Jackie Thomson

21/6/2025

ETHICAL CONSIDERATIONS OF PATIENT BLOOD MANAGEMENT

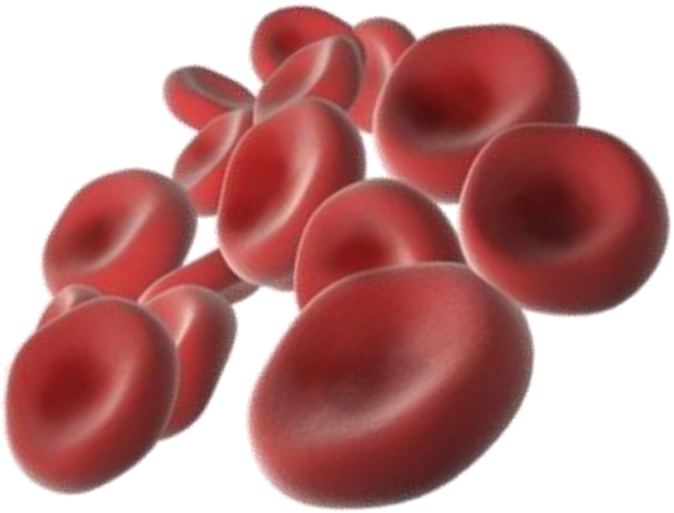
Patient Blood Management

Patient Blood Management (PBM) is an ethical imperative that prioritizes patient safety and improves outcomes by optimizing the use of blood and blood products. It involves a patient-centered, evidence-based approach that encompasses optimizing a patient's own blood volume, minimizing blood loss, and enhancing the patient's tolerance of anemia. Ethical considerations in PBM revolve around key principles like patient autonomy, beneficence, non-maleficence, and justice

PBM
Autonomy
Beneficence
Non-Maleficence
Justice

OVERVIEW

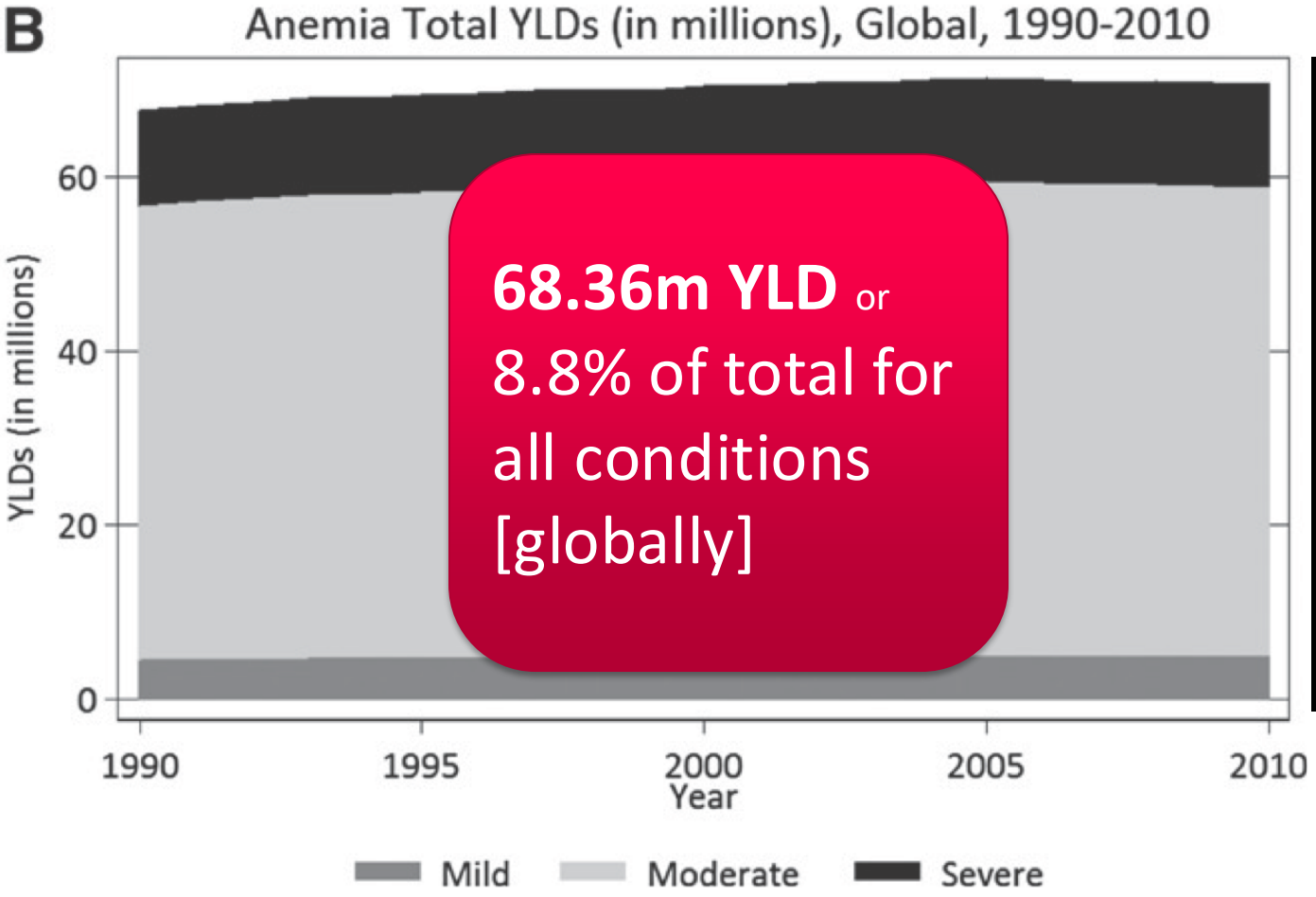
Anaemia



blood
2014 123: 615-624
doi:10.1182/blood-2013-06-508325 originally published online December 2, 2013

A systematic analysis of global anemia burden from 1990 to 2010

Nicholas J. Kassebaum, Rashmi Jasrasaria, Mohsen Naghavi, Sarah K. Wulf, Nicole Johns, Rafael Lozano, Mathilda Regan, David Weatherall, David P. Chou, Thomas P. Eisele, Seth R. Flaxman, Rachel L. Pullan, Simon J. Brooker and Christopher J. L. Murray



68.36m YLD or 8.8% of total for all conditions [globally]

Associated w/

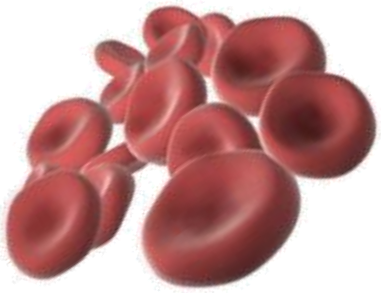
- weakness
- fatigue
- difficulty concentrating
- poor work productivity
- infection
- heart failure
- preterm labor
- low birth weight
- child and maternal mortality

Global, regional, and national incidence, prevalence, and years lived with disability for 310 diseases and injuries, 1990–2015: a systematic analysis for the Global Burden of Disease Study 2015

*GBD 2015 Disease and Injury Incidence and Prevalence Collaborators**

www.thelancet.com **Vol 388 October 8, 2016**

- The impairment that affected the greatest number of people in 2015 was **anaemia, with 2.36 billion (2.35–2.37 billion) individuals affected**
- The prevalence of **iron-deficiency anaemia** alone was **1.46 billion** (1.45-1.46 billion).



Targeted anemia surveillance and intervention should be a greater priority in high-risk populations, especially young children and females.[42] Despite causing so much disability, anemia does not receive its requisite attention in many public health spheres. Such inattention may be partly because anemia is thought of as a by-product of other disease processes rather than as a target for intervention in and of itself. It is somewhat ironic, then, that etiology-specific

Kassebaum NJ et al. Blood, 2014;123: 615-24

Systematic review

Meta-analysis of the association between preoperative anaemia and mortality after surgery

- **949'449 patients of 24 studies analyzed**
- **39% of patients were anemic (WHO definition)**
- **Anemia was associated with**
  - Perioperative mortality ⬆ - OR 2.90 (2.30 – 3.68, p< 0.001)
  - Acute kidney injury ⬆ - OR 3.75 (2.95 – 4.76, p< 0.001)
  - Infections ⬆ - OR 1.93 (1.06 – 1.55, p< 0.01)
  - Stroke in cardiac surgery ⬆ - OR 1.28 (1.17 – 3.18, p< 0.01)
  - RBC transfusion ⬆ - OR 5.04 (4.12 – 6.17, p< 0.001)

Fowler A.J. et al. Br J Surg (2015) 102: 1314

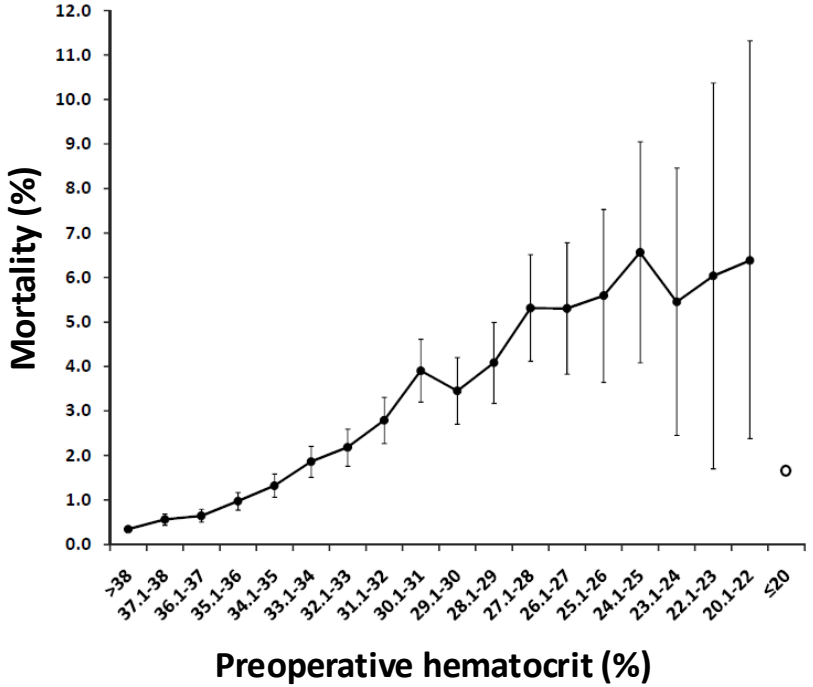
Preoperative anaemia and postoperative outcomes in non-cardiac surgery: a retrospective cohort study

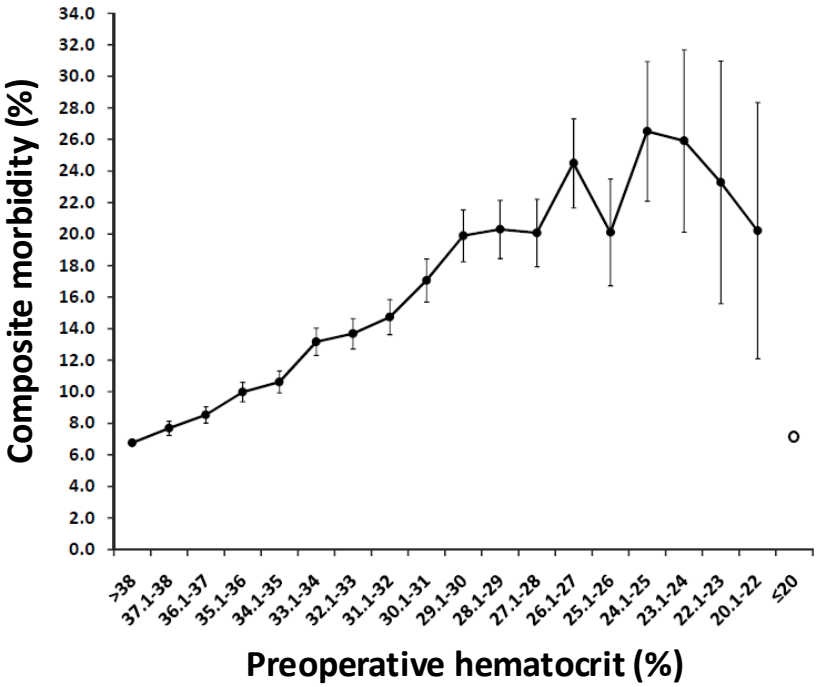
Khaled M Musallam, Hani M Tamim, Toby Richards, Donat R Spahn, Frits R Rosendaal, Aida Habbal, Mohammad Khreiss, Fadi S Dahdaleh, Kaivan Khavandi , Pierre M Sfeir, Assaad Soweid, Jamal J Hoballah, Ali T Taher, Faek R Jamali

- Preoperative anemia: 30.4%
- **Mild** anemia ➡ OR mortality ⬆: 1.4 (1.3 – 1.5)
- **Mild** anemia ➡ OR morbidity ⬆: 1.3 (1.3 – 1.4)
- RBC trans. ➡ OR mortality ⬆: 2.0 (1.8 – 2.2)
- RBC trans. ➡ OR morbidity ⬆: 1.8 (1.7 – 1.9)

Musallam, K.M., et al., Preoperative anaemia and postoperative outcomes in non-cardiac surgery: a retrospective cohort study. Lancet, 2011.

Effect of Anemia on Mortality and Composite Morbidity





Musallam, K.M., et al., Preoperative anaemia and postoperative outcomes in non-cardiac surgery: a retrospective cohort study. Lancet, 2011.

Major blood loss associated with increased

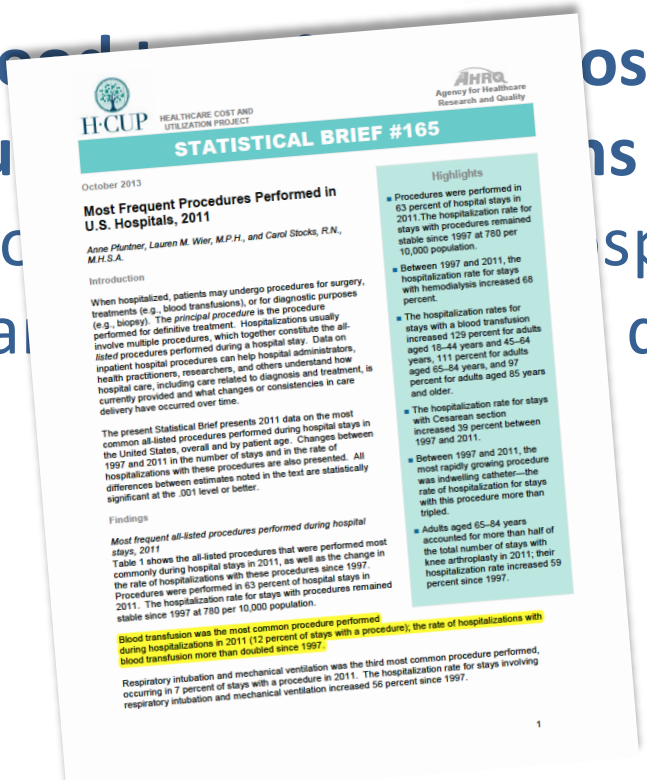
- Mortality (3-fold)
- Major morbidity (3-fold)
- ICU and hospital length of stay
- Likelihood of transfusion

Causes

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

Shander A. *Surgery* 2007
Ranucci M et al. *Ann Thorac Surg* 2013; 96:478
Vivacqua et al *Ann Thorac Surg* 2011
Christensen et al *J Thorac Cardiovasc Surg* 2009
Spence et al *Am J Surg* 1990
Stokes, M.E., et al *BMC Health Serv Res*, 2011
Ye, X., et al *BMC Health Serv Res*, 2013
Alstrom, U., et al *Br J Anaesth*, 2012

Blo… …ost common procedure performed du… …ns in 2011 (12% of stays with a pro… …spitalizations with blood tra… doubled since 1997.



H-CUP HEALTHCARE COST AND UTILIZATION PROJECT

AHRQ Agency for Healthcare Research and Quality

STATISTICAL BRIEF #165

October 2013

Most Frequent Procedures Performed in U.S. Hospitals, 2011

Anne Pfuntner, Lauren M. Wier, M.P.H., and Carol Stocks, R.N., M.H.S.A.

Introduction

When hospitalized, patients may undergo procedures for surgery, treatments (e.g., blood transfusions), or for diagnostic purposes (e.g., biopsy). The *principal procedure* is the procedure performed for definitive treatment. Hospitalizations usually involve multiple procedures, which together constitute the all-*listed* procedures performed during a hospital stay. Data on inpatient hospital procedures can help hospital administrators, health practitioners, researchers, and others understand how hospital care, including care related to diagnosis and treatment, is currently provided and what changes or consistencies in care delivery have occurred over time.

The present Statistical Brief presents 2011 data on the most common all-listed procedures performed during hospital stays in the United States, overall and by patient age. Changes between 1997 and 2011 in the number of stays and in the rate of hospitalizations with these procedures are also presented. All differences between estimates noted in the text are statistically significant at the .001 level or better.

Findings

Most frequent all-listed procedures performed during hospital stays, 2011

Table 1 shows the all-listed procedures that were performed most commonly during hospital stays in 2011, as well as the change in the rate of hospitalizations with these procedures since 1997. Procedures were performed in 63 percent of hospital stays in 2011. The hospitalization rate for stays with procedures remained stable since 1997 at 780 per 10,000 population.

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.

Respiratory intubation and mechanical ventilation was the third most common procedure performed, occurring in 7 percent of stays with a procedure in 2011. The hospitalization rate for stays involving respiratory intubation and mechanical ventilation increased 56 percent since 1997.

1

Highlights

- Procedures were performed in 63 percent of hospital stays in 2011.The hospitalization rate for stays with procedures remained stable since 1997 at 780 per 10,000 population.
- Between 1997 and 2011, the hospitalization rate for stays with hemodialysis increased 68 percent.
- The hospitalization rates for stays with a blood transfusion increased 129 percent for adults aged 18–44 years and 45–64 years, 111 percent for adults aged 65–84 years, and 97 percent for adults aged 85 years and older.
- The hospitalization rate for stays with Cesarean section increased 39 percent between 1997 and 2011.
- Between 1997 and 2011, the most rapidly growing procedure was indwelling catheter—the rate of hospitalization for stays with this procedure more than tripled.
- Adults aged 65–84 years accounted for more than half of the total number of stays with knee arthroplasty in 2011; their hospitalization rate increased 59 percent since 1997.

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

Infectious Agents in the Blood Supply

✓HIV, HCV, HBV

✗New infectious agents

✗Prions (vCJD)
✗Dengue (DENV)
✗Babesia species
✗Chikungunya (CHIKV)

✗HBV variants (vl)
✗HEV (vl)
✗Herpes viruses (other than CMV, EBV, HHV-8) (t)

However, pathogens in the blood pool are just the tip of the iceberg when looking at the problem of adverse transfusion outcomes …

✗Hantavirus New World (t)
✗Hantavirus Old World (t)

✗and what is next ?

Stramer, SL et al. Emerging infectious disease agents and their potential threat to transfusion safety. Transfusion, 2009. 49 Suppl 2: p. 15-295

“[M]ore patients have died in any one year owing to transfusion immunomodulation’s side effects than died in the entire transfusion transmitted AIDS epidemic”

Blumberg, N. and J.M. Heal, Immunomodulation by blood transfusion: an evolving scientific and clinical challenge. Am J Med, 1996. 101(3): p. 299-308.

Ann Thorac Surg 2001;72:S1832–7

Blood Transfusion: The Silent Epidemic

Bruce D. Spiess, MD

Department of Anesthesiology, Virginia Commonwealth University/Medical College of Virginia, Richmond, Virginia

The Multi-Billion Dollar Question:

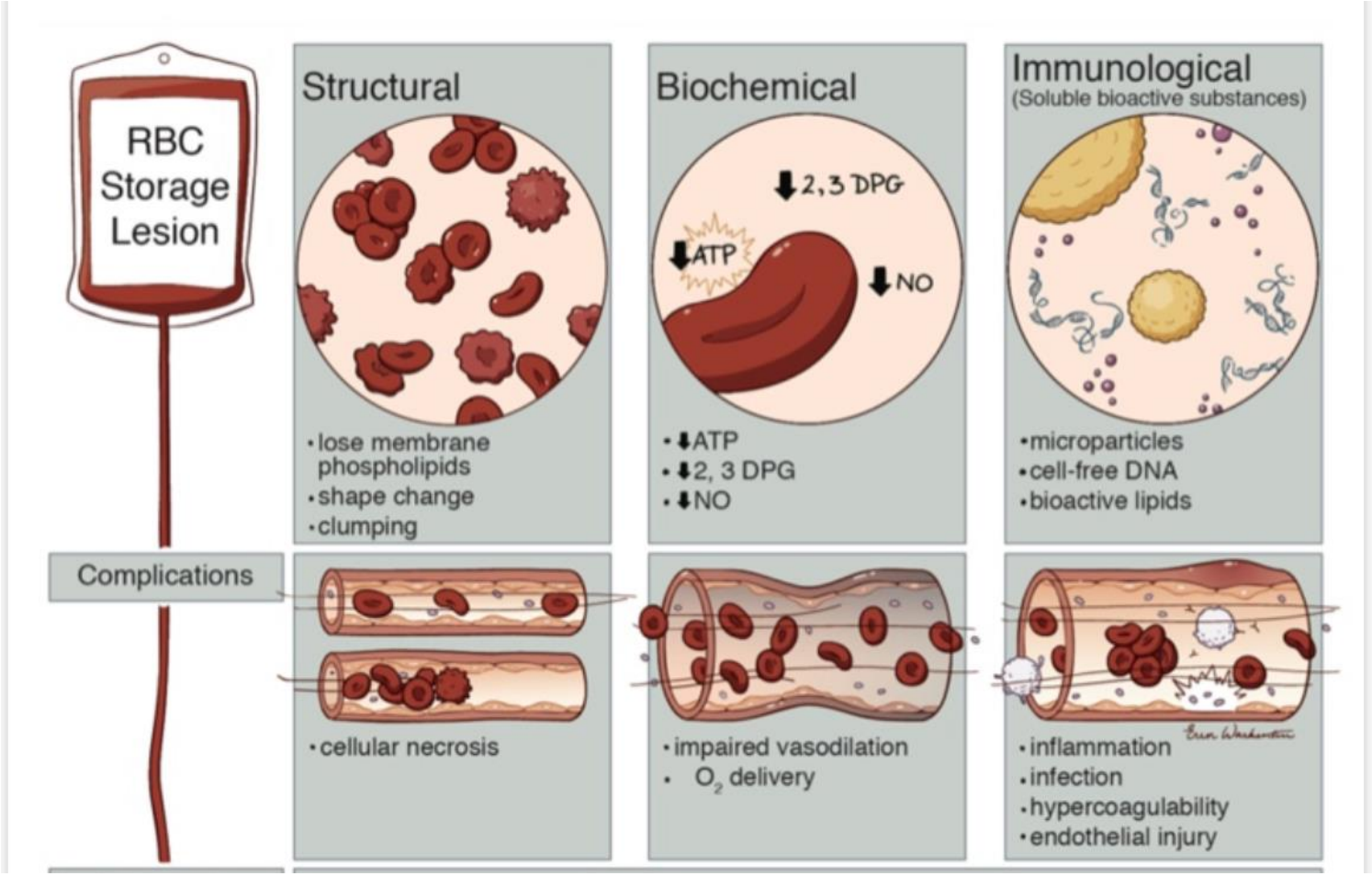
of ≈150 million allogeneic blood components per year

Does transfusion do what it is intended to do—improve outcome or prevent adverse outcomes?

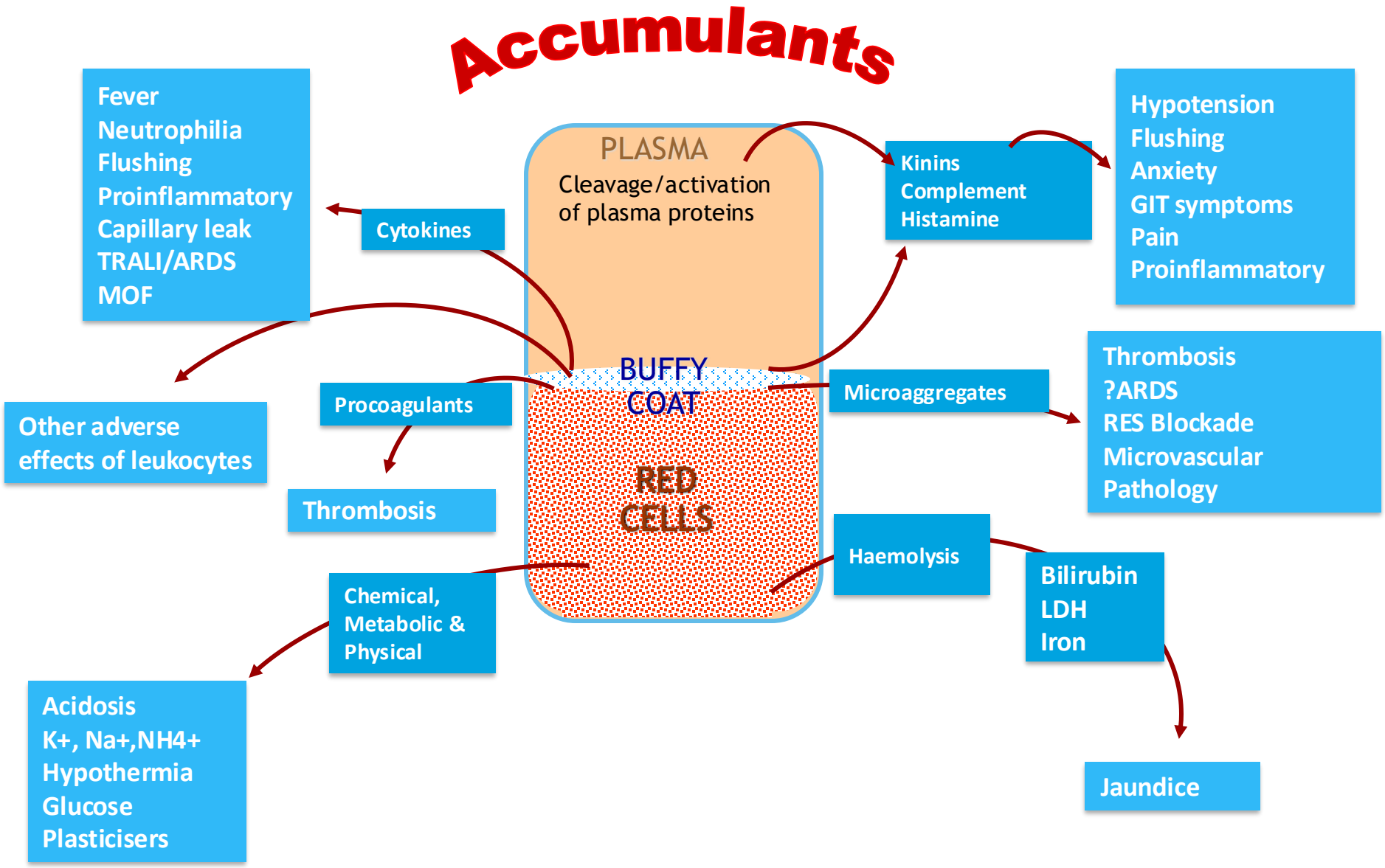
- There are few if any articles that support transfusion actually improving patient outcomes.
- The majority of database papers show associations between transfusion utilization and with immunosuppression, increased infection, increased renal failure, multisystem organ failure, and death.

Spiess, B.D., Risks of transfusion: outcome focus. Transfusion, 2004. 44(12 Suppl): p. 4S-14S.

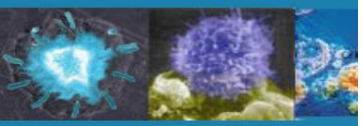
Red cell storage lesions



RED CELL STORAGE LESIONS



Acknowledgement: Prof. James Isbister



NEWS

Faculty Profiles

Marcos Intaglietta

Professor, Bioengineering

Development of effective blood substitutes based on a deep understanding of the microcirculation. Applications to transfusion and emergency medicine, cancer, ischemia, and the heart-lung machine.
Professor Intaglietta has largely influenced present understanding of the effects of viscosity and colloid osmotic pressure on the local regulation of blood flow and oxygen transport at the level of microscopic blood vessels. He is the author or co-author of more than 200 scientific papers and books and pioneered instruments currently in use in laboratories worldwide for studying the microcirculation. His fundamental discovery that oxygen is delivered in small pulses to the microcirculation has provided important information towards creating effective blood substitutes. Previously, substitutes actually caused blood vessels to constrict and shut down because the substitutes delivered too much oxygen. Intaglietta has also collaborated for many years with international colleagues in Europe, Latin America and Asia on projects related to blood plasma expanders for use in emergency situations and for companies with low blood bank supplies.

Capsule Bio:
Marcos Intaglietta joined UCSD in 1966 as a founding bioengineering faculty member. His pioneering work on artificial blood substitutes with Robert Winslow is now being developed through Sangart, a San Diego based company. He is the Chair of Sangart's Scientific Advisory Board, and serves on the company's board of directors. Intaglietta received his Ph.D. in mechanical engineering from the California Institute of Technology in 1963. He founded the International Institute for Microcirculation, and is an honorary member of the Italian, French, Indian, and Mexican societies for microcirculation. Intaglietta received the Malpighi Gold Medal Award from the European Society for Microcirculation (1994), the Whitaker Award (1996) and the International Award (2002) from the Biomedical Engineering Society, and the Landis Award (1999) from the Microcirculation Society.

Selected Publications:

Google Scholar Publications

Web Page
Email: mintaglietta@ucsd.edu
Office Phone: 858-534-4275
Institute Affiliation: Institute of Engineering in Medicine

Print Profile

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Transfusion and Apheresis Science 43 (2010) 69–78

Contents lists available at ScienceDirect

Transfusion and Apheresis Science

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

Perfusion vs. oxygen delivery in transfusion with "fresh" and "old" red blood cells: The experimental evidence

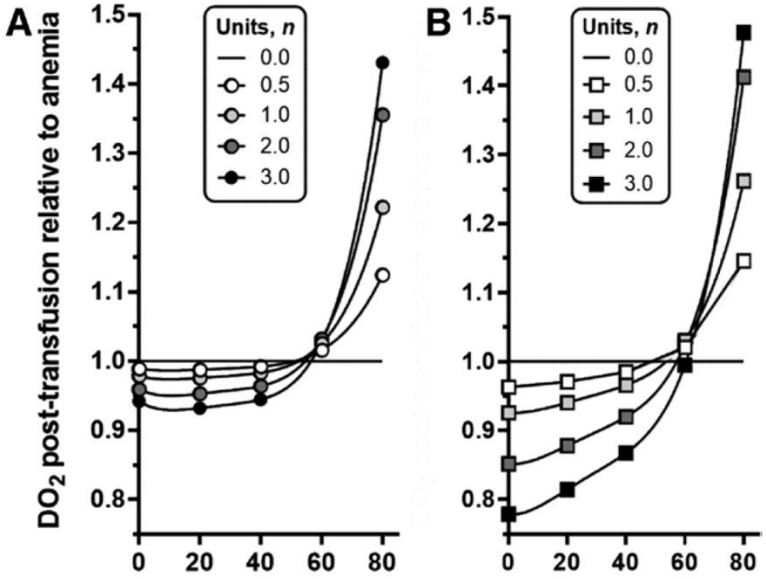
Amy G. Tsai [a], Axel Hofmann [b], Pedro Cabrales [a], Marcos Intaglietta [a,*]

[a] Department of Bioengineering, University of California, San Diego, CA, United States
[b] Society for the Advancement of Blood Management, Milwaukee, WI, United States

Impairment of oxygen transport of stored RBCs was first reported when measurement of the corresponding oxygen dissociation curves showed an immediate and significant increase in the oxygen affinity during the initial week of storage at 4 °C. This resulted in a decrease of oxygen delivery during transfusion of stored RBCs by comparison to normal RBCs, the difference being proportional to the volume transfused and storage time [16].

Posttransfusion Increase of Hematocrit per se Does Not Improve Circulatory Oxygen Delivery due to Increased Blood Viscosity

Robert Zimmerman, MS,* Amy G. Tsai, PhD,† Beatriz Y. Salazar Vázquez, MD, PhD,†‡§ Pedro Cabrales, PhD,† Axel Hofmann, ME, PhD,‖ Jens Meier, MD, PhD,# Aryeh Shander, MD,** Donat R. Spahn, MD,¶ Joel M. Friedman, MD, PhD,†† Daniel M. Tartakovsky, PhD,* and Marcos Intaglietta, PhD†



RESULTS: Blood transfusion of up to 3 units of PRBCs increased DO_2 when Hct (or hemoglobin) was 60% lower than normal, but did not increase DO_2 when administered before this threshold.

Zimmerman et al. Anesth Analg 2017.

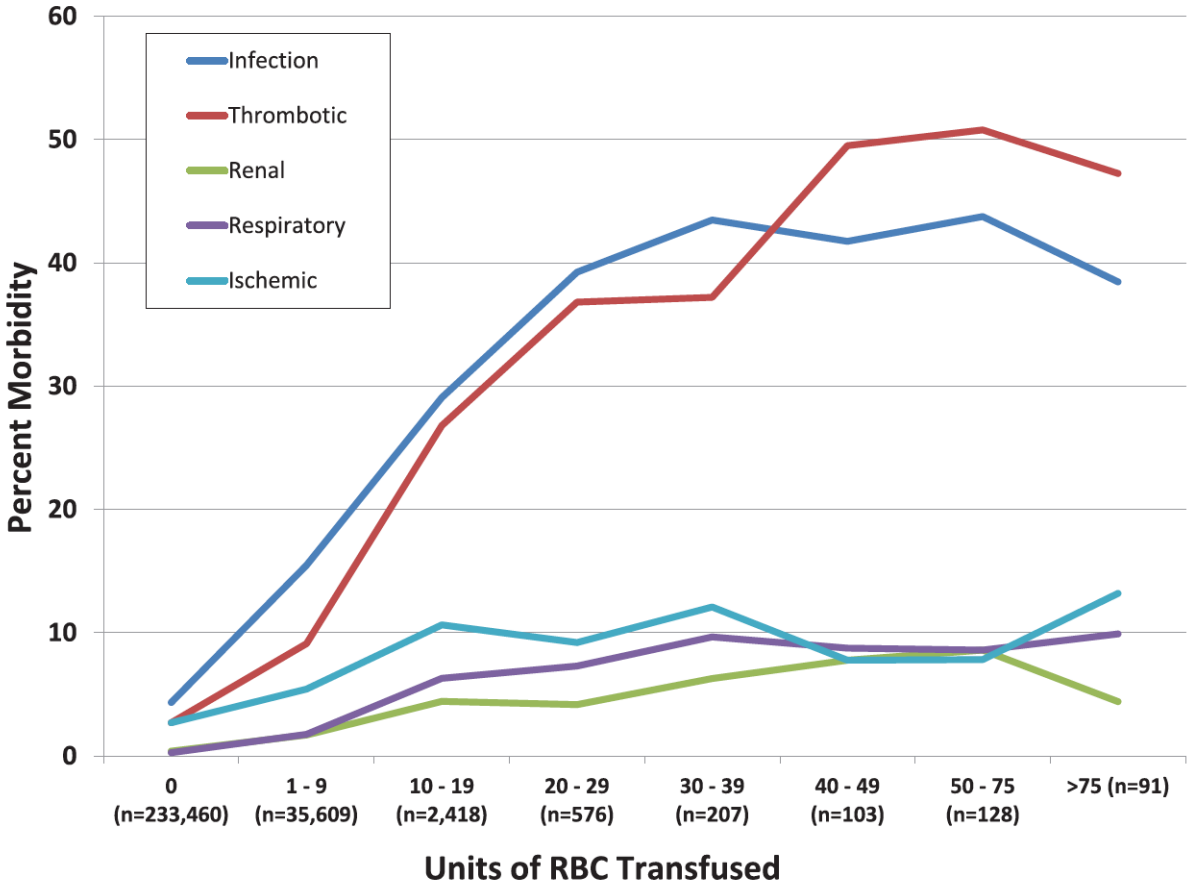
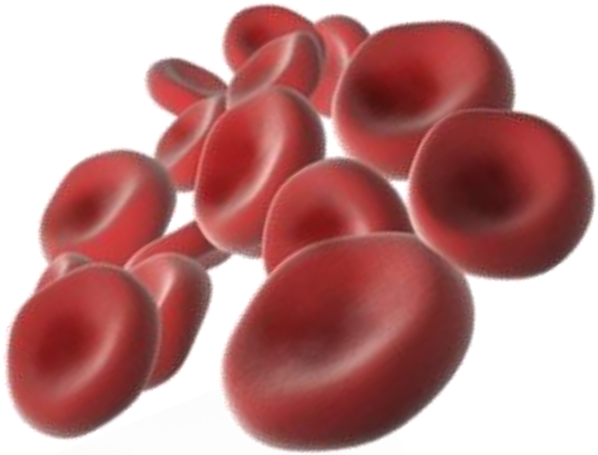
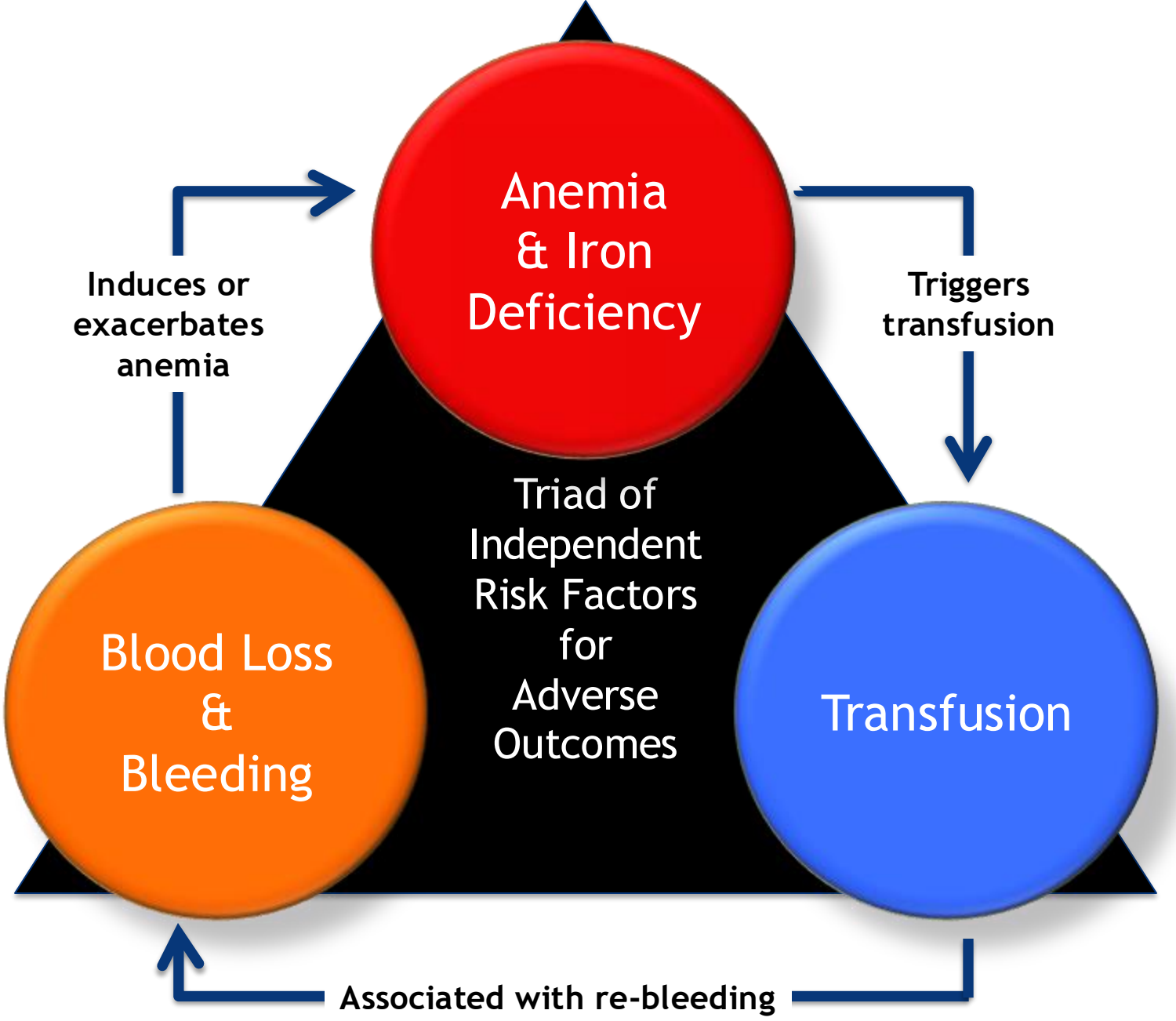


Fig. 2. Event rates for five morbid outcomes are plotted according to the number of erythrocyte units transfused. In high-dose transfused patients, hospital-acquired infections and thrombotic events were four to five times more prevalent than renal, respiratory, or ischemic events. The incidence of infection increased with erythrocyte dose up to 40% and then plateaued. Thrombotic events increased up to a rate of 50% before reaching a plateau. Renal, respiratory, and ischemic event rates increased gradually up to rates of 5 to 10% at an erythrocyte dose of 20 units. RBC = erythrocyte.

Anesthesiology 2016; 124:387-95

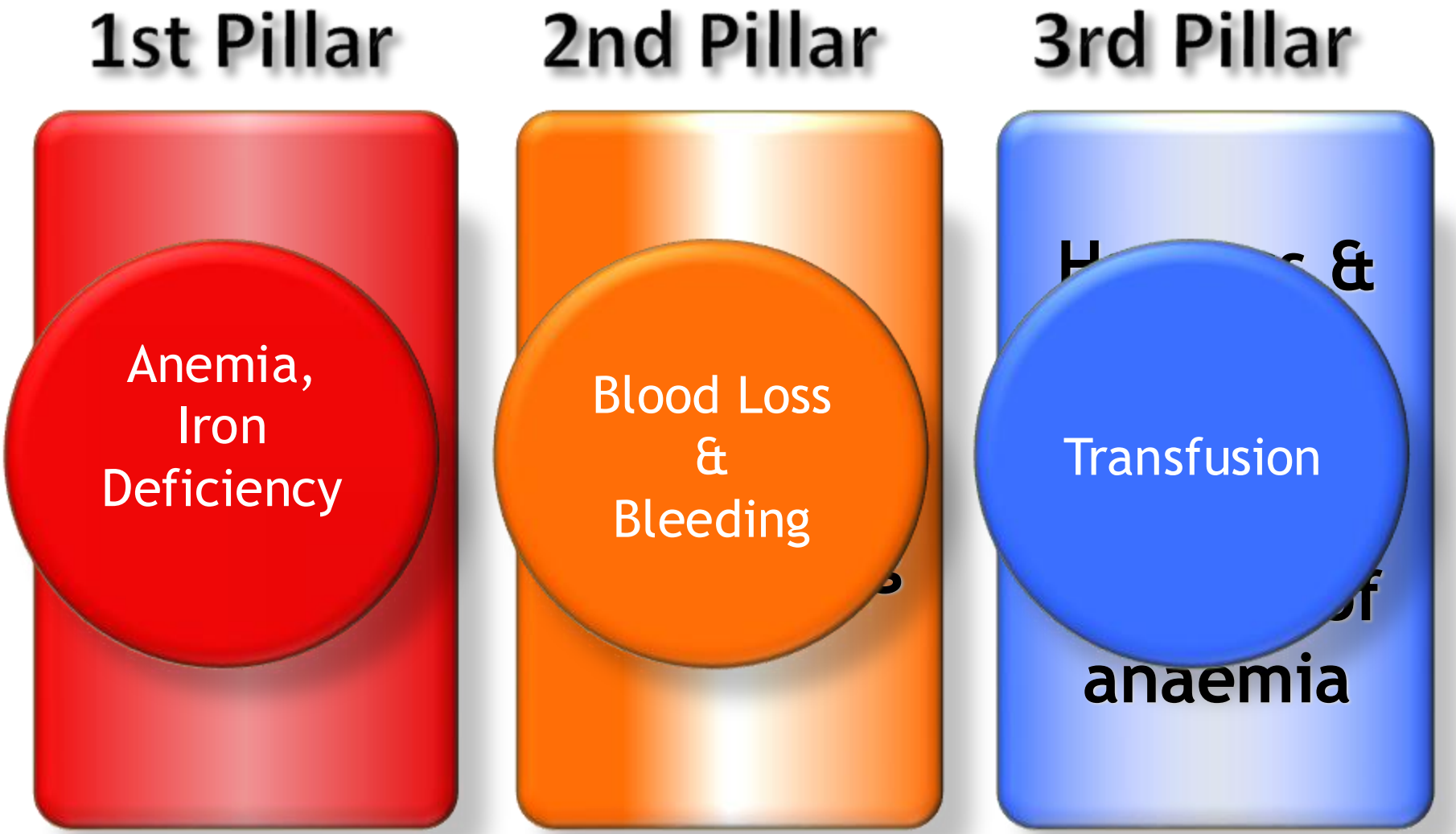



Rh POSITIVE
O



Farmer SL., Towler SC, Leahy MF, Hofmann A. Best Pract Res Clin Anaesthesiol, 2013. 27(1): p. 43-58.

MODIFYING THE RISK FACTORS



ANESTHESIOLOGY
The Journal of the American Society of Anesthesiologists, Inc.
Wolters Kluwer Health | Lippincott Williams & Wilkins

Anesthesiology:
December 2008 - Volume 109 - Issue 6 - pp 951-953
doi: 10.1097/ALN.0b013e31818e3d75
Editorial Views

Patient Blood Management: The Pragmatic Solution for the Problems with Blood Transfusions

Spahn, Donat R. M.D., F.R.C.A.*; Moch, Holger M.D.†; Hofmann, Axel M.E.‡; Isbister, James P. M.B., F.R.A.C.P.§

Anesthesiology 2008; 109:951–3

Patient Blood Management

The Pragmatic Solution for the Problems with Blood Transfusions

ALLOGENEIC erythrocyte transfusions are associated with increased mortality,[1] major adverse cardiac and noncardiac outcome,[2] and low output failure in cardiac surgery. Transfusion of allogeneic erythrocyte transfusions has also been found to be an independent factor

rocytes stored for more than 9 days having a significantly more pronounced deleterious effect.

The reason for cancer progression after blood transfusion is unclear, and the article by Atzil *et al.* did not precisely elucidate the mechanisms involved. The peri-

TRANSFUSION

2017

Results from the world's largest PBM study (n=605'046)

Improved outcomes and reduced costs associated with a health-system–wide patient blood management program: a retrospective observational study in four major adult tertiary-care hospitals

Michael F. Leahy,[1,2,3] Axel Hofmann,[4,5,6] Simon Towler,[7] Kevin M. Trentino,[8] Sally A. Burrows,[1] Stuart G. Swain,[8] Jeffrey Hamdorf,[9,10] Trudi Gallagher,[11,12] Audrey Koay,[11] Gary C. Geelhoed,[11,13] and Shannon L. Farmer[9,14]

BACKGROUND: Patient blood management (PBM) programs are associated with improved patient outcomes, reduced transfusions and costs. In 2008, the Western Australia Department of Health initiated a comprehensive health-system–wide PBM program. This study assesses program outcomes.

STUDY DESIGN AND METHODS: This was a retrospective study of 605,046 patients admitted to four major adult tertiary-care hospitals between July 2008 and June 2014. Outcome measures were red blood cell (RBC), fresh-frozen plasma (FFP), and platelet units transfused; single-unit RBC transfusions; pretransfusion hemoglobin levels; elective surgery patients anemic at admission; product and activity-based costs of transfusion; in-hospital mortality; length of stay; 28-day all-cause emergency readmissions; and hospital-acquired complications.

RESULTS: Comparing final year with baseline, units of RBCs, FFP, and platelets transfused per admission decreased 41% ($p < 0.001$), representing a saving of AU$18,507,092 (US$18,078,258) and between AU$80 million and AU$100 million (US$78 million and US$97 million) estimated activity-based savings. Mean pretransfusion hemoglobin levels decreased 7.9 g/dL to 7.3 g/dL ($p < 0.001$), and anemic elective surgery admissions decreased 20.8% to 14.4% ($p = 0.001$). Single-unit RBC transfusions increased from 33.3% to 63.7% ($p < 0.001$). There were risk-adjusted reductions in hospital mortality (odds ratio [OR], 0.72; 95% confidence interval [CI], 0.67-0.77; $p < 0.001$), length of stay (incidence rate ratio, 0.85; 95% CI, 0.84-0.87; $p < 0.001$), hospital-acquired infections (OR, 0.79; 95% CI, 0.73-0.86; $p < 0.001$), and acute myocardial infarction-stroke (OR, 0.69; 95% CI, 0.58-0.82; $p < 0.001$). All-cause emergency readmissions increased (OR, 1.06; 95% CI, 1.02-1.10; $p = 0.001$).

CONCLUSION: Implementation of a unique, jurisdiction-wide PBM program was associated with improved patient outcomes, reduced blood product utilization, and product-related cost savings.

Improved outcomes and reduced costs associated with a health-system–wide patient blood management program: a retrospective observational study in four major adult tertiary-care hospitals

Michael F. Leahy,[1,2,3] Axel Hofmann,[4,5,6] Simon Towler,[7] Kevin M. Trentino,[8] Sally A. Burrows,[1] Stuart G. Swain,[8] Jeffrey Hamdorf,[9,10] Trudi Gallagher,[11,12] Audrey Koay,[11] Gary C. Geelhoed,[11,13] and Shannon L. Farmer[9,14]

- **Quality, safety**, and **effectiveness initiative** with resource and economic implications.
- Primary aim: **improving medical and surgical patient outcomes while achieving significant cost savings** by applying PBM principles

Leahy MF, Hofmann A, Towler S, et al. Improved outcomes and reduced costs associated with a health-system-wide patient blood management program: a retrospective observational study in four major adult tertiary-care hospitals. Transfusion 2017

- Retrospective observational study to assess the impact on key outcome measures in **all emergency** and **elective** adult acute-care multi-day stay inpatients **(n=605,046)** admitted to the **4 major adult tertiary-care hospitals** July 2008 – June 2014.
- Hospitals perform **majority of high-complexity procedures performed in WA** including **cardiac, major trauma, burns**, and **obstetrics** referral services
- Multivariate analysis to control for potential confounders and changes in patient case-mix

Leahy MF, Hofmann A, Towler S, et al. Improved outcomes and reduced costs associated with a health-system-wide patient blood management program: a retrospective observational study in four major adult tertiary-care hospitals. Transfusion 2017

Key program performance indicators

Compared to baseline year, implementation was associated in year 6 with:

- **41% reduction in blood product usage** (P<0.001)
- RBC txn Hb threshold decreased from 7.9 to 7.3 g/dL (P<0.001)
- Single-unit RBC txn increased from 33% to 64% (P<0.001)
- Proportion admitted anemic decreased from 20.8% to 14.4% (P=0.001)
- **Product acquisition cost savings** of **AU$18.5M**
- Estimated **activity-based cost savings $80 - $100M**
- A one-time **investment of $4.5M** to cover 5-year change management and implementation process.

Leahy MF, Hofmann A, Towler S, et al. Improved outcomes and reduced costs associated with a health-system-wide patient blood management program: a retrospective observational study in four major adult tertiary-care hospitals. Transfusion 2017

Key Patient Outcomes

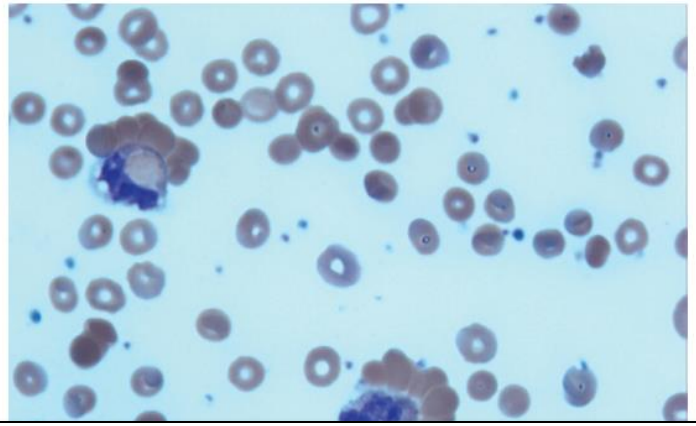
In-hospital mortality:	**28%** ↓	(95% CI, 0.67 to 0.77; P<0.001)
Length of hospital stay:	**15%** ↓	(95% CI, 0.84 to 0.87; P<0.001)
Infection:	**21%** ↓	(95% CI, 0.73 to 0.86; P<0.001)
AMI/Stroke:	**31%** ↓	(95% CI, 0.58 to 0.82; P<0.001)
Readmission:	**6%** ↑	(95% CI, 1.02 to 1.10; P<0.001)

= additional non-valorized cost savings

Leahy MF, Hofmann A, Towler S, et al. Improved outcomes and reduced costs associated with a health-system-wide patient blood management program: a retrospective observational study in four major adult tertiary-care hospitals. Transfusion 2017

www.transfusion.org Vol. 57, No. 6, June 2017

TRANSFUSION



Volume 57, June 2017 TRANSFUSION 1325

Spahn DR. Transfusion 2017

EDITORIAL

Patient Blood Management: the new standard

Preoperative anemia, [illegible] blood loss[2] and transfusion of allogeneic blood products[3–6] all adversely affect patient outcome. Patient Blood Management (PBM) aims to reduce the need for blood transfusions preemptively to improve patient safety and outcome.[7] The three pillars of PBM consist of treating preoperative anemia, reducing perioperative blood loss, and optimizing anemia tolerance. In addition, the use of restrictive, evidence-based, and patient-centered transfusion triggers is an integral part of PBM.[3,8]

Implementing one or more PBM measures has indeed improved certain patient outcomes in the past,[8-12] and some of these studies included well over 100,000 patients.[10,13] What is then so unique in the landmark study by Leahy and colleagues[14] in this issue of **TRANSFUSION** in which they describe the success of the health system–wide PBM program implementation in Western Australia? Its uniqueness includes:

- The largest ever number of patients studied: 605,064.
- Multi-centric: four major adult tertiary care hospitals.
- Health system–wide PBM program not focused on surgical disciplines alone.
- Multiple outcomes assessed:
  - Safety;
  - Clinical outcomes;
  - Transfusions;
  - Costs.
- Duration of the study: 6 years.

The results are indeed impressive. The authors report a progressively reduced adjusted in-hospital mortality (−28%), a shorter hospital length of stay (−15%), less hospital-acquired infections (−21%), and a reduced rate of myocardial infarction or stroke (−31%). Transfusions of allogeneic blood products were also reduced by 41% whereby transfusions of red blood cells (RBCs) were down 41%, fresh-frozen plasma (FFP) down 47%, and platelets (PLTs) down 27%. These trends resulted in reduction of blood product acquisition costs of more than US$18M and a reduction of activity-based transfusion costs of more than US$80M.

doi:10.1111/trf.14095

TRANSFUSION 2017;57;1325–1327

There is [illegible] more remarkable achievement: the percentage of elective patients admitted with anemia decreased from 20.8% to 14.4%. This result can be attributed to consistent identification and treatment of existing anemia and iron deficiency in the weeks before hospitalization. To my knowledge, this study is the first worldwide so far reporting a substantial reduction of the preoperative anemia rate. This achievement is highly remarkable given the logistic complexity of preoperative anemia treatment.

How was this program better than any other PBM program so far? The current article does not give a definitive answer. However, the extremely intense educational activity of the proponents of the Western Australia PBM program already described in a previous report by Leahy and colleagues in 2014[13] may be a key element in increasing the awareness of the high incidence of preoperative anemia and iron deficiency and its negative consequences on outcome.[1,15,16] In addition, hospital physicians and referring general practitioners could consult readily accessible diagnostic and therapeutic algorithms (http://www.healthnetworks.health.wa.gov.au/modelsofcare/docs/Elective_Joint_Replacement.pdf). Ironically, the highest-quality studies on the success of pre- and postoperative anemia treatment[17-20] were published years after the start of the Western Australia PBM program. However, a consensus is growing that elective surgery should be delayed until anemia correction. This movement started with individual claims.[3] Then experts stopped a prospective randomized study on the efficacy of preoperative treatment of iron deficiency anemia with intravenous (IV) iron due to a much more favorable outcome in the treatment group as compared to placebo group.[17] Finally, a professional society (Association of Anaesthetists of Great Britain and Ireland [AAGBI])[21] recommended delaying elective surgery until anemia correction in patients with an expected blood loss of more than 500 mL or an expected transfusion rate of more than 10%.[8,22] In addition, preoperative correction of iron deficiency without anemia has become recognized as likely to be beneficial for patient outcome.[22]

The time course of the improvements of the clinical outcomes is highly interesting. For most clinical outcomes, it took 2 to 3 years until they became significantly improved (Table 2 of the paper[14]). This lag period may well explain why other big PBM programs could only detect trends toward an improvement in clinical outcomes since most analyses published so far analyzed only the first year after the implementation of

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Marking the paradigm shift

SAVE BLOOD, SAVE LIVES

Transfusions are one of the most overused treatments in modern medicine, at a cost of billions of dollars. Researchers are working out how to cut back.

BY EMILY ANTHES

Ethical considerations

Autonomy:

Patients have the right to make informed decisions about their healthcare, including whether or not to accept blood transfusions. This necessitates providing patients with clear, understandable information about the risks and benefits of transfusion, as well as alternative treatment options, to ensure they can make a truly informed choice

Ethical considerations

Beneficence:

Healthcare providers have a responsibility to act in the best interests of their patients. In the context of PBM, this means ensuring that transfusions are only administered when medically necessary, minimizing risks, and maximizing the benefits

Ethical Considerations

Non-maleficence:

PBM emphasizes the avoidance of harm. Unnecessary or inappropriate transfusions carry risks, including transfusion reactions, transmission of infectious diseases, and potential immunosuppression. PBM strategies, such as optimizing pre-operative anemia management, minimizing blood loss during surgery, and promoting the use of alternatives to transfusion, aim to reduce these risks.

Ethical Considerations

Justice:

This principle ensures that all patients have fair and equitable access to appropriate blood management strategies, regardless of their background, socioeconomic status, or other factors. Resources should be used efficiently and effectively to maximize benefit for all patients in need.

The Cost of Health Care

How much are we spending?

■ = $1 Billion

$2.5 Trillion

spent in the U.S. on health care in 2009

The Cost of Health Care
How much is waste?

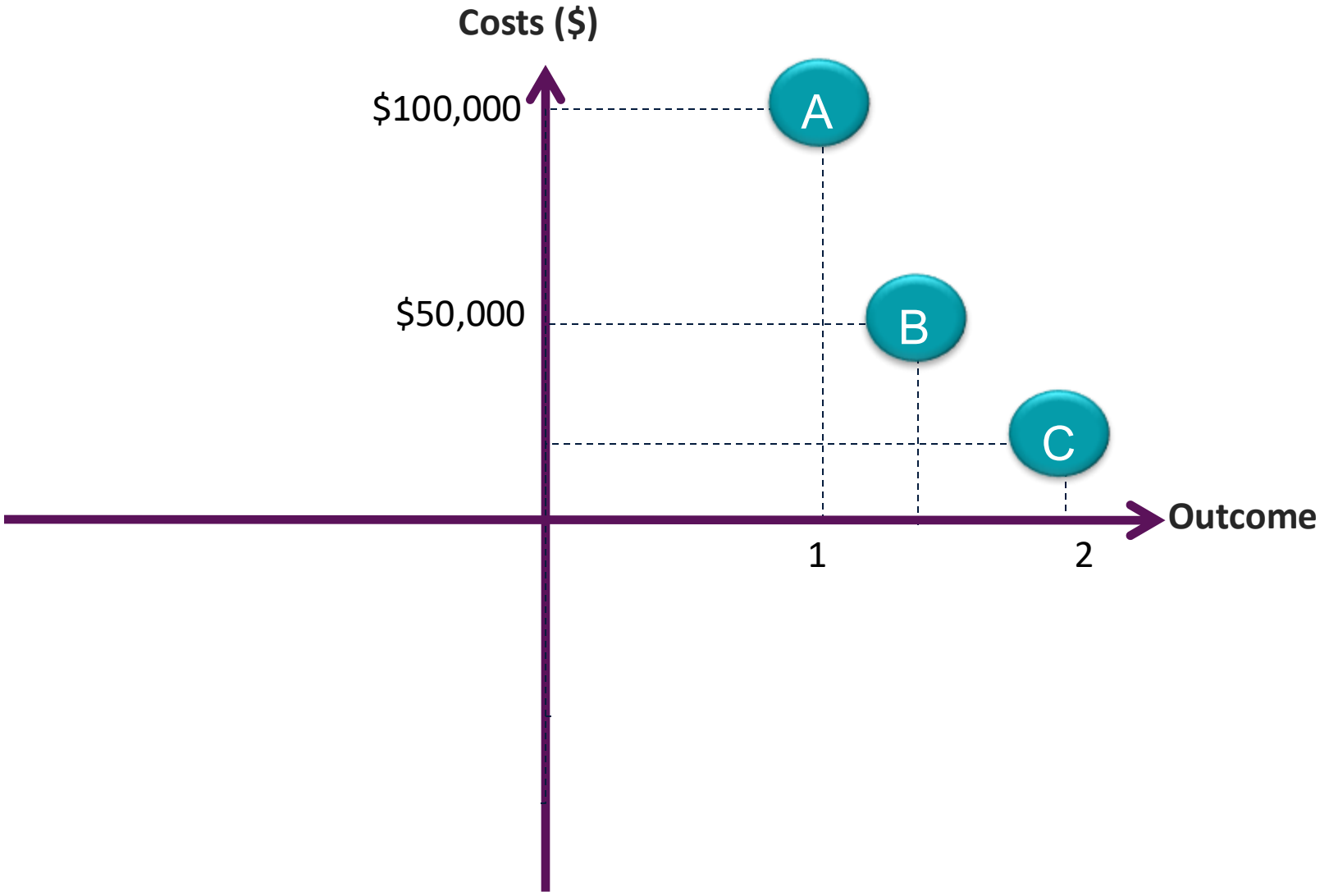
Source: Data from workshop presentations and discussions summarized in *The Healthcare Imperative*

The Cost of Health Care
How much is waste?

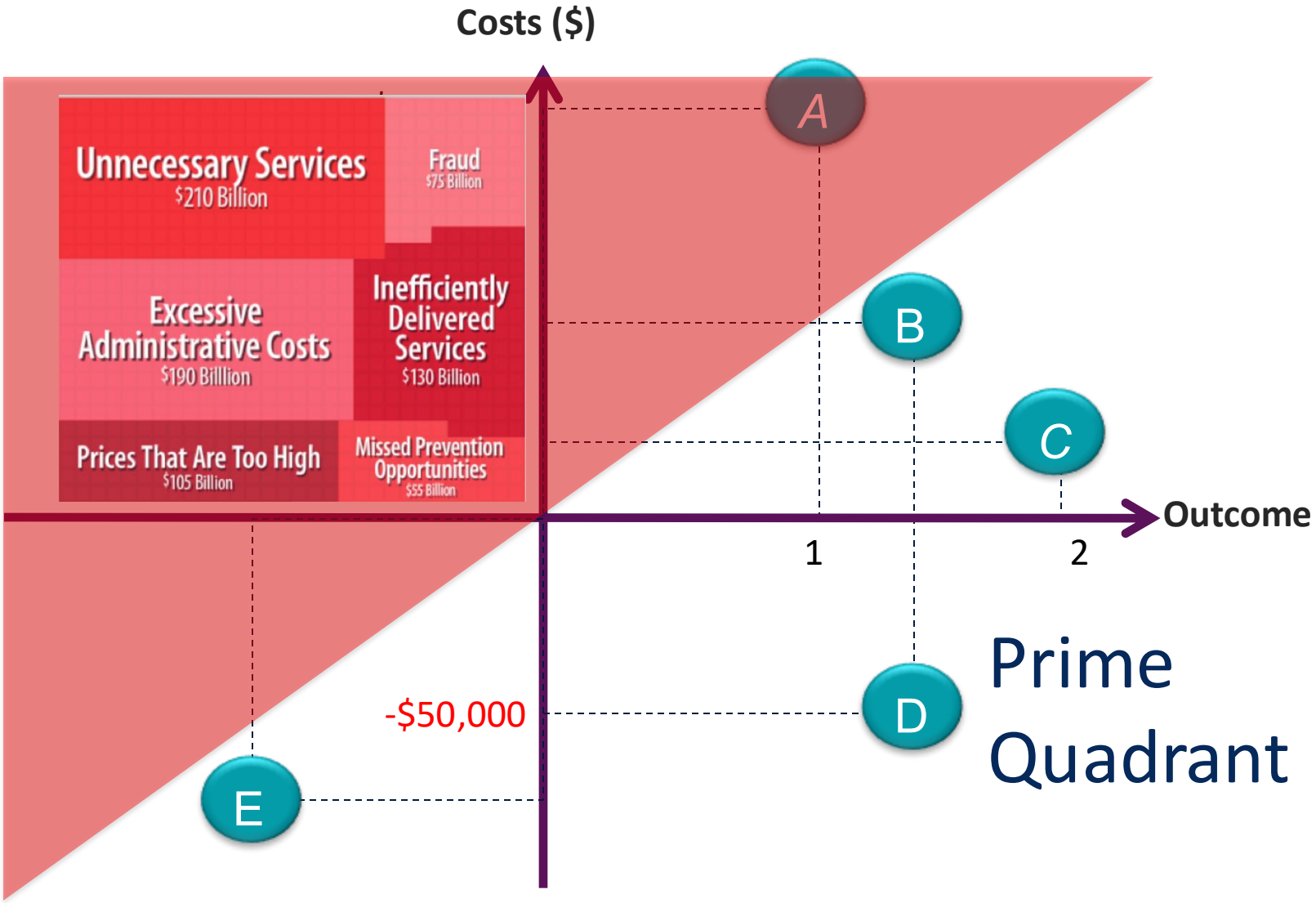
Click the diagram for more detail or here to **CONTINUE**

Source: Data from workshop presentations and discussions summarized in *The Healthcare Imperative*

Cost-Effectiveness Concept



Cost-Effectiveness Concept



A huge missed opportunity:
As a standard of care, managing the patients' own blood rather than resorting to donor blood!

→ PATIENT BLOOD MANAGEMENT

Ethical Dilemmas in PBM

Blood Shortages:

In situations of episodic blood unavailability, healthcare providers may face ethical dilemmas in prioritizing patients and determining who receives limited blood supplies.

ISSUES IN PUBLIC HEALTH

Patient blood management: A solution for South Africa

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For more than 70 years the default therapy for anaemia and blood loss was mostly transfusion. Accumulating evidence demonstrates a significant dose-dependent relationship between transfusion and adverse outcomes. This and other transfusion-related challenges led the way to a new paradigm. Patient blood management (PBM) is the application of evidence-based practices to optimise patient outcomes by managing and preserving the patient's own blood. 'Real-world' studies have shown that PBM improves patient outcomes and saves money. The prevalence of anaemia in adult South Africans is 31% in females and 17% in males. Improving the management of anaemia will firstly improve public health, secondly relieve the pressure on the blood supply, and thirdly improve the productivity of the nation's workforce. While high-income countries are increasingly implementing PBM, many middle- and low-income countries are still trying to upscale their transfusion services. The implementation of PBM will improve South Africa's health status while saving costs.

S Afr Med J 2019;109(7):xxxx. DOI:10.7196/SAMJ.2019.v109i7.13859

For decades the default treatment for anaemia and bleeding was mostly blood transfusion. However, safety risks from new and re-emerging pathogens in the blood pool,[1-3] significant inter- and intrahospital transfusion variability for matched patients,[4-9] the high cost of transfusion therapy,[10,11] and in particular the large number of risk-adjusted observational studies demonstrating that transfusion is independently associated in a dose-dependent relationship with adverse outcomes including morbidity and mortality,[12-25] have led

Ethical Dilemmas in PBM

Patient vs. Clinical Judgment:

Disagreements may arise between a patient's preference for a specific treatment and a clinician's professional judgment regarding the best course of action.

Ethical Dilemmas in PBM

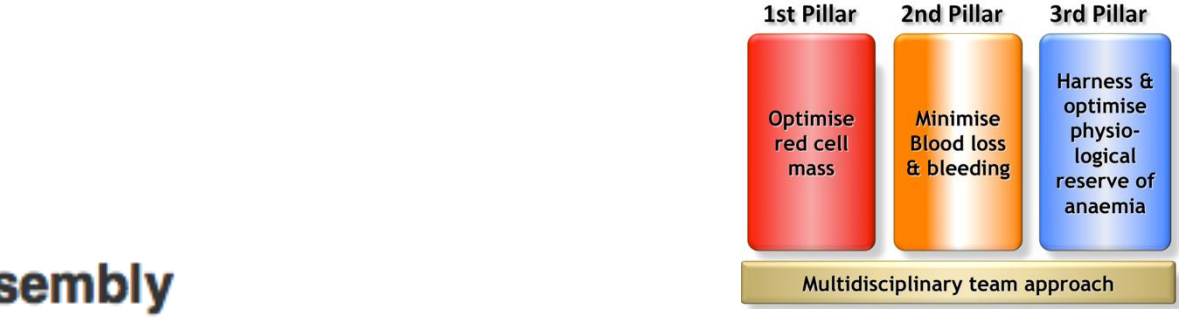
Religious or Belief-Based Refusal:

Some patients may refuse blood transfusions based on religious or personal beliefs.Respecting these decisions while ensuring patient safety and well-being can be challenging.

PBM as a Standard of Care:

PBM as a Standard of Care:

The World Health Organization (WHO) has called PBM an "ethical imperative" and recommended its integration into routine clinical practice. By adopting PBM principles, healthcare systems can improve patient outcomes, reduce costs, and ensure responsible use of a valuable resource.



World Health Organization

Sixty-third World Health Assembly

Date: 17–21 May 2010
Location: Geneva, Switzerland

The Sixty-third session of the World Health Assembly took place in Geneva during 17–21 May 2010. At this session, the Health Assembly discussed a number of public health issues, including:

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**)"*

World Health Organization

Global Forum for Blood Safety: Patient Blood Management

14 -15 March 2011, Dubai, UAE

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

Hospital/Institutional Level

1. Benchmark transfusion prescription and practices
2. Develop transfusion protocols based on generic/national guidelines, abandon transfusion triggers as surrogate markers
    a. Assess clinical and physiologic condition for deciding on transfusion
    b. Define symptoms, physical signs, and interpret laboratory results, based on individual patients
3. Set up multi-disciplinary teams for managing blood use in patients
4. Put in practice the use of:
    a. Standardized transfusion request form
    b. Standardized transfusion outcome form
5. Develop clinical transfusion process, as part of hospital quality system and participate in hospital accreditation programmes
6. Establish mechanisms for improving communication and coordination among various stakeholders in patient care
7. Establish and activate hospital transfusion committees (HTC)
8. Designate transfusion officers in hospitals
9. Provide pre-service and in-service training for clinicians, nurses and midwives on blood use
10. Collect a minimum set of data on patient transfusion outcomes

National Level

1. Obtain commitment of the government through policy and legal framework for HTCs and for multi-disciplinary approach for blood use in patient management
2. Identify major national clinical needs, and based on these, develop and implement national guidelines on blood use including patient blood management
3. Based on guidelines, develop algorithms for prescribing
4. Develop standards for hospital transfusion system, as part of hospital standards
5. Establish a minimum data set that can be captured at each hospital
6. Develop national or regional public health networks and their integration within the haemovigilance systems
7. Introduce technologies to facilitate decision for transfusion prescription
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

World Health Organization

Global Forum for Blood Safety: Patient Blood Management

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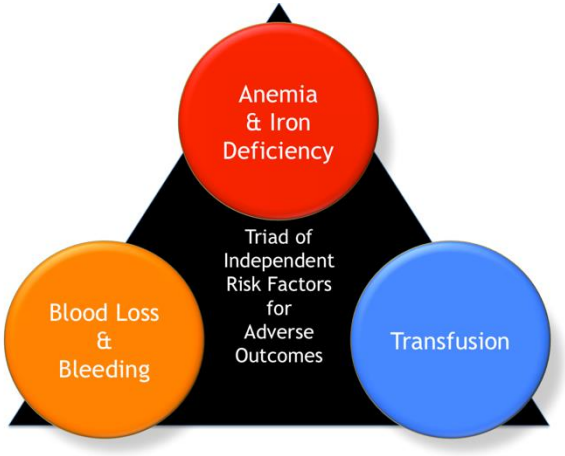
International Level

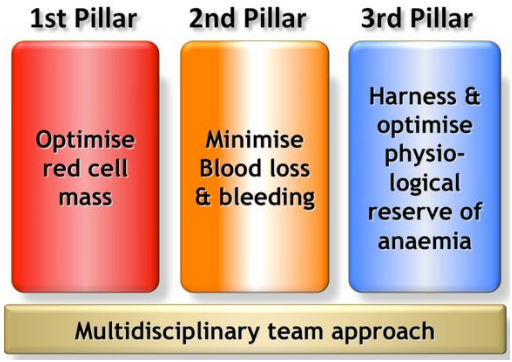
1. Develop and provide generic tools for collection of minimum transfusion outcome and patient outcome data at national level
2. Develop and provide tools for clinical transfusion audits
3. Collect global data on blood use and transfusion outcome
4. Establish global observatory on transfusion data
5. Modify '*WHO Aide-Memoire on 'Clinical Use of Blood*' to get patient management and clinicians' perspectives
6. Promote and support research on inappropriate blood use in developing countries
7. Share opinions and information through WHO Global Forum on Blood Safety and expand to involve multiple clinical disciplines
8. Review WHO list of essential medicine to include agents to reduce need for blood transfusion
9. Disseminate information on best transfusion practices
10. Develop patient-oriented handbooks on blood use
11. Promote and support evidence based reviews
12. Promote and support research on other transfusion modalities (e. g, Washed v Unwashed red cells) during intra-operative cell salvage
13. Develop key performance indicators
    a. functioning HTC
    b. clinical transfusion process
14. Develop generic curriculum for nurse and medical students on blood use
15. Acknowledge countries providing data to promote the countries not currently providing data

THE CHALLENGES

THE SOLUTION

THE EXPANSION





- Anaemia, blood loss and transfusion are modifiable risk factors for adverse outcomes
- PBM addresses these risks:
  - Reduced mortality
  - Reduced morbidity
  - Reduced transfusions, thus leading to improved safety
  - Reduced LOS
  - Less cost
- PBM recommended as STANDARD OF CARE by the WHO, EC/EU, NBA, NHS, ESA, EBA, ACSQHC, SABM, IFPBM, AABB, ARC Blood Service and others

In conclusion, PBM is not just a set of clinical guidelines but a framework rooted in ethical principles that guide healthcare professionals in providing the best possible care for their patients while respecting their autonomy and ensuring the responsible use of blood and blood products.

CONCLUSION