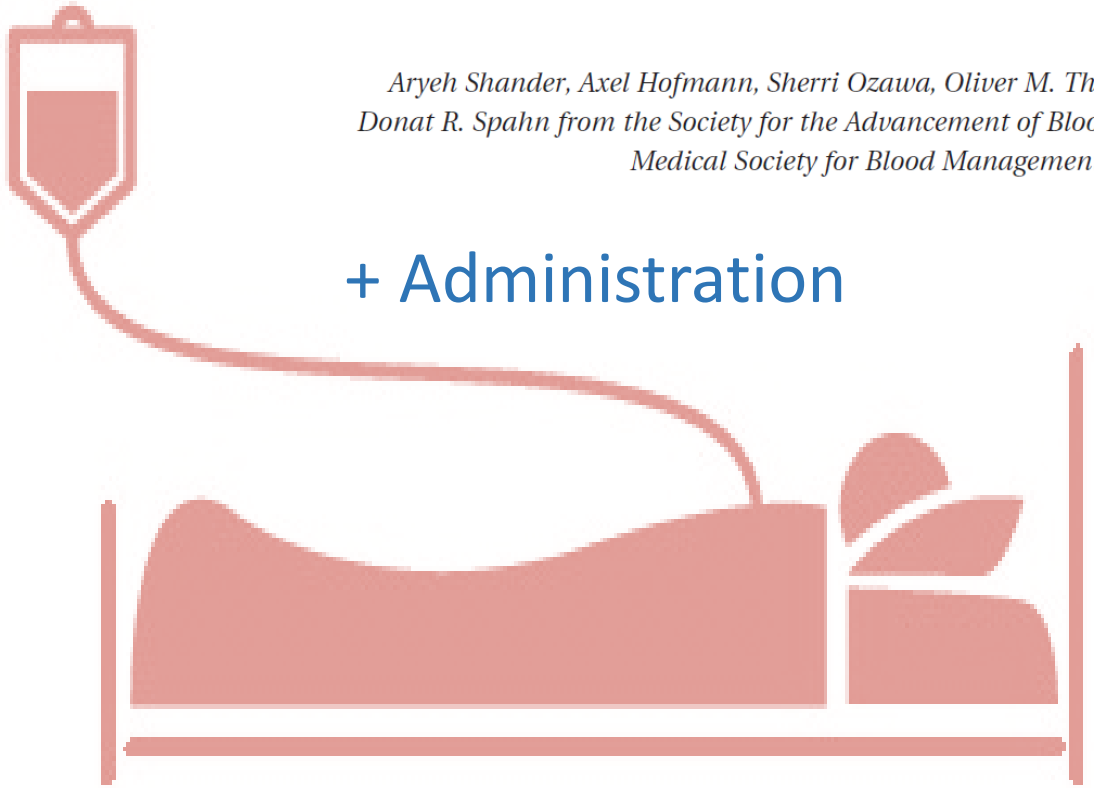
Hofmann A, et al. Cost-effectiveness in haemotherapies and transfusion medicine. *ISBT Science Series.* 2009;4:258-265.

Cost of RBCs - Administration

Acquisition

Activity-based costs of blood transfusions in surgical patients at four hospitals

Aryeh Shander, Axel Hofmann, Sherri Ozawa, Oliver M. Theusinger, Hans Gombotz, and Donat R. Spahn from the Society for the Advancement of Blood Management (SABM) and the Medical Society for Blood Management (MSBM)



+ Administration

Shander A, et al. Activity-based costs of blood transfusions in surgical patients at four hospitals. *Transfusion.* 2010;50(4):753-765.

Cost of RBCs - Administration

Activity-based costs of blood transfusions in surgical patients at four hospitals

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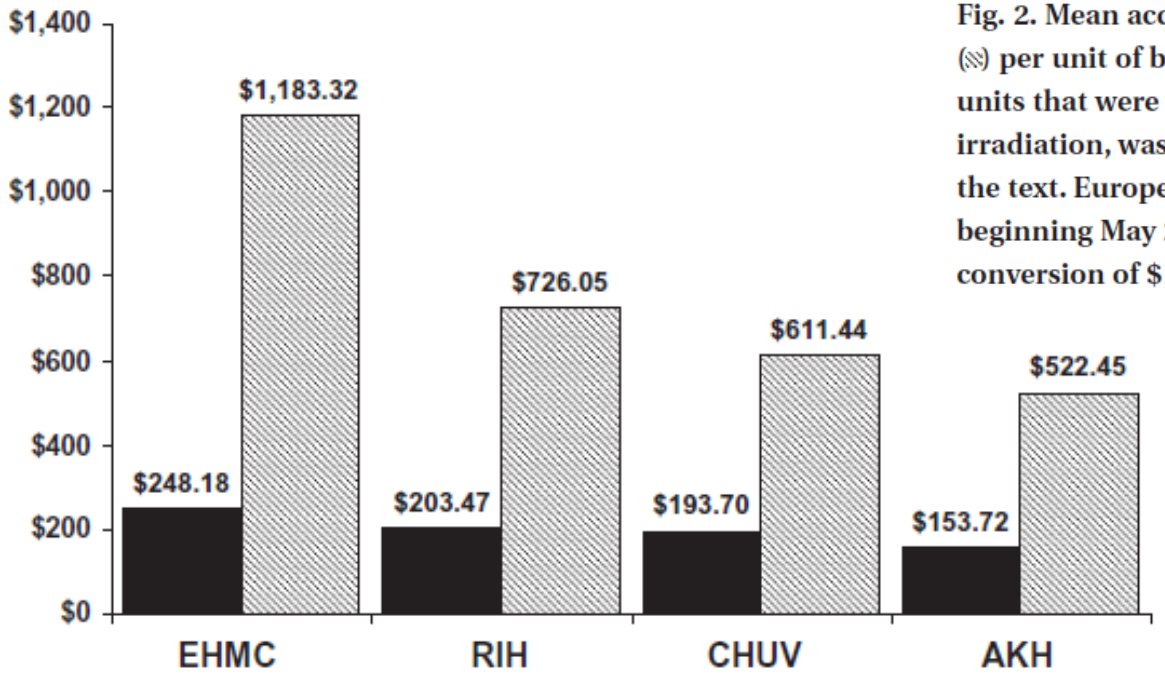
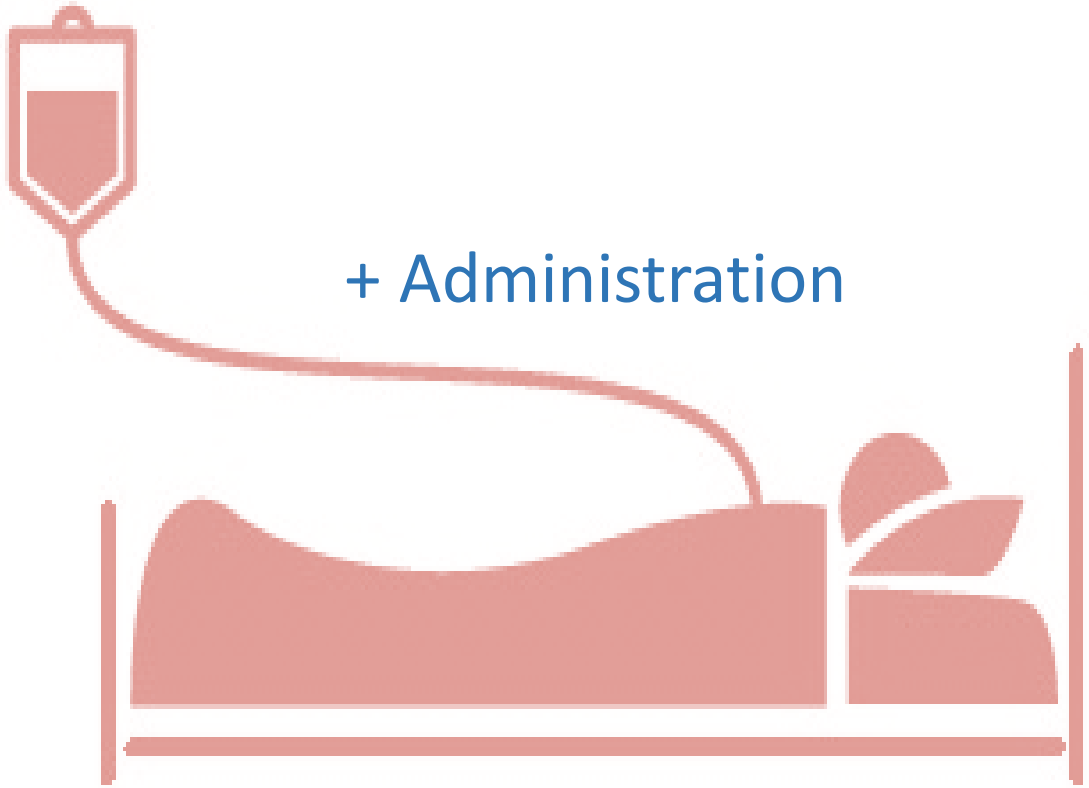


Fig. 2. Mean acquisition costs (■) and total ABC model costs (▨) per unit of blood. Mean per-unit acquisition costs included units that were wasted and additional services provided (e.g., irradiation, washing, cytomegalovirus testing) as described in the text. European currencies converted from the 1-year mean beginning May 2008 (CHUV conversion of $1 = SFr 1.12; AKH conversion of $1 = € 0.72).

Shander A, et al. Activity-based costs of blood transfusions in surgical patients at four hospitals. *Transfusion.* 2010;50(4):753-765.

Cost of RBCs - Administration

Purchase



+ Administration

Associated Outcomes - RBCs

Contents lists available at ScienceDirect

The Journal of Arthroplasty

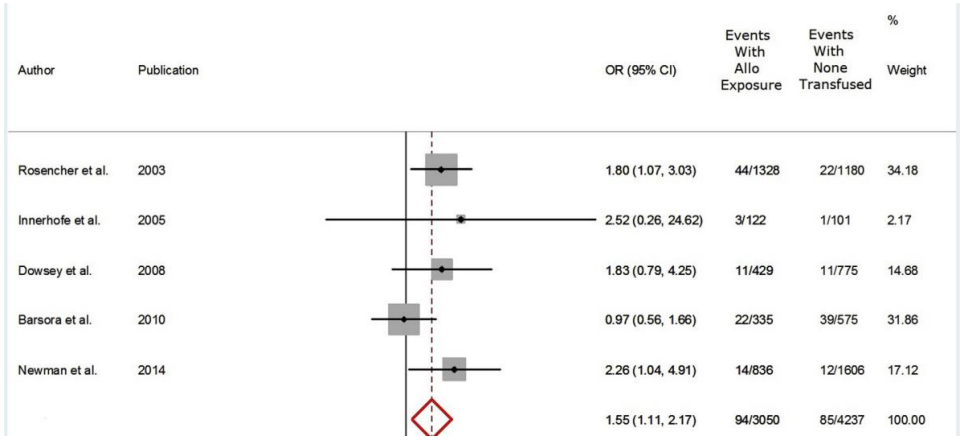
journal homepage: www.arthroplastyjournal.org

Review

Allogeneic Blood Transfusion Is a Significant Risk Factor for Surgical-Site Infection Following Total Hip and Knee Arthroplasty: A Meta-Analysis

Jeong Lae Kim, MD, Jong-Hoon Park, MD, PhD, Seung-Beom Han, MD, PhD, Il Youp Cho, MD, Ki-Mo Jang, MD, PhD *

Department of Orthopaedic Surgery, Anam Hospital, Korea University College of Medicine, Seoul, South Korea



Yes vs No: 1.55 (1.11 – 2.17)

J.Arth. http://dx.doi.org/10.1016/j.arth.2016.08.026 0883-5403

Research

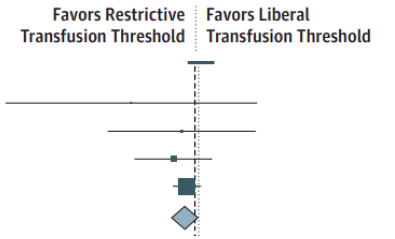
Original Investigation

Health Care–Associated Infection After Red Blood Cell Transfusion
A Systematic Review and Meta-analysis

Jeffrey M. Rohde, MD; Derek E. Dimcheff, MD, PhD; Neil Blumberg, MD; Sanjay Saint, MD, MPH; Kenneth M. Langa, MD, PhD; Latoya Kuhn, MPH; Andrew Hickner, MSI; Mary A. M. Rogers, PhD

Figure 3. Forest Plot of Risk Ratios for Infection Comparing Restrictive vs Liberal Transfusion Strategies by Patient Type

Source	Restrictive Transfusion Threshold: No. of Events	Restrictive Transfusion Threshold: Total No. of Patients	Liberal Transfusion Threshold: No. of Events	Liberal Transfusion Threshold: Total No. of Patients	Risk Ratio (95% CI)
Orthopedic					
Carson et al,[29] 1998	0	42	2	42	0.20 (0.01-4.04)
Grover et al,[30] 2006	2	109	3	109	0.67 (0.11-3.91)
Foss et al,[31] 2009	6	60	11	60	0.55 (0.22-1.38)
Carson et al,[33] 2011	56	1009	74	1007	0.76 (0.54-1.06)
Subtotal I^2 = 0.0%, (P = .77)					0.72 (0.53-0.97)



More vs Less: 1.39 (1.03 - 1.89)

JAMA. 2014;311(13):1317-1326. doi:10.1001/jama.2014.2726

Associated Cost Outcomes - RBCs

BLOOD MANAGEMENT

Increased hospital costs associated with red blood cell transfusion

Kevin M. Trentino,[1] Shannon L. Farmer,[2,3] Stuart G. Swain,[1] Sally A. Burrows,[4] Axel Hofmann,[2,3] Rinaldo Ienco,[1] Warren Pavey,[5] Frank F.S. Daly,[6,7] Anton Van Niekerk,[8] Steven A.R. Webb,[4,9] Simon Towler,[10,11] and Michael F. Leahy[4,12]

- Mean **inpatient cost 1.83 times higher in transfused group** (95% CI 1.78 to 1.89; p<0.001)
- Estimated **total hospital associated cost of red blood cell transfusion in this study was AUD $77 million** (US $72 million), representing 7.8% of total hospital expenditure on acute-care inpatients.
- **Dose-dependent** association between the number of RBC units transfused and increased costs after adjusting for confounders.

Funny Story

FEEDBACK.

Intern Weekly Education Session - Evaluation

(please circle one answer for each question)

Intern *(please circle)* Student Other _____

How could this session be improved?/ general comments/ topic requests:

Ses
Pro
Dat

1. This topic constituted a Y0909 and left me with a G839 would have preferred. 9251499 [1910]
2. "This topic constituted an [assault by unspecified means] and
3. left me with a [paralytic syndrome] would have preferred
4. [general anaesthesia]"
5.

6. The overall quality of today's session was excellent		(1)	2	3	4	5

2. Is PBM cost-effective? - NO

PBM Cost Effective?

BJA

British Journal of Anaesthesia, 126 (1): 149–156 (2021)

doi: 10.1016/j.bja.2020.04.087
Advance Access Publication Date: 30 June 2020
Review Article

Patient blood management interventions do not lead to important clinical benefits or cost-effectiveness for major surgery: a network meta-analysis

Marius A. Roman[1,*], Riccardo G. Abbasciano[1], Suraj Pathak[1], Shwe Oo[2], Syabira Yusoff[1,*,7], Marcin Wozniak[1], Saqib Qureshi[3], Florence Y. Lai[1], Tracy Kumar[1], Toby Richards[4], Guiqing Yao[5], Lise Estcourt[6] and Gavin J. Murphy[1]

[1]Department of Cardiovascular Sciences and National Institute for Health Research Leicester Biomedical Research Unit in Cardiovascular Medicine, College of Life Sciences, University of Leicester, Leicester, UK, [2]Department of Cardiac Surgery, Liverpool Heart and Chest Hospital NHS Foundation Trust, Liverpool, UK, [3]Department of Cardiothoracic Surgery, University Hospitals of Nottingham, Nottingham, UK, [4]Faculty of Health and Medical Sciences, University of Western Australia, Perth, Australia, [5]Biostatistics Research Group, Department of Health Sciences, College of Life Sciences, University of Leicester, Leicester, UK and [6]Haematology/Transfusion Medicine, NHS Blood, and Transplant, John Radcliffe Hospital, Headington, Oxford, UK

PBM Cost Effective?

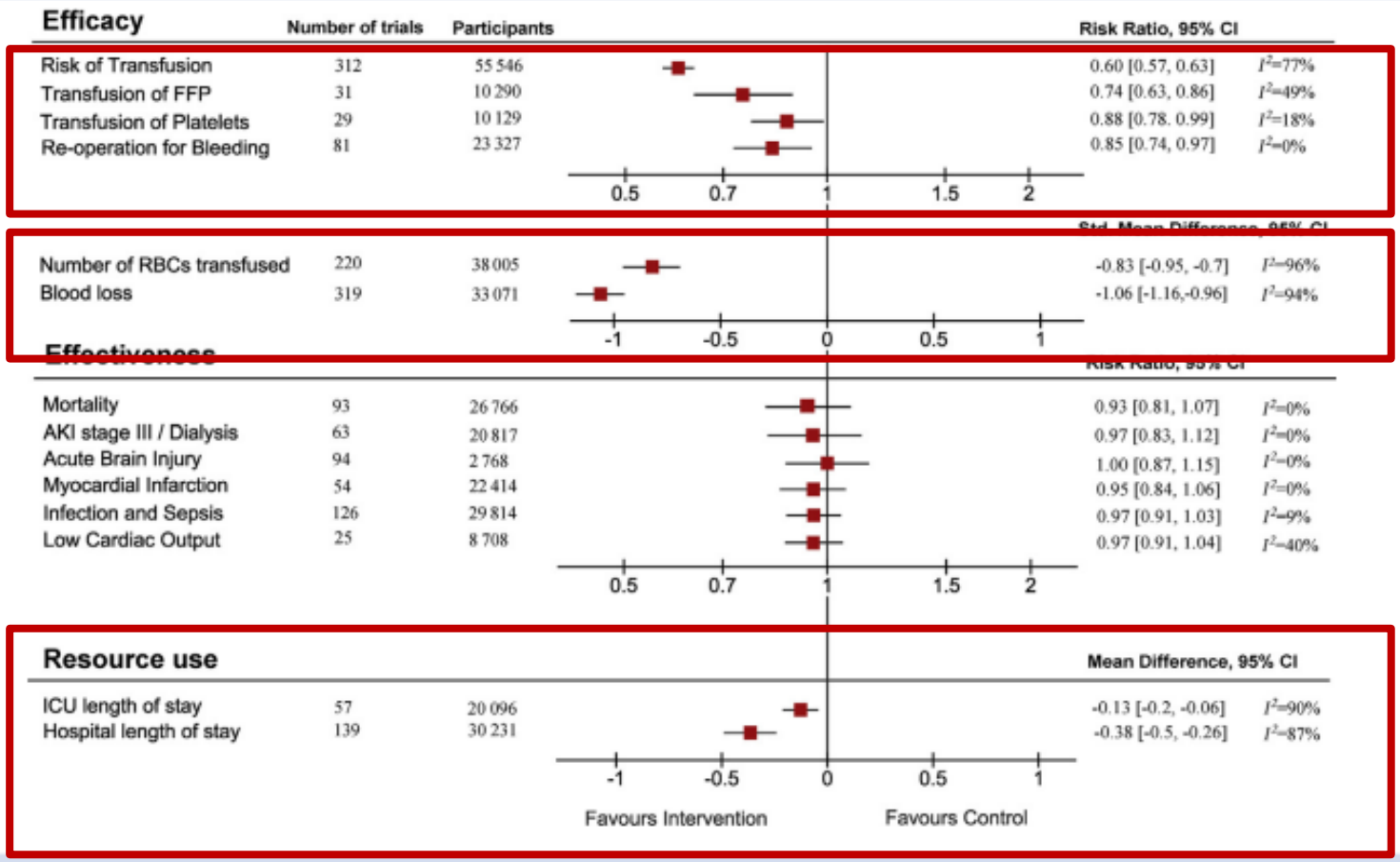


Fig 1. Forest plots of transfusion and bleeding, effectiveness and resource use outcomes. Interventions were compared with controls, showing a significant reduction of the effect on transfusion and bleeding outcomes, but no significant difference in the effectiveness outcomes. There was moderate heterogeneity for the risk of red blood cell transfusion (I^2=77%) and no heterogeneity for mortality (I^2=0%). The results are expressed as risk ratio (RR), mean difference (MD), or standard mean difference (SMD), along with 95% confidence intervals (CIs). The heterogeneity for each outcome is expressed as I^2. AKI, acute kidney injury.

Patient blood management interventions do not lead to important clinical benefits or cost-effectiveness for major surgery: a network meta-analysis

Cost-effectiveness

Only one trial compared the cost-effectiveness of a PBM intervention to controls (Supplementary Table 13).[18] This trial, in adult cardiac surgery, demonstrated that a restrictive red cell transfusion threshold reduced costs, mean restrictive minus liberal difference of −£182, (from −£1108 to £744), but had no effect on quality adjusted life years, 0.0004 (from −0.0037 to 0.0045). Four model-based studies that were

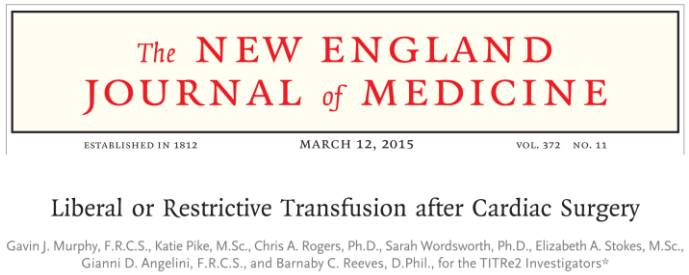
Patient blood management interventions do not lead to important clinical benefits or cost-effectiveness for major surgery: a network meta-analysis

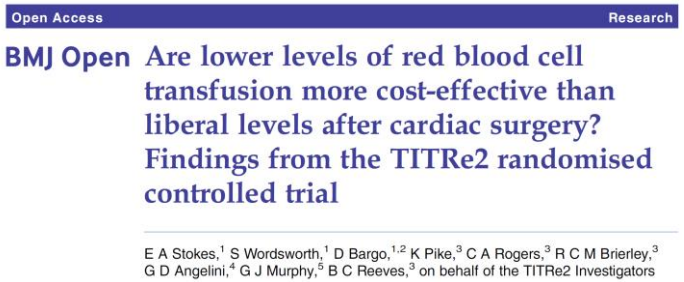
Are lower levels of red blood cell transfusion more cost-effective than liberal levels after cardiac surgery? Findings from the TITRe2 randomised controlled trial

Results: The total costs from surgery up to 3 months were £17 945 and £18 127 in the restrictive and liberal groups (mean difference is –£182, 95% CI –£1108 to £744). The cost difference was largely attributable to the difference in the cost of red blood cells. Mean QALYs to 3 months were 0.18 in both groups (restrictive minus liberal difference is 0.0004, 95% CI –0.0037 to 0.0045). The point estimate for the base-case cost-effectiveness analysis suggested that the restrictive group was slightly more effective and slightly less costly than the liberal group and, therefore, cost-effective.

Stokes, et al. Are lower levels of red blood cell transfusion more cost-effective than liberal levels after cardiac surgery? Findings from the titre2 randomised controlled trial. BMJ Open. 2016;6(8):e011311.

PBM Cost Effective?





PBM

Table 1 Resource use per participant to 3 months from surgery

Resource use component	Randomised to restrictive threshold (N=1000) Frequency (%) or mean (SE)	Randomised to liberal threshold (N=1003) Frequency (%) or mean (SE)	Restrictive vs liberal threshold % or mean (SE) difference
Red blood cells—number of units/participant	2.08 (0.09)	3.07 (0.11)	−1.00 (0.14)
Type of cardiac procedure—number (%) of participants			
Coronary artery bypass grafting	408 (41)	408 (41)	0
Valve	307 (31)	304 (30)	1
Coronary artery bypass grafting and valve	195 (20)	203 (20)	0
Other	90 (9)	88 (9)	0
Blood products—number of units/participant			
Fresh frozen plasma	1.00 (0.06)	0.95 (0.06)	0.05 (0.08)
Platelets	0.65 (0.03)	0.64 (0.03)	0.01 (0.05)
Cryoprecipitate	0.23 (0.03)	0.21 (0.02)	0.02 (0.04)
Inpatient complications			
Primary outcome—number (%) of participants			
Antibiotics for infectious complication	341 (34)	344 (34)	0
Stroke	14 (1)	16 (2)	−1
Suspected myocardial infarction	3 (0)	7 (1)	−1
Gut infarction	5 (1)	1 (0)	1
Acute kidney injury—stage 3	60 (6)	51 (5)	1

Is patient blood management cost-effective? Comment on *Br J Anaesth* 2021; 126: 149–56

Kevin M. Trentino[1,*], Donat R. Spahn[2], Hamish S. Mace[3,4], Hans Gombotz[5] and Axel Hofmann[1,2]

Trentino KM, Spahn DR, Mace HS, Gombotz H, Hofmann A. Is patient blood management cost-effective? Br J Anaesth. 2021;126(1):e7-e9.

2. Is PBM cost-effective? - YES

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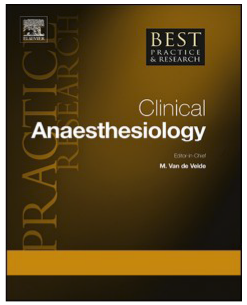
Best Practice & Research Clinical Anaesthesiology

journal homepage: www.elsevier.com/locate/bean



Does patient blood management represent good value for money?

Adam Irving [a,b,*], Zoe K. McQuilten [a,c]

[a] *Transfusion Research Unit, School of Public Health and Preventive Medicine, Monash University, Australia*
[b] *Centre for Health Economics, Monash Business School, Monash University, Australia*
[c] *Department of Clinical Haematology, Monash Health, Melbourne, Australia*


54
EVALUATIONS

15 IV IRON	Anaemia management using FCM **cost effective** in a wide range of patients.
21 TXA	TXA for surgical patients, **highly cost effective** in all patient groups except when delivered high dose for GI bleeding.
11 CELL SAVER	Intraoperative cell salvage, approx. half the studies found cell salvage to be cost saving. cost effectiveness could be improved by targeting pts with high risk of bleeding.
4 R vs L	Majority suggest restrictive was cost saving compared to liberal
3 PBM PROGRAMS	all found significant improvements in patient outcomes and cost savings after the programmes were implemented.

PBM – Cost effectiveness analysis

Anaesthesia 2020 doi:10.1111/anae.15240

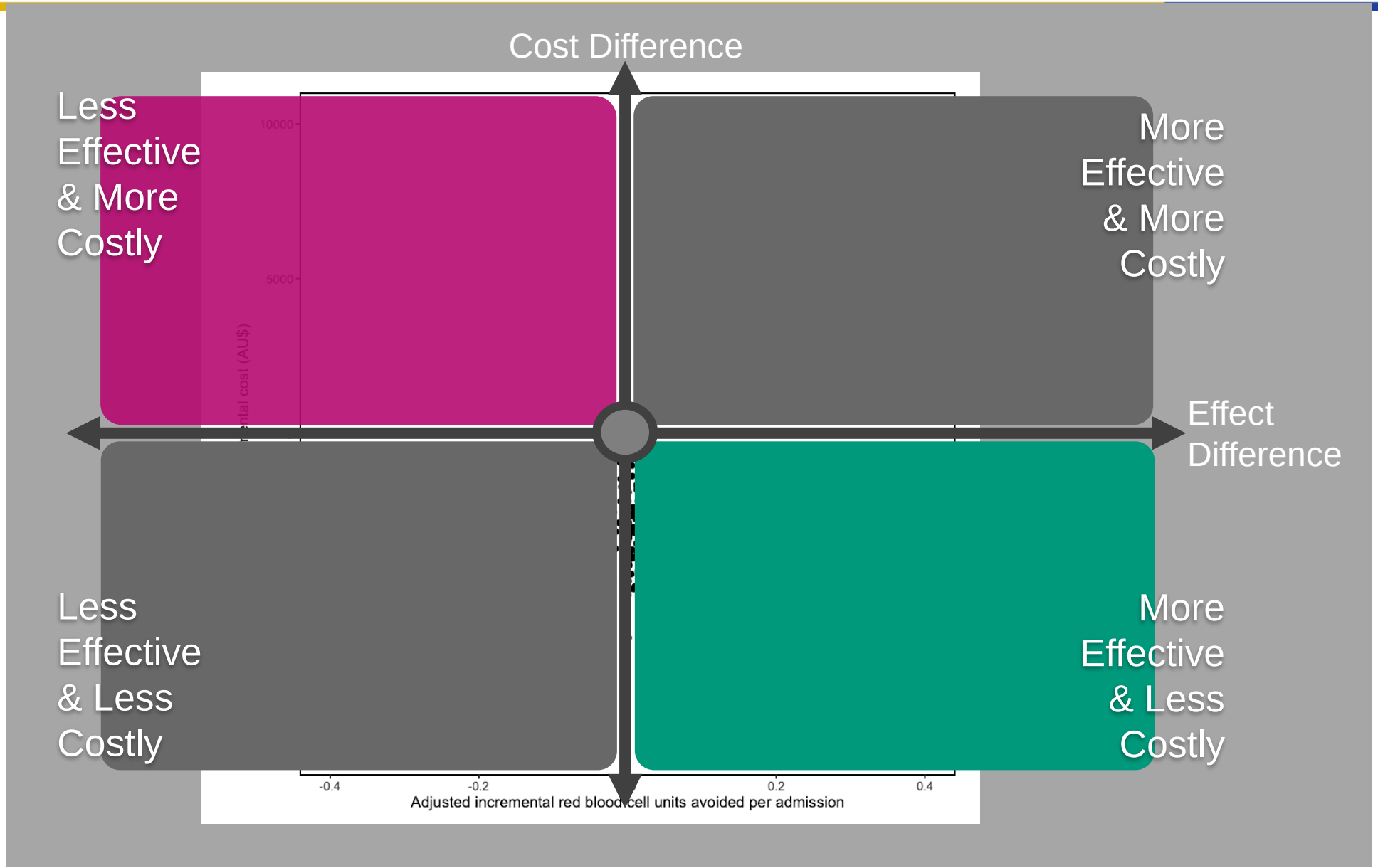
Original Article

Screening and treating pre-operative anaemia and suboptimal iron stores in elective colorectal surgery: a cost effectiveness analysis

K. M. Trentino,[1] H. S. Mace,[2] K. Symons,[3] F. M. Sanfilippo,[4] M. F. Leahy,[5] S. L. Farmer,[6] A. Hofmann,[7] R. D. Watts,[8] M. H. Wallace[9] and K. Murray[10]

- Preop clinic to screen & treat anaemia and suboptimal iron stores
- Elective colorectal surgery
- 441 patients screened vs 239 not screed
- Of screened patients 40.8% received IV iron
- Outcome = RBC tranfusions avoided

PBM – Cost effectiveness analysis



Conclusion

1. The cost of transfusion has been underestimated
2. PBM programs are associated with reduced transfusions, blood loss, ICU and hospital LOS, and costs
3. The results of economic evaluations suggest PBM interventions and programs are cost-effective