

Quali sono i pazienti che beneficiano maggiormente di un programma PBM?

Analisi dei trial clinici

A. Bontadini

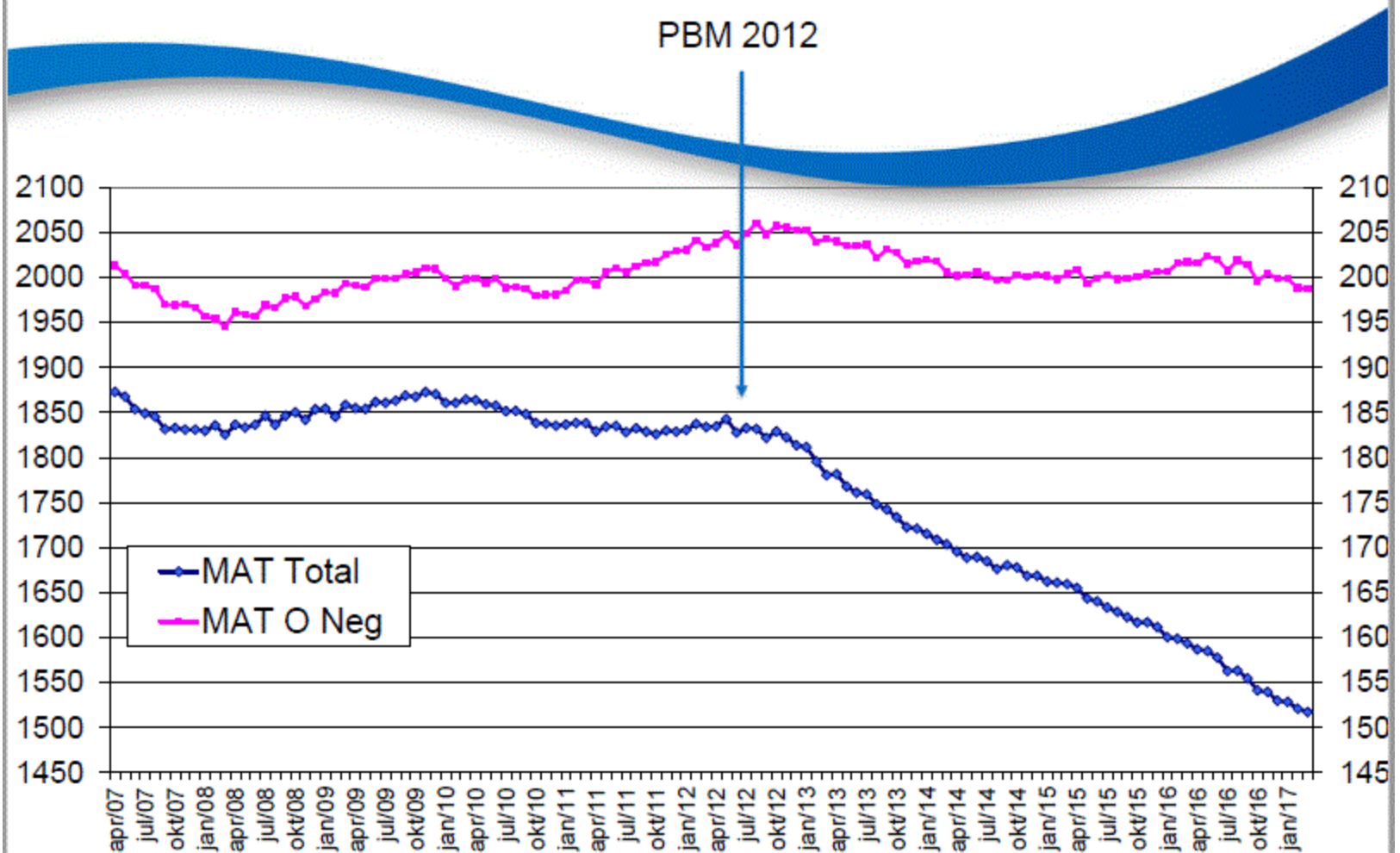


Moving Annual Total of Red Cell Issues to Hospitals - 000s



Blood and Transplant

PBM 2012



Anemia preoperatoria in studi osservazionali

Tipo di Chirurgia	Prevalenza di pazienti anemici (%)
Non cardiaca	30-42
Ortopedica	10-19
Colon-retto	40-47
Vascolare	47
Cardiaca	25-36

Chirurgia Ortopedica

	Interventi per artroprotesi N.
USA	929.000
Francia	250.000
Italia	160.000

Patient blood management in orthopaedic surgery: a four-year follow-up of transfusion requirements and blood loss from 2008 to 2011 at the Balgrist University Hospital in Zurich, Switzerland

Blood Transfus 2014; 12: 195-203

Table III - Transfusion of patients anaemic or non-anaemic immediately pre-operatively.

Year	Surgery	Transfusion in non-anaemic patients (%)	Transfusion in anaemic patients (%)	p
2008	Hip	14.7	60.0	<0.0001
2009	Hip	10.2	38.5	<0.0001
2010	Hip	14.9	49.7	<0.0001
2011	Hip	15.5	39.9	<0.0001
2008	Knee	13.3	53.6	<0.0001
2009	Knee	8.4	40.8	<0.0001
2010	Knee	6.2	28.9	<0.0001
2011	Knee	5.5	37.3	<0.0001
2008	Spine	13.8	53.8	<0.0001
2009	Spine	9.8	40.6	<0.0001
2010	Spine	10.9	39.7	<0.0001
2011	Spine	6.8	25.6	<0.0001

Tuttavia, negli interventi di artroprotesi dell'anca e del ginocchio nessun miglioramento degli indici trasfusionali di piastrine e plasma

Accettazione di trigger trasfusionali restrittivi (Hb 10 gr/dl → Hb 8 gr/dl)

Patient Blood Management is Associated With a Substantial Reduction of Red Blood Cell Utilization and Safe for Patient's Outcome

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Hugo K. Van Aken, MD, PhD, FRCA, FANZCA,‡ Christian F. Weber, MD,* Markus M. Mueller, MD,||
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the PBM-study Collaborators

(Ann Surg 2016;264:203–211)

Studio tedesco prospettico, multicentrico (n.4 Ospedali) .
Dal luglio 2012 al giugno 2015.

TABLE 1. Patient Characteristics of the Two Cohorts

Variable	Pre-PBM (n=54,513)	PBM (n=75,206)
Age (yrs)*	55.7±0.8	55.6±0.8
Male sex (%)	51.6	51.7
Hemoglobin (g/dL)		
First value after admission* /determined (%)	12.9±0.2 / 81.6	12.9±0.1 / 80.8
Last value before discharge* /determined (%)	11.3±0.1 / 66.9	11.2±0.1 / 68.2
Subtypes of surgery [†]		
Neurosurgery	7135	9886
Otorhinolaryngology	9257	11,701
Thoracic	1951	2609
Cardiac	5630	7904
Vascular	4377	5823
Visceral and endocrine	9164	13,649
Urology	4791	7243
Gynecology	4029	5174
Obstetric	4145	6308
Oral and maxillofacial	2361	3105
Trauma/Orthopedic	12,633	16,298
Others	2844	3830

Endpoint primari:

- mortalità ospedaliera
- infarto del miocardio
- stroke ischemico
- insufficienza renale
- polmonite
- sepsi

Endpoint secondari:

- Hb pre- e post-dimissione
- Periodo di ricovero
- % di pazienti trasfusi
- Numero di unità trasfuse per paziente

Patient Blood Management is Associated With a Substantial Reduction of Red Blood Cell Utilization and Safe for Patient's Outcome

(Ann Surg 2016;264:203–211)

TABLE 4. Primary Endpoint and RBC Utilization at Average in All Four Centers— Subgroups of Surgery

Type of Surgery	Primary Composite Endpoint			Percentage of Patients Transfused – % (no./total no.)			Units Per Patient – No. Mean ± Standard Error		
	Pre-PBM – %	PBM – %	OR Mantel-Haenszel	Pre-PBM	PBM	% Relative Changes	Pre-PBM	PBM	% Relative Changes
Neurosurgery	9.00	9.59	1.05 (0.95–1.17)	15.4	14.5	–6.1	0.88±0.04	0.75±0.04	–14.2
Otorhinolaryngology	9.40	9.54	1.00 (0.91–1.09)	12.2	12.1	–1.7	1.90±0.23	1.74±0.23	–8.4
Thoracic	26.37	25.75	0.99 (0.86–1.13)	45.2	43.9	–2.7	7.40±0.33	6.38±0.28	–13.8
Cardiac	17.01	16.36	0.96 (0.87–1.05)	60.5	51.1	–15.5	4.65±0.46	3.68±0.46	–20.9
Vascular	19.10	16.26	0.82 (0.74–0.91)	40.1	35.9	–10.5	4.90±0.53	3.77±0.52	–23.0
Visceral and endocrine	11.69	11.23	0.94 (0.87–1.03)	22.4	20.8	–7.2	2.39±0.16	2.09±0.16	–12.5
Urology	6.27	5.71	0.90 (0.77–1.05)	16.7	13.8	–17.2	1.15±0.12	1.00±0.12	–12.4
Gynecology	0.89	0.91	1.05 (0.68–1.62)	5.3	5.4	+0.5	0.32±0.07	0.28±0.07	–13.4
Obstetric	0.31	0.13	0.57 (0.25–1.28)	2.7	2.2	–18.7	0.10±0.03	0.09±0.03	–11.9
Oral and maxillofacial	1.89	1.58	0.78 (0.52–1.18)	5.0	4.4	–12.4	0.37±0.09	0.22±0.09	–37.4
Trauma/Orthopedic	5.77	5.81	0.99 (0.90–1.10)	19.3	17.5	–9.0	1.46±0.16	1.24±0.16	–15.5
Others	4.41	5.31	1.17 (0.93–1.47)	16.1	16.1	–0.1	1.26±0.27	1.27±0.26	+0.7

In questo studio: il PBM non è peggiorativo, la sua implementazione conduce ad una sostanziale e significativa riduzione dei globuli rossi in pazienti afferenti a differenti chirurgie specialistiche

OPEN

Multimodal Patient Blood Management Program Based on a Three-pillar Strategy

A Systematic Review and Meta-analysis

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Michael F. Leahy, MD,‡‡ Kai Zacharowski, MD, PhD,* Patrick Meybohm, MD,* and Suma Choorapoikayil, PhD*

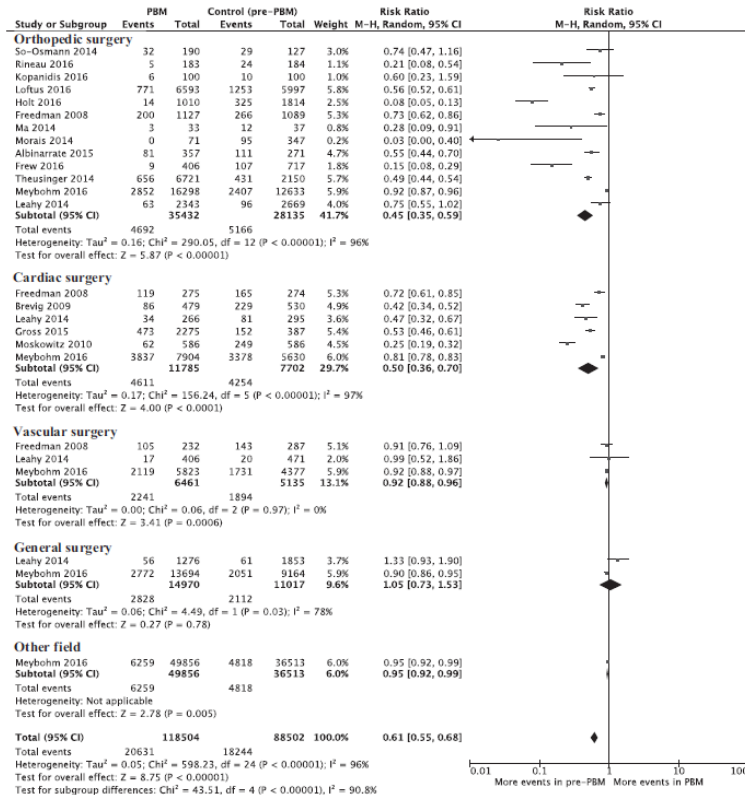
Annals of Surgery • Volume 269, Number 5, May 2019

Chirurgia Ortopedica, cardiaca, vascolare, generale.

N. di pazienti esposti alla trasfusione

N. di unità trasfuse per paziente

Number of patients exposed to allogeneic RBC



Number of units of allogeneic RBC per patient

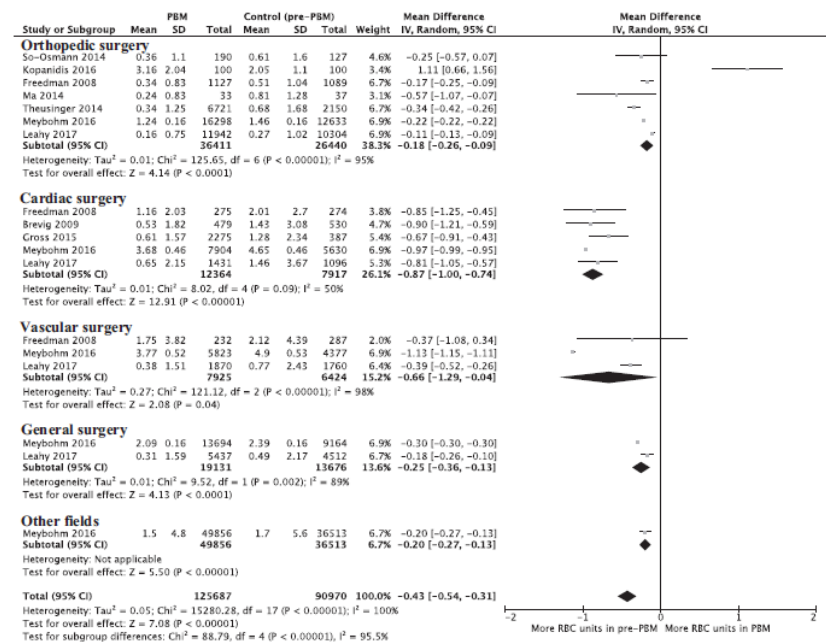


FIGURE 3. Transfused RBC units per patient in pre-PBM group compared to PBM group. Studies are ranked in ascending order from 3 to 6 measures.

URE 2. Transfusion rate in pre-PBM group compared to PBM group. Studies are ranked in ascending order from 3 to 6 measures.

N. totale di complicazioni

Total number of complications

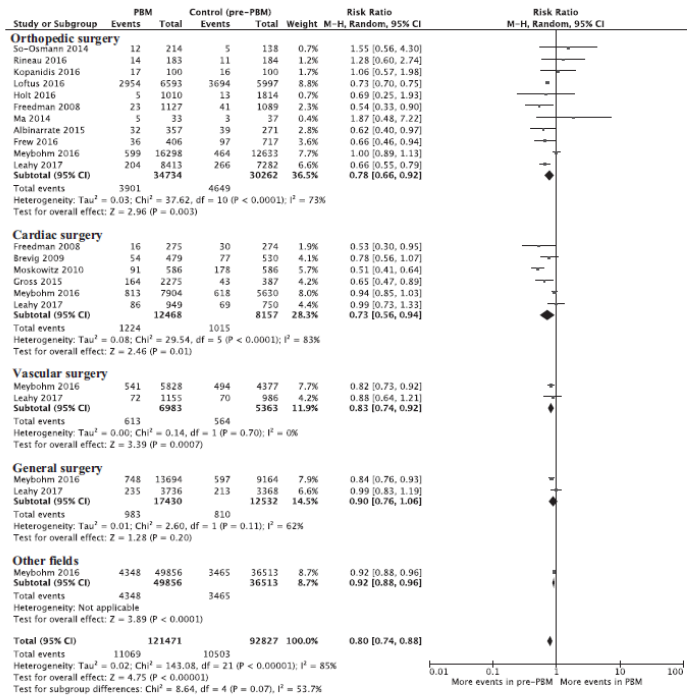


FIGURE 5. Total number of complications in pre-PBM group compared to PBM group. Studies are ranked in ascending order from 3 to 6 measures.

Mortalità

Mortality

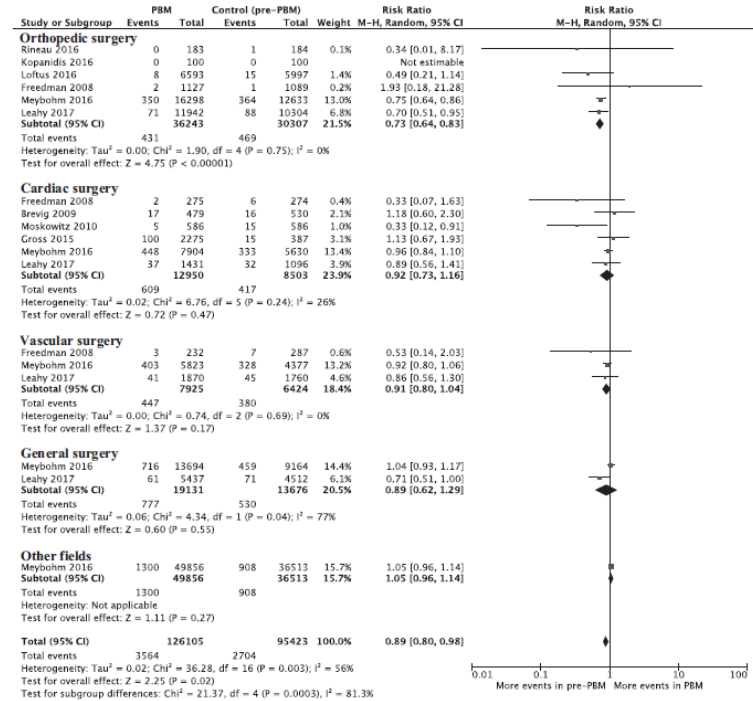


FIGURE 6. Mortality rate in pre-PBM group compared to PBM group. Studies are ranked in ascending order from 3 to 6 measures.

L'analisi si è focalizzata sul PBM che prendesse in esame tutti e tre i pilastri.

I dati a disposizione non permettono di evidenziare quale pilastro possa giocare un ruolo prioritario.

Programmi di PBM sul primo pilastro dimostrano un successo nella riduzione delle trasfusioni, tuttavia presentano limitazioni in molte tipologie di pazienti (p.e. quelli urgenti)

Una nota: solo in Italia il PBM è mandatorio per legge.

Implementation of a Blood Management Program at a Tertiary Care Hospital

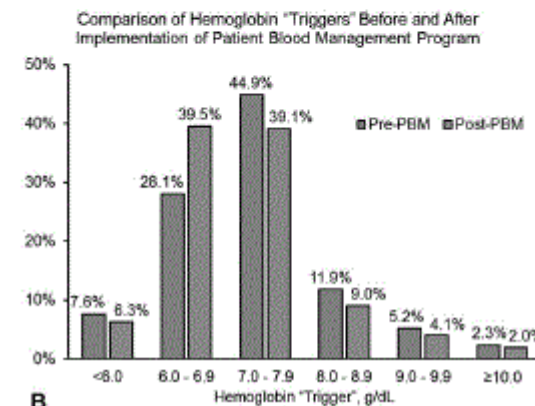
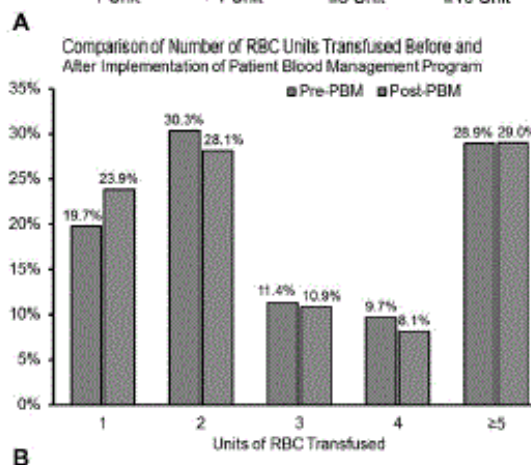
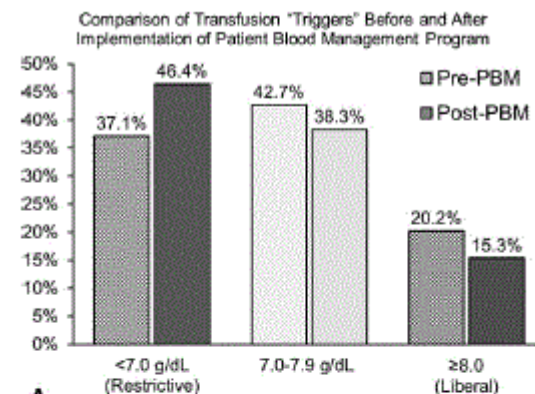
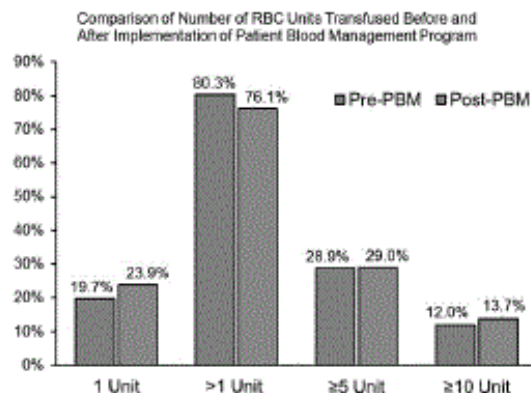
Effect on Transfusion Practices and Clinical Outcomes Among Patients Undergoing Surgery

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Vincent M. Demario, BS,† Fabian M. Johnston, MD, MHS,* Steven M. Frank, MD,†
and Timothy M. Pawlik, MD, MPH, PhD*‡

Annals of Surgery • Volume 269, Number 6, June 2019

Dipartimento Chirurgico Johns Hopkins, inizio PBM 2011

Characteristic	Total	
	N	%
Age, y, median (IQR)	56 (45–67)	
Sex		
Male	8659	50.6
Female	8455	49.4



- **Aumentano gli eventi con 1 sola Unità**
- **Aumenta la % di pazienti trasfusa con livelli emoglobinici restrittivi**
- **Il trigger emoglobinico si abbassa**

Patient blood management in cardiac surgery results in fewer transfusions and better outcome

Irwin Gross,¹ Burkhardt Seifert,² Axel Hofmann,² and Donat R. Spahn²

Volume 55, May 2015 TRANSFUSION 1075

2662 pazienti analizzati, 387 nel periodo pre-PBM e 2275 nel periodo post-PBM

TABLE 2. Blood loss and transfusion outcome*			
	Pre-PBM epoch	PBM epoch	p value
RBC loss (mL)	810 ± 426 721 [538-993]	605 ± 369 552 [370-756]	<0.001
Hb (g/dL)			
Before transfusion	7.2 ± 1.4	6.6 ± 1.2	<0.001
After transfusion	8.3 ± 1.3	7.7 ± 1.1	<0.001
% of patients transfused			
RBCs	39.3	20.8	<0.001
FFP	18.3	6.5	<0.001
PLTs	17.8	9.8	<0.001
RBCs (units/patient)	1.28 ± 2.34 0 [0-2]	0.61 ± 1.57 0 [0-0]	<0.001
FFP (units/patient)	0.78 ± 1.98 0 [0-0]	0.23 ± 1.05 0 [0-0]	<0.001
PLTs (units/patient)	0.39 ± 1.03 0 [0-0]	0.17 ± 0.65 0 [0-0]	<0.001
Discharge Hb (g/dL)	9.1 ± 1.2	9.4 ± 1.5	<0.001

* Data are mean ± SD and median [interquartile range] for nonnormally distributed data.

Il lavoro enfatizza l'importanza di applicare tutti i pilastri del PBM.

In particolare:

- **primo pilastro** non ha avuto grande peso nel successo dei dati per l'alto numero di urgenze e per le limitazioni dell'utilizzo dell' EPO
- **secondo pilastro** ha maggior peso per l'attenzione alla riduzione delle perdite intraoperatorie (attenzione all'emostasi chirurgica, farmaci antifibrinolitici, tromboelastogramma, algoritmo trasfusionale)
- **terzo pilastro**: trasfusione restrittiva, utilizzo del ferro iv anche nel post-operatorio

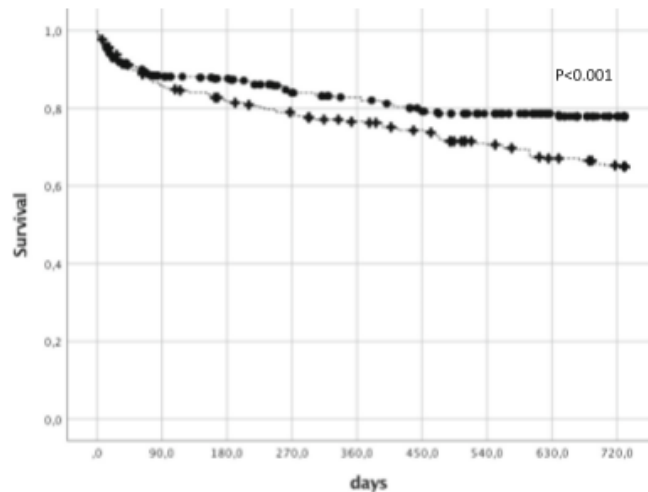
Patient Blood Management improves outcome in oncologic surgery

Keding et al. *World Journal of Surgical Oncology* (2018) 16:159

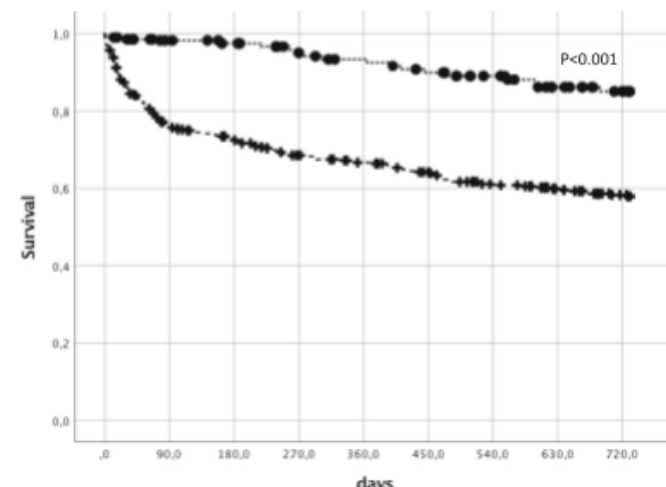
Studio retrospettivo. Chirurgia Oncologia epatobiliare, pancreatica, esofagea, gastrica, intestinale, metastasi epatiche

Table 1 Demographic data, indications, concomitant disease, pre-surgical anemia, and numbers of RBC transfusions

	Cumulative N = 836	PBM- N = 389	PBM+ N = 447	p value
Hemoglobin prior to surgery (g/dl)		11.9 ± 2.2	12.5 ± 1.9	< 0.001
Hemoglobin before surgery normal		139 (35.7%)	253 (56.6%)	< 0.001
RBCs transfused per patient		5.5 ± 11.1	3.0 ± 6.9	< 0.001
Patients receiving at least 1 RBC		242 (62.4%)	180 (40.9%)	< 0.001



Two-year overall survival comparing patients with and without Patient Blood Management



Two-year overall survival comparing patients with and without transfusion.

Implementation of a patient blood management program in hematopoietic stem cell transplantation

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William C. Mundell⁴, Alberto Marquez¹, Andrew A. Higgins¹, Nageswar R. Madde¹, William J. Hogan²,
and Daryl J. Kor¹

TRANSFUSION Volume 59, September 2019

Sviluppo programma di PBM:

- Formazione per ridurre l'esposizione a emocomponenti allogenici
- Sviluppo di piattaforme informatiche per il monitoraggio e la decisione trasfusionale
- Definizione di precisi trigger trasfusionali (Hb 7gr/dl; PLT <10 x 10⁹/L)

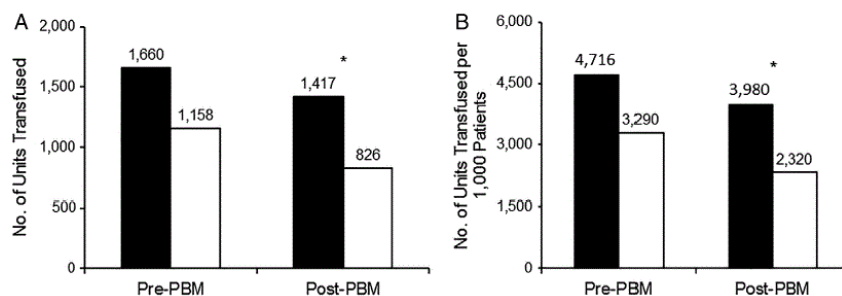


Fig. 1. Number of RBC (□) and PLT (■) units transfused in cohorts before and after PBM program implementation. (A) Total number of PLT or RBC units transfused; (B) total number of PLT or RBC units transfused, normalized per 1,000 patients. *Significant difference (chi-square test; p < 0.001).

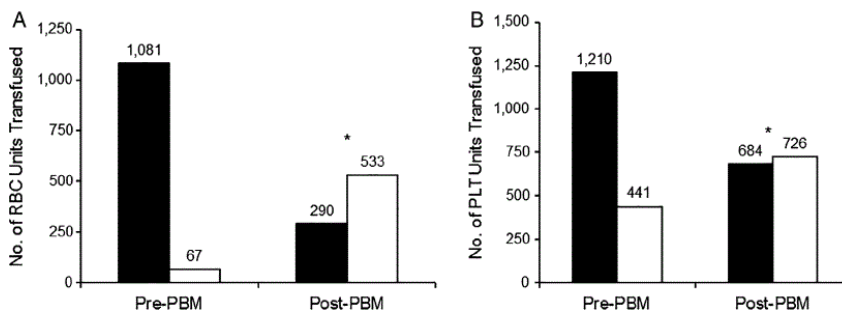


Fig. 2. RBC and PLT units transfused above (■, Hb ≥ 7 g/dL; ■, PLT count ≥ 10 × 10⁹/L) or below (□, Hb < 7 g/dL; □, PLT count < 10 × 10⁹/L) prespecified laboratory thresholds, before and after PBM program implementation. (A) RBC transfusions; (B) PLT transfusions. *Significant difference (chi-square test; p < 0.001). Pretransfusion Hb values were missing for 13 units (excluded). Pretransfusion PLT count values were missing for 16 units (excluded).

Outcome	2013 (n = 352)	2015 (n = 356)	p value†
All-cause mortality at 3 months	11 (3.1)	10 (2.8)	0.83
Hospital admission within 30 days	172 (48.9)	191 (53.7)	0.23
Hospital length of stay (days)	5.1 (2.9-8.8)	5.0 (2.9-9.2)	0.90
ICU admission within 30 days	27 (7.7)	29 (8.1)	0.89
ICU length of stay (days)	1.2 (0.9-2.7)	1.0 (0.5-2.1)	0.27

* Data are reported as number (%) or median (IQR).
† Differences in continuous data were assessed with the Wilcoxon rank-sum test. Differences in categorical data were assessed with the Fisher's exact test.

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dati di laboratorio, clinica e eventi
trasfusionali!!**

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Blood use in patients receiving intensive chemotherapy for acute leukemia or hematopoietic stem cell transplantation: the impact of a health system-wide patient blood management program

TRANSFUSION 2017;57:2189–2196

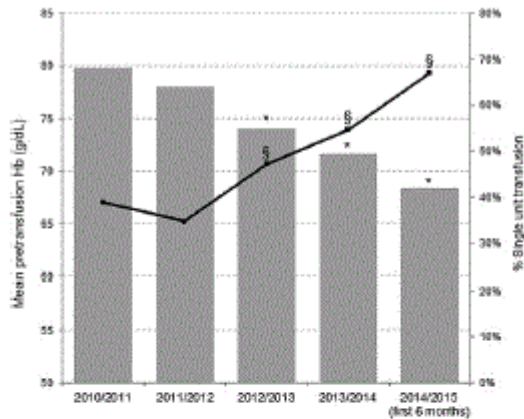


Fig. 1. Mean pretransfusion Hb (■) and proportion of single-unit transfusions (—■—). This graph highlights that among inpatients the pretransfusion Hb decreased significantly between 2012-2013 and the first half of 2014-2015 when compared to 2010-2011. The proportion of single-unit RBC transfusions increased significantly over the same period. * $p < 0.05$, indicating the mean pretransfusion Hb decreased significantly when compared to the reference year (2010-2011). § $p < 0.05$, indicating the proportion of single-unit transfusions increased significantly when compared to the reference year (2010-2011).

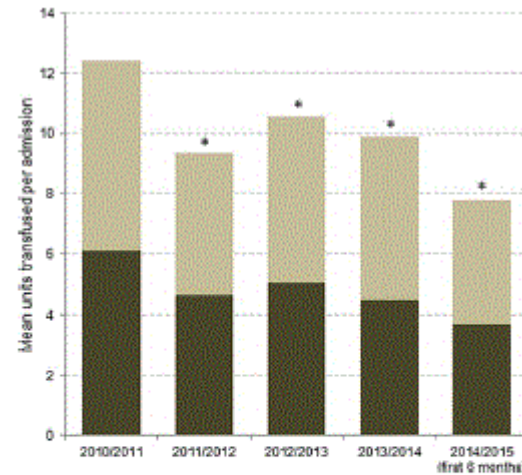


Fig. 2. Mean number of RBC (■) and PIT (■) units transfused per inpatient admission. This graph highlights the mean number of units of RBCs and PLTs transfused per inpatient admission decreased significantly between 2011-2012 and the first half of 2014-2015 when compared to 2010-2011. * $p < 0.05$ indicates RBC and PLT units transfused per admission decreased significantly when compared to the reference year (2010-2011). [Color figure can be viewed at wileyonlinelibrary.com]

Passaggio dalla politica di trasfondere 2 unità ad 1 unità: 25% di riduzione unità trasfuse

Fattibilità dell'applicazione del PBM anche in pazienti non chirurgici

Patient blood management: A solution for South Africa

SAMJ July 2019, Vol. 109, No. 7

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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):471-476. DOI:10.7196/SAMJ.2019.v109i7.13859

Alta prevalenza di anemia preoperatoria nei pazienti ricoverati: 47,8%

Alta prevalenza di positività dell' HIV. Dimissioni permanenti dei donatori di sangue > 20%

Risparmi economici

ORIGINAL ARTICLE

Improvements in patient blood management for pediatric craniostomosis surgery using a ROTEM®-assisted strategy – feasibility and costs

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¹ Department of Anaesthesia, University Children's Hospital Zurich, Zurich, Switzerland

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³ Department of Haematology, University Children's Hospital Zurich, Zurich, Switzerland

Table 2 Data on coagulation management and related costs

	Before implementation of PBM strategy (2007–2011) (n = 36)	After implementation of PBM strategy (2011–2013) (n = 11)
Number of intraoperative transfusions of red blood cells	36 (100%)	11 (100%)
Number of intraoperative transfusions of fresh frozen plasma	26 (72%)	0*
Number of intraoperative transfusions of platelet concentrate	9 (25%)	1 (9%)
Number of intraoperative transfusions of fibrinogen concentrate	22 (61%)	11 (100%)*
Number of intraoperative transfusions of FXIII concentrate	0	5 (45%)*
Number of postoperative transfusion on ICU	9 (25%)	2 (18%)
Perioperative administration of tranexamic acid	6 (16%)	11 (100%)
Mean costs of allogeneic blood products per patient ^a	608.73 EUR	416.11 EUR
Mean costs of coagulation factors per patient ^a	263.09 EUR	472.82 EUR
Mean total costs of PBM per patient ^a	1071.82 EUR	888.93 EUR

Data are expressed as absolute number (%).

PBM, patient blood management

^aCalculated mean costs per patient in Euro.

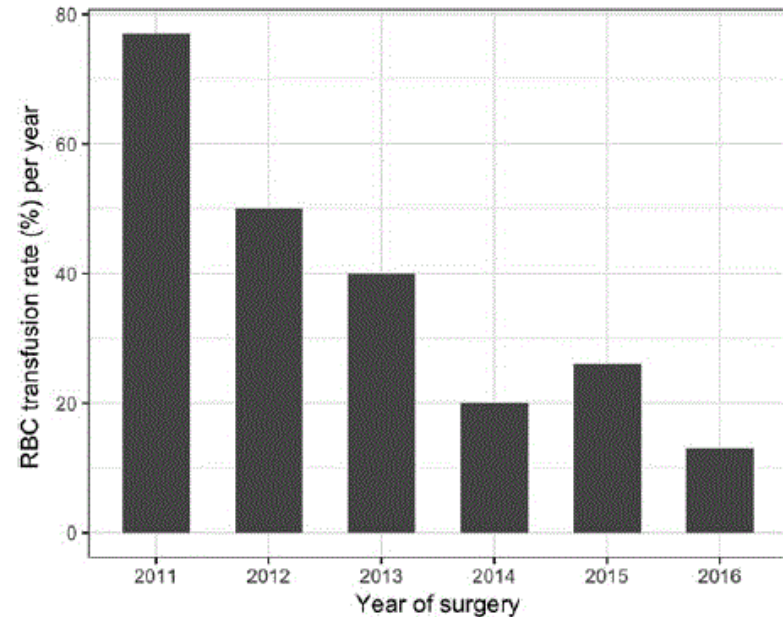
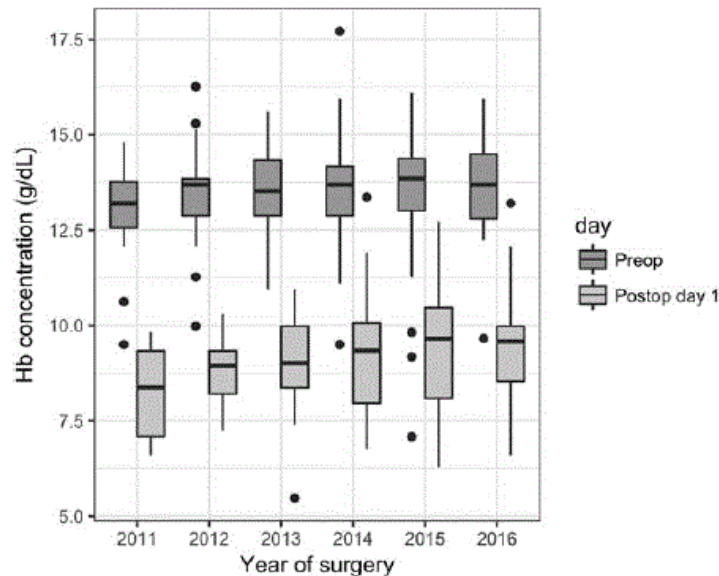
*P < 0.05 (chi-square test).

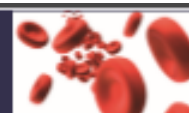
Blood transfusion in the surgical treatment of adolescent idiopathic scoliosis—a single-center experience of patient blood management in 210 cases

Søren Ohrt-Nissen ¹, Naeem Bukhari,¹ Casper Dragsted,¹ Martin Gehrchen,¹ Pär I. Johansson,³
Jesper Dirks,² Jakob Stensballe,^{2,3} and Benny Dahl⁴

TRANSFUSION Volume 57, July 2017

Patient blood management strategies were implemented in 2011, including prophylactic tranexamic acid, intraoperative permissive hypotension, restrictive fluid therapy (including avoidance of synthetic colloids), restrictive RBC trigger according to institutional standardized protocol, the use of cell salvage, and goal-directed therapy according to thrombelastography.





Patient blood management in obstetrics: management of anaemia and haematinic deficiencies in pregnancy and in the post-partum period: NATA consensus statement

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Prevalence of anemia and therapeutic behavior in the emergency department at a tertiary care Hospital: Are patient blood management principles applied?

I. Beverina



- Studio retrospettivo su 22329 pazienti. 6144 erano anemici (27,5%)
- 281/6144 (4,6%) erano stati trasfusi
- Buona appropriatezza delle indicazioni della richieste (74,5%)
- Bassa appropriatezza per il numero di unità richieste (8,8%)
- Nei pazienti microcitici, bilancio del ferro richiesto solo nel 22% dei casi



For decades transfusion was considered the optimal treatment for

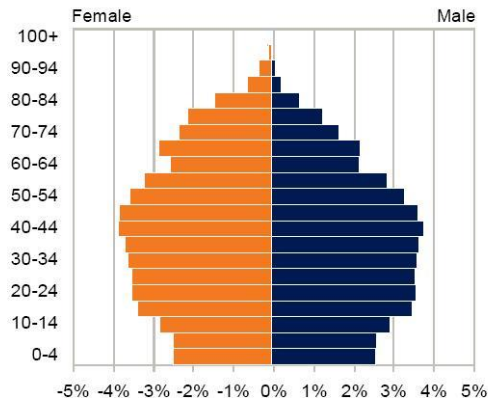
- Anaemia
- Bleeding

but ...

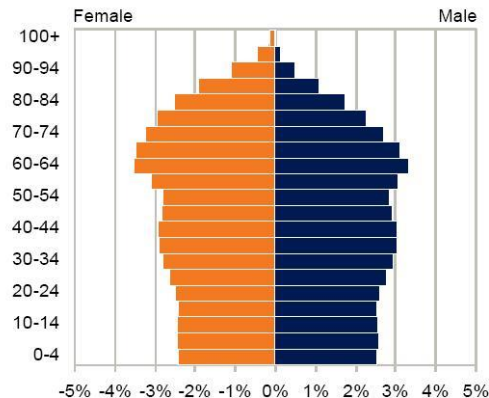


and check the facts!

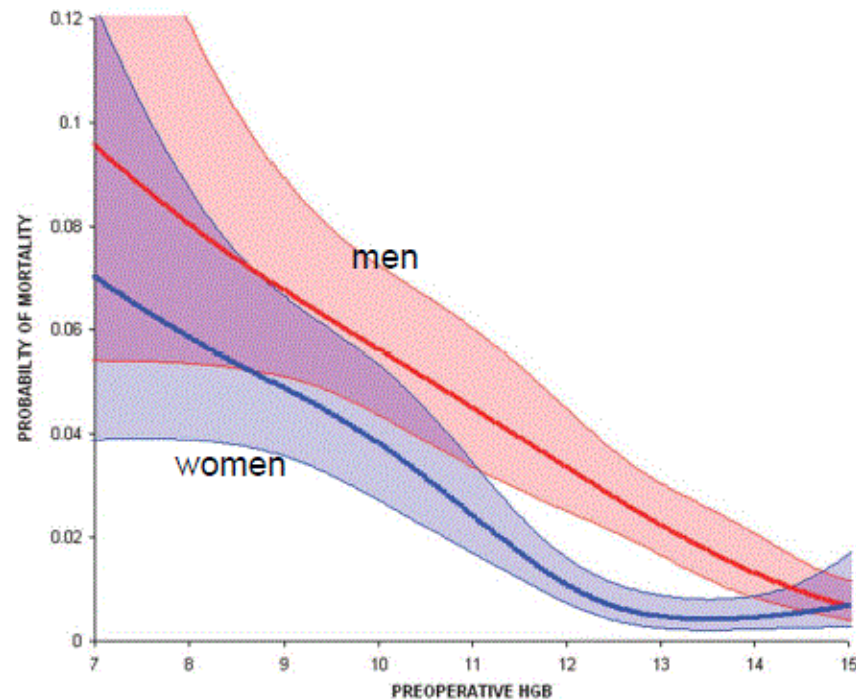
Figure 1: Population pyramids for Europe
(a) 2005, total population 729.4m



(b) 2050, total population 691m

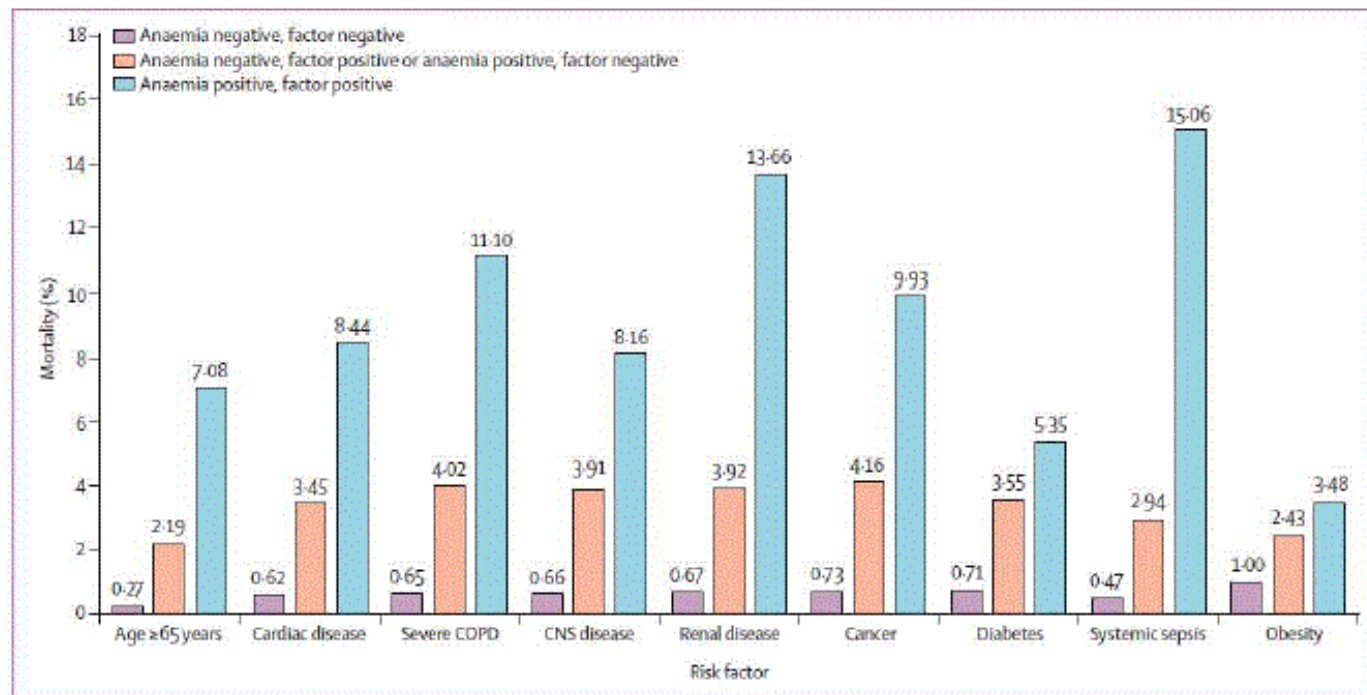


Unadjusted cubic spline relationship for men and women (95% CI) showing the relationship between preoperative anemia and 90-day mortality.



Beattie et al. Anesthesiology 2009; 110:574–81

30-day mortality, by anaemia and risk factor status



Mussallam et al: www.thelancet.com Published online October 6, 2011

PBM

-Inizialmente solo Chirurgia Elettiva non oncologica
-poi Chirurgia Oncologica
-ancora in campo pediatrico e ostetrico
-proseguendo in ematologia (trapianto CSE)
-e ancora nella medicina d'urgenza
-molto verosimilmente applicabile anche per piastrine e plasma

*Il PBM è solo una modalità per ridurre
la trasfusione nei pazienti chirurgici
oppure è una moderna modalità
«culturale» per NON trasfondere
tutti i pazienti ?*





Grazie per l'attenzione



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