

Ferro per via endovenosa come strategia di risparmio del sangue in chirurgia elettiva: quali evidenze?

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Special Conference

Il Patient Blood Management: non solo una questione di ferro e anemia

Rome, 15th October 2015



The undersigned Speaker, declare that in the last two years I have had the following relationships, including financial ones with subjects with commercial interests in the field of healthcare:

- I have received honorarium for lectures and/travel support from VIFOR-PHARMA international and Spain, OM-Pharma, ORTHO-BIOTECH, WellSpect, Sandoz
- Consultant for Advisory Board for VIFOR- PHARMA España 2013-2014.

INDEX

- Rationale
- Some considerations in anaemia management in a PBM approach
- Evidence in preoperative anaemia treatment
- Evidence in postoperative anaemia treatment
- Conclusions

PATIENT BLOOD MANAGEMENT



- PBM identify **patients** at risk of transfusion and provide a managed plan aimed at **reducing or eliminating the need for allogeneic transfusion** with an acceptable risk of anemia.
- MULTIMODAL and MULTIDISCIPLINAR
- **AIM:** to Improve patients outcome

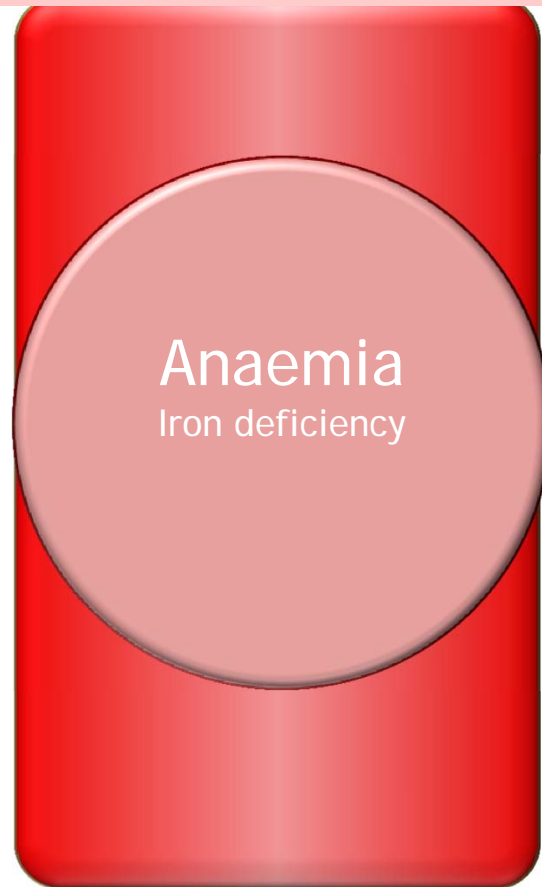
Blood use in elective surgery: the Austrian benchmark study

Hans Gombotz, Peter H. Rehak , Aryeh Shander , and Axel Hofmann

97.4% of transfusions could be predicted by:

- 1. Level of **anaemia/Hb** prior to surgery**
- 2. Volume of perioperative blood loss**
- 3. Transfusion trigger**

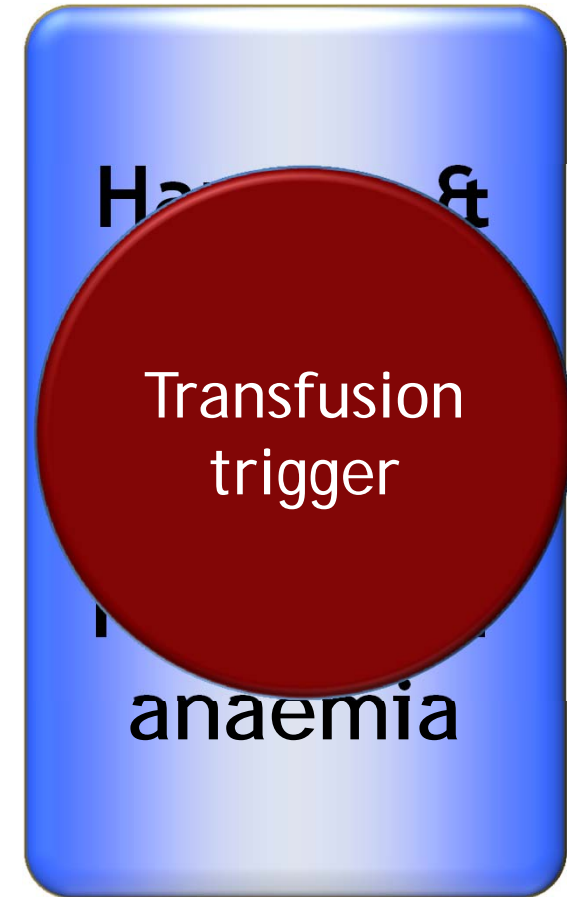
1st Pillar



2nd Pillar



3rd Pillar



PBM is a multidisciplinary team approach

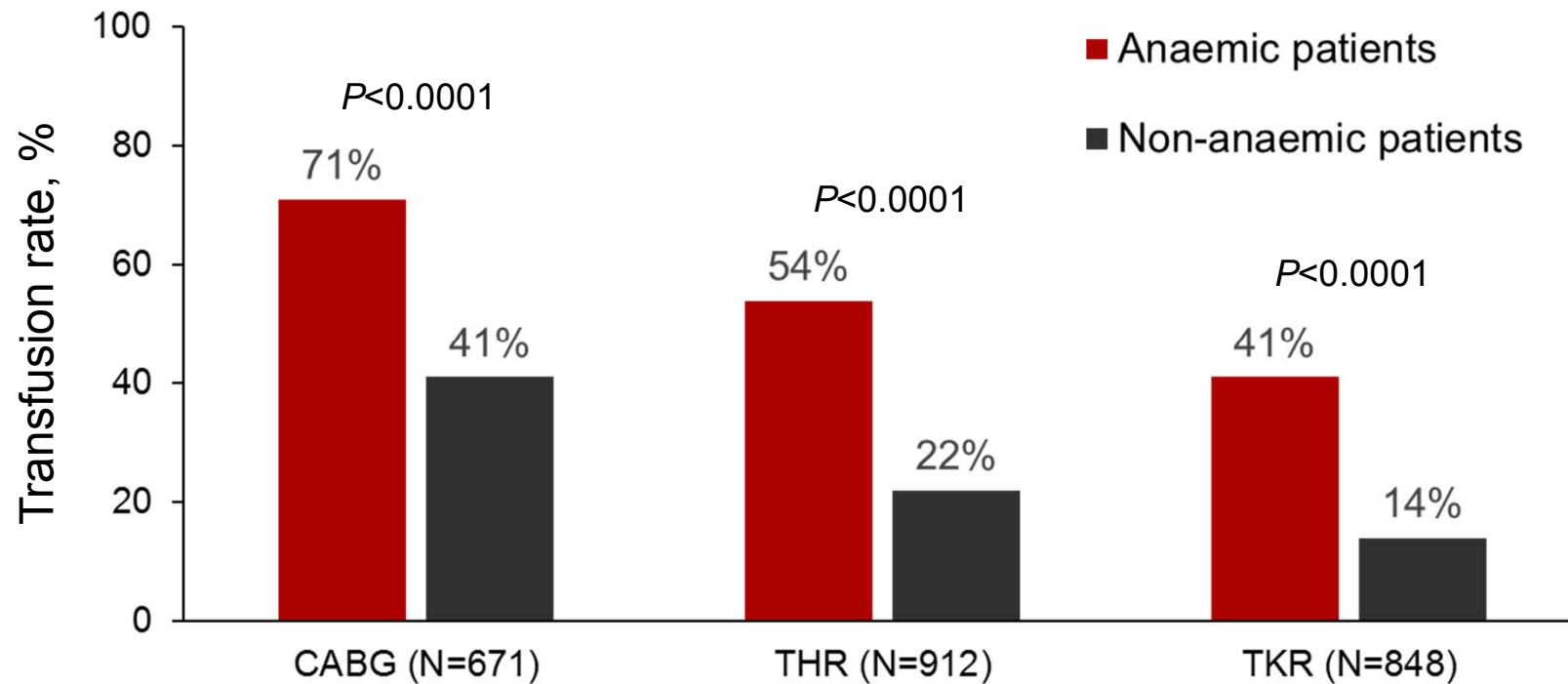


RATIONALE

Preoperative anemia is one of the main risk factors for **transfusion** in major surgical procedures and one of the few, we can modify

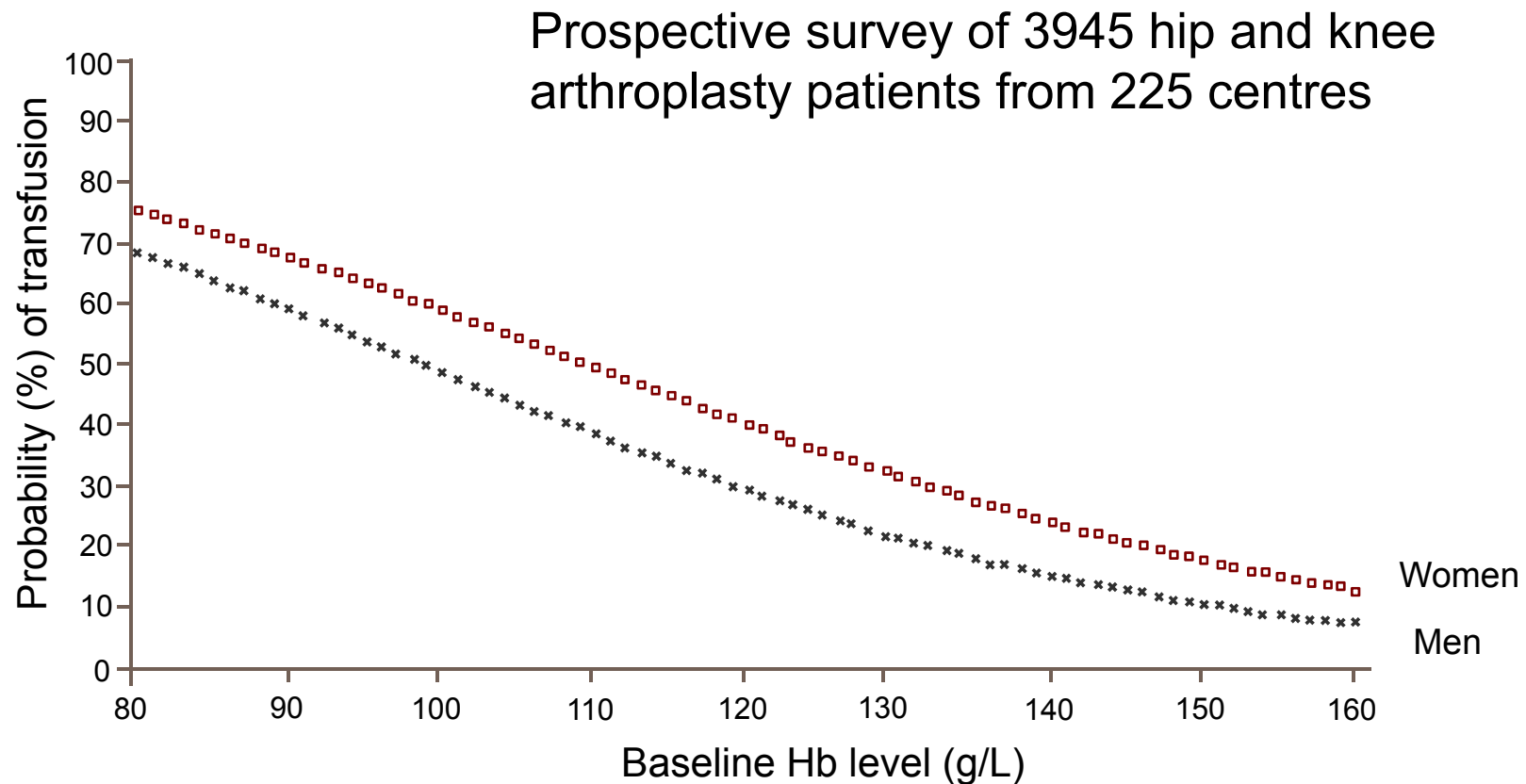
Preoperative anaemia and RBC transfusion: NATA benchmark study

Observational study of transfusion practices
in cardiac and orthopaedic surgery in 11 centres (2431 patients)



CABG, coronary artery bypass graft surgery
THR, total hip replacement
TKR, total knee replacement

Baseline haemoglobin and risk of transfusion in hip and knee arthroplasty: OSTHEO study





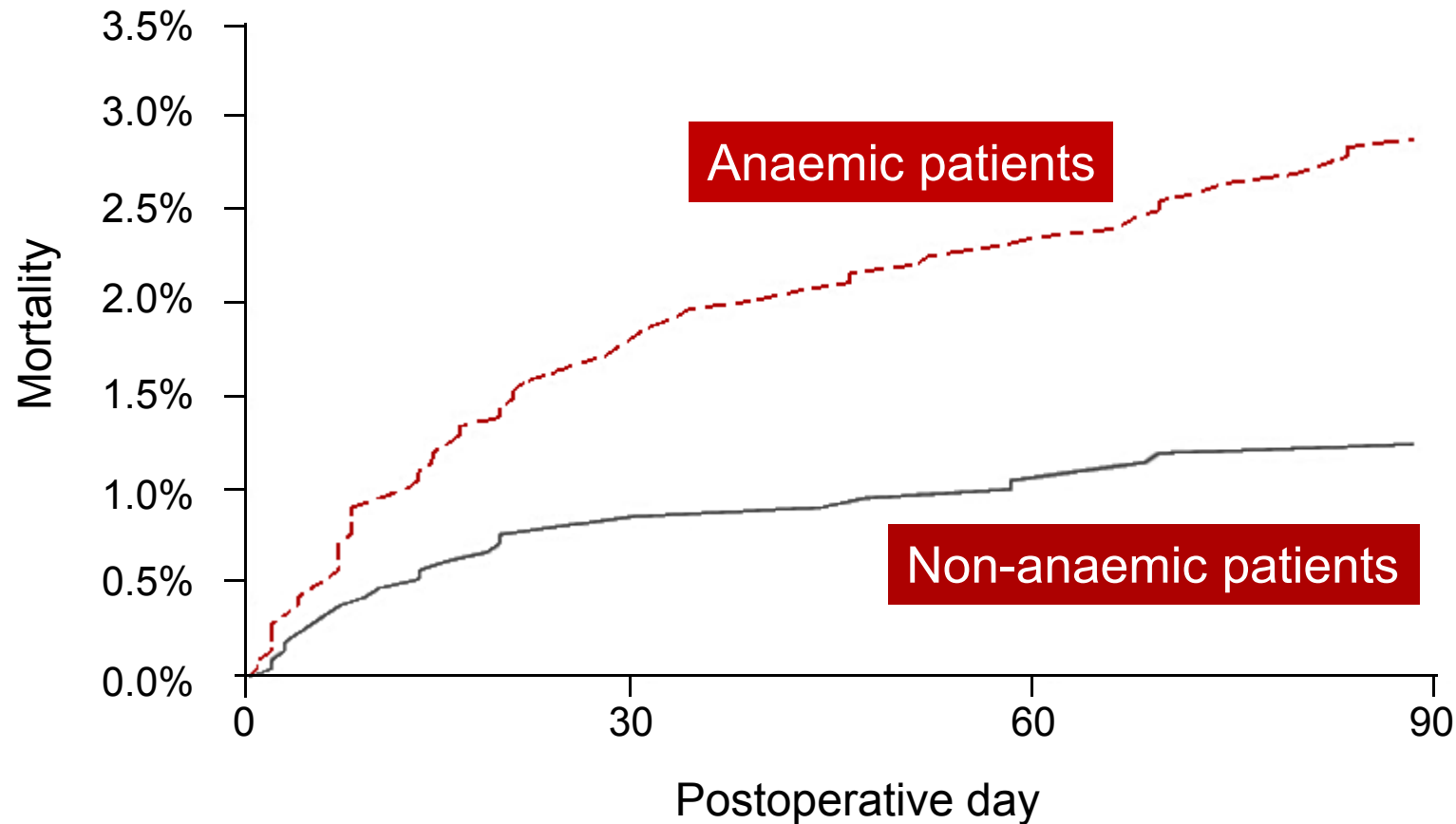
RATIONALE

Preoperative anemia is one of the main risk factors of transfusion in major surgical procedures and one of the few we can modify

Preoperative anemia, even mild degree, is an independent risk factor of morbi-mortality

Preoperative anaemia and postoperative mortality after non-cardiac surgery

In a propensity-matched cohort, anaemia increased mortality (**OR, 2.29**; 95% CI, 1.45–3.63)





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

Summary

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See [Comment](#) page 1362

Department of Internal Medicine (K M Musallam MD, H M Tamim PhD, A Soweid MD, Prof A T Taher MD), Department of Surgery (A Habbal BSN, M Khreiss MD, F S Dahdaleh MD, P M Sfeir MD, Prof J J Hoballah MD, F R Jamali MD), American University of Beirut Medical Center, Beirut, Lebanon; Angelo Bianchi Bonomi Haemophilia and Thrombosis Centre, Fondazione IRCCS Cà Granda, Ospedale Maggiore Policlinico, Milan, Italy (K M Musallam); College of Medicine, King Abdullah International Medical Research Center, King Saud bin Abdulaziz University for Health Sciences

Background Preoperative anaemia is associated with adverse outcomes after cardiac surgery but outcomes after non-cardiac surgery are not well established. We aimed to assess the effect of preoperative anaemia on 30-day postoperative morbidity and mortality in patients undergoing major non-cardiac surgery.

Methods We analysed data for patients undergoing major non-cardiac surgery in 2008 from The American College of Surgeons' National Surgical Quality Improvement Program database (a prospective validated outcomes registry from 211 hospitals worldwide in 2008). We obtained anonymised data for 30-day mortality and morbidity (cardiac, respiratory, CNS, urinary tract, wound, sepsis, and venous thromboembolism outcomes), demographics, and preoperative and perioperative risk factors. We used multivariate logistic regression to assess the adjusted and modified (nine predefined risk factor subgroups) effect of anaemia, which was defined as mild (haematocrit concentration >29 – $<39\%$ in men and >29 – $<36\%$ in women) or moderate-to-severe ($\leq 29\%$ in men and women) on postoperative outcomes.

Findings We obtained data for 227 425 patients, of whom 69 229 (30·44%) had preoperative anaemia. After adjustment, postoperative mortality at 30 days was higher in patients with anaemia than in those without anaemia (odds ratio [OR] 1·42, 95% CI 1·31–1·54); this difference was consistent in mild anaemia (1·41, 1·30–1·53) and moderate-to-severe anaemia (1·44, 1·29–1·60). Composite postoperative morbidity at 30 days was also higher in patients with anaemia than in those without anaemia (adjusted OR 1·35, 1·30–1·40), again consistent in patients with mild anaemia (1·31, 1·26–1·36) and moderate-to-severe anaemia (1·56, 1·47–1·66). When compared with patients without anaemia or a defined risk factor, patients with anaemia and most risk factors had a higher adjusted OR for 30-day mortality and morbidity than did patients with either anaemia or the risk factor alone.

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

Prevalence of preoperative anaemia in large observational studies

Type of surgery	Anaemia prevalence (%)
Non-cardiac surgery (mixed)¹⁻³	30–42
Orthopaedic surgery ⁴⁻⁶	10–19
Colorectal surgery ⁷	47.4
Vascular surgery ⁸	47.9
Cardiac surgery ⁹⁻¹³	25–32

1. Wu WC et al. *JAMA* 2007;297:2481-8; 2. Beattie WS et al. *Anesthesiology* 2009;110:574-81; 3. Musallam KM et al. *Lancet* 2011;378:1396-407; 4. Saleh E et al. *Br J Anaesth* 2007;99:801-8; 5. Bisbe E et al. *Transfus Alternat Transfus Med* 2008;10:166-73; 6. Jans Ø et al. *Transfusion* 2014;54:717-26; 7. Leichtle SW et al. *J Am Coll Surg* 2011;212:187-94; 8. Gupta PK et al. *Ann Surg* 2013;258:1096-102; 9. Kulier A et al. *Circulation* 2007;116:471-9; 10. Karkouti K et al. *Circulation* 2008;117:478-84; 11. De Santo L et al. *J Thorac Cardiovasc Surg* 2009;138:965-70; 12. David O et al. *Anaesth Intensive Care* 2013;41:316-21; 13. Elmistekawy E et al. *Eur J Cardiothorac Surg* 2013;44:1051-5

Pharmacological management of perioperative anaemia: our experience with intravenous iron in orthopaedic surgery

Manuel Muñoz,¹ José Antonio García-Erce,² Jorge Cuenca³ & Elvira Bisbe⁴

Mar – Esperanza in 2005. CRP, C-reactive protein; MCH, mean corpuscular haemoglobin. * $P < 0.05$ (Data taken from reference [3])

	Anaemic <i>n</i> = 62	Non-anaemic <i>n</i> = 282
Haemoglobin(g/dl)	11,5	14,0*
Ferritin < 30 ng/ml (%)	35,5	17,7*
Vitamin B12 < 270 pg/ml (%)	24,2	21,2
Folate < 3 ng/ml (%)	14,5	7,1
CRP > 1 g/dl (%)	40,7	18,5
Reticulocyte count < $25 \times 10^3/\mu\text{l}$ (%)	25,8	15,2*
MCH < 27 pg (%)	16,9	5*

Types of anaemia in patients scheduled for elective major orthopaedic surgery

Type of anaemia	Proportion (%)
Haematinic deficiencies	30.7
Iron deficiency only	16.9
Folate deficiency only	1.5
Vitamin B ₁₂ deficiency only	6.1
Iron plus folate and/or B ₁₂ deficiency	4.6
ACD without haematinic deficiency	30.7
Renal failure only	3.1
ACD only	18.4
ACD and renal failure	9.3
ACD with haematinic deficiency	13.8
ACD plus folate and/or B ₁₂ deficiency	10.7
Renal failure plus folate and/or B ₁₂ deficiency	3.1
Unexplained anaemia	24.6

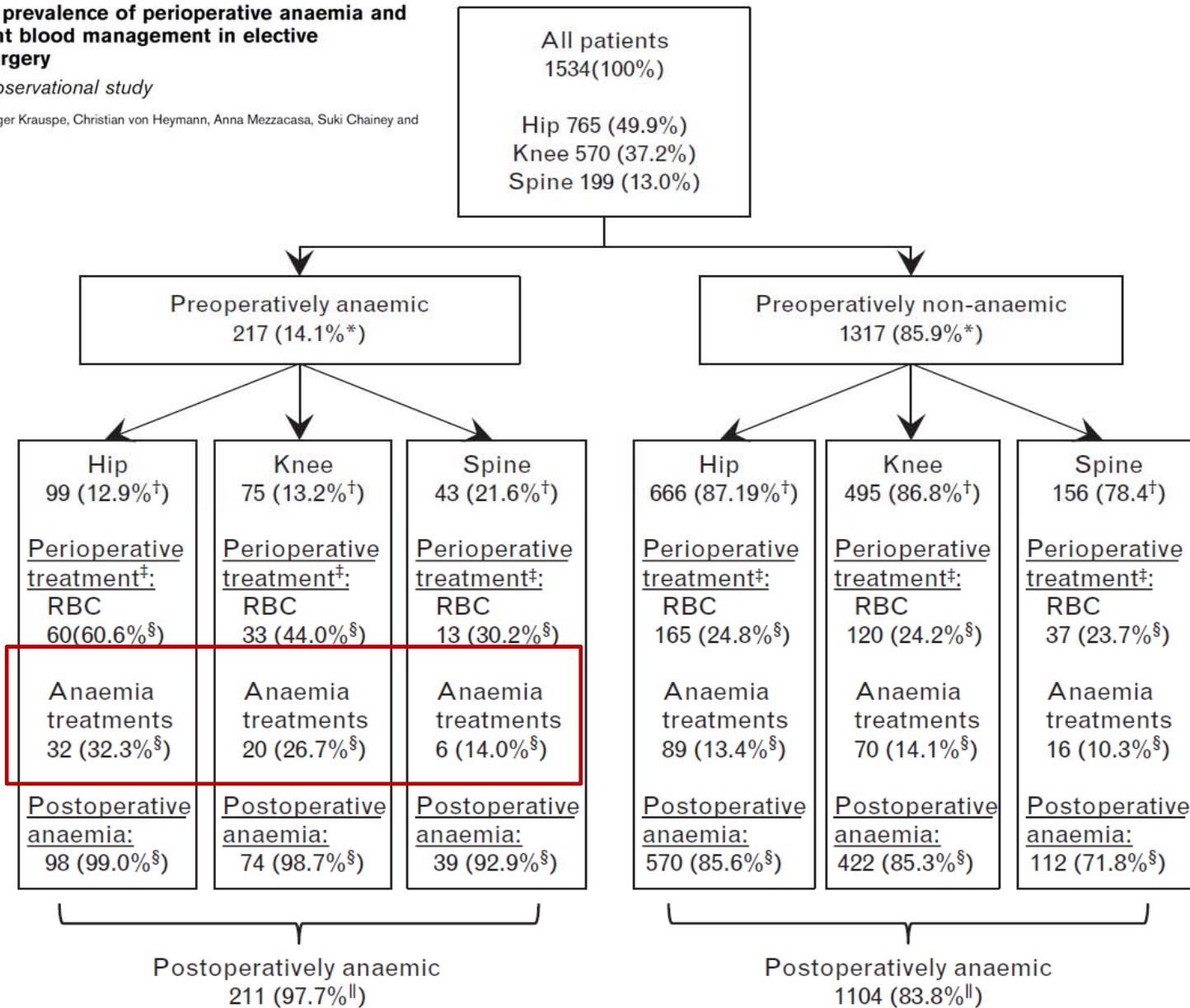
ACD, anaemia of chronic disease

ORIGINAL ARTICLE

PREPARE: the prevalence of perioperative anaemia and need for patient blood management in elective orthopaedic surgery

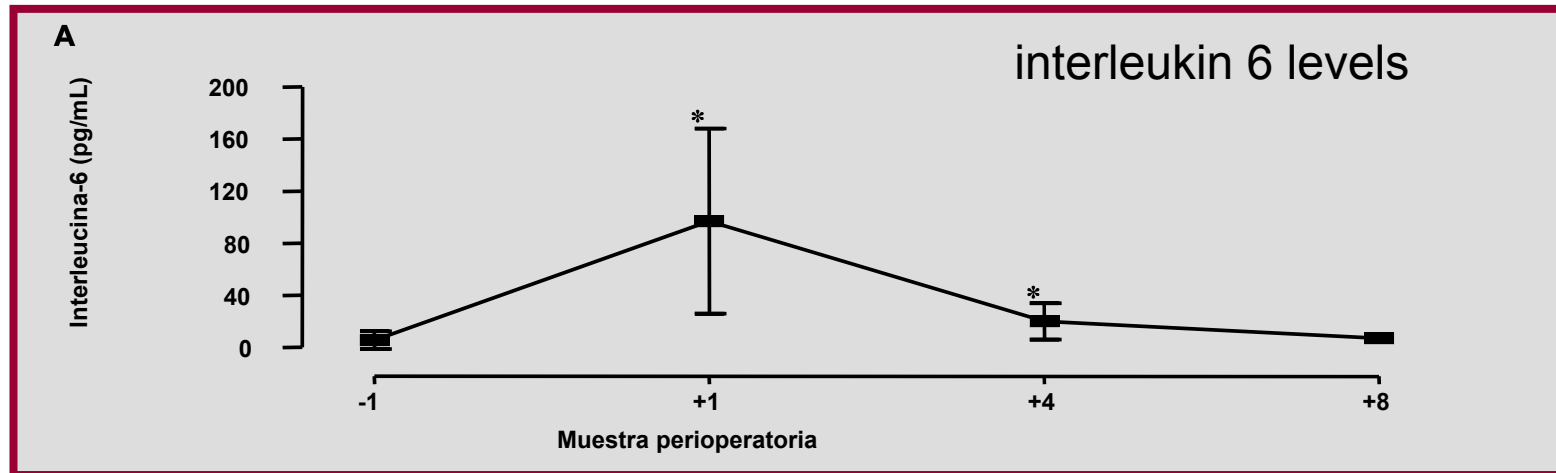
A multicentre, observational study

Sigismond Lasocki, Rüdiger Krauspe, Christian von Heymann, Anna Mezzacasa, Suki Chainey and Donat R. Spahn



Causes of postoperative anaemia in major surgery

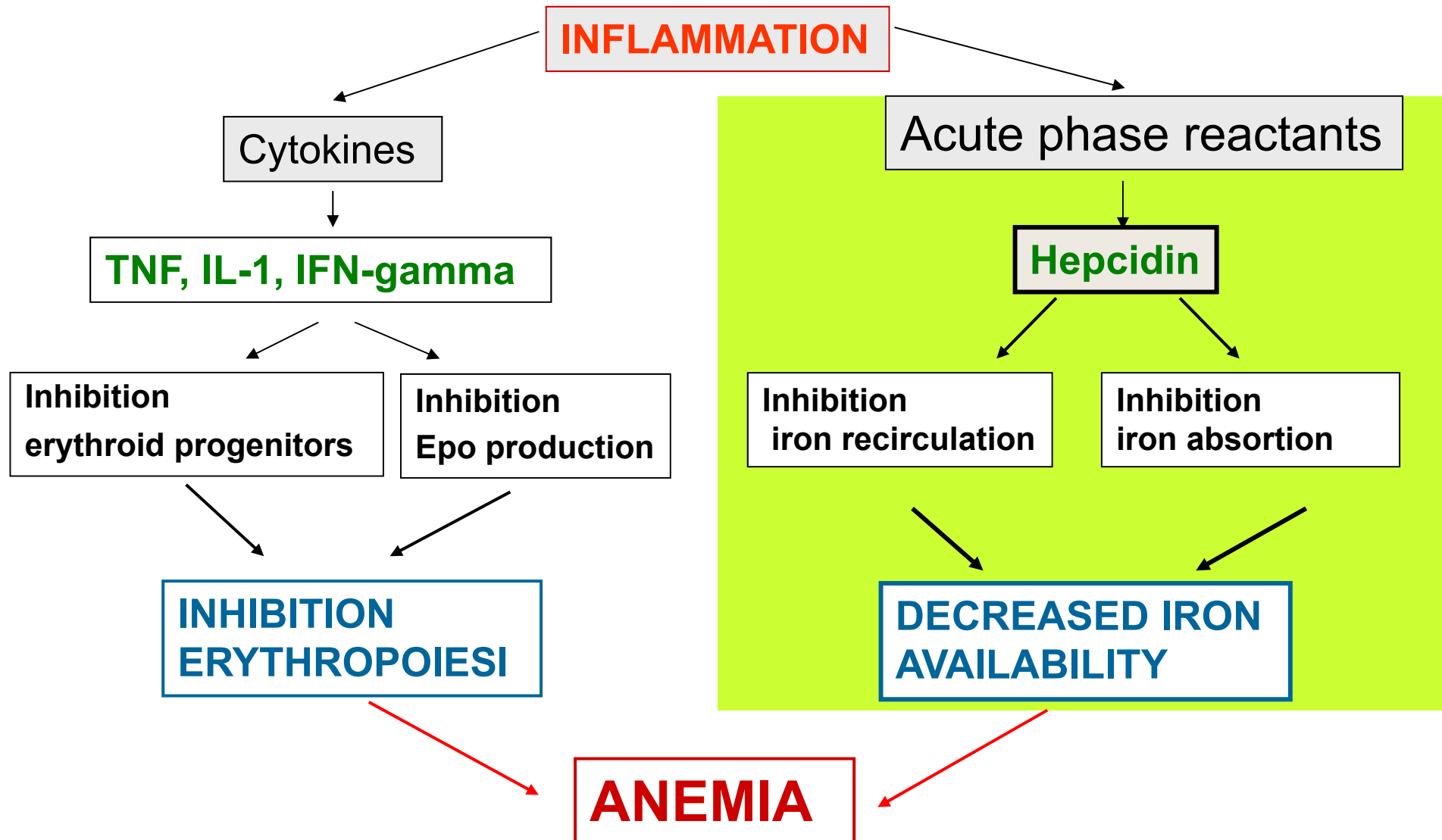
- **Perioperative blood loss**
- **Blunted post-operative erythropoiesis** (surgery induced inflammation)
- Preoperative anemia



POSTOPERATIVE IRON METABOLISM ORTHOPEDIC MAJOR SURGERY (n=83)

	day -1	day +1	day +4	day +8
Serum Iron (mg/dL)	74 51	32 15	39 12	61 16
Transferrin (mg/ dL)	255 33	194 50	181 40	214 48
Transferrin saturation	21 16	12 2	15 5	21 8
Ferritin (ng/mL)	95 72	181 154	210 164	300 196
Transf. receptor (mg/dl)	1.99 0.87	1.70 1.2	1.76 1.18	1.47 0.82
Reticulocits (%)	1.85 1.11	1.68 1.0	1.85 0.76	3.16 1.34

INFLAMMATORY ANEMIA. Pathophysiology



Detection, evaluation, and management of preoperative anaemia in the elective orthopaedic surgical patient: NATA guidelines

L. T. Goodnough^{1*}, A. Maniatis², P. Earnshaw³, G. Benoni⁴, P. Beris⁵, E. Bisbe⁶, D. A. Fergusson⁷, H. Gombotz⁸, O. Habler⁹, T. G. Monk¹⁰, Y. Ozier¹¹, R. Slappendel¹² and M. Szpalski¹³

Recommendation 1:

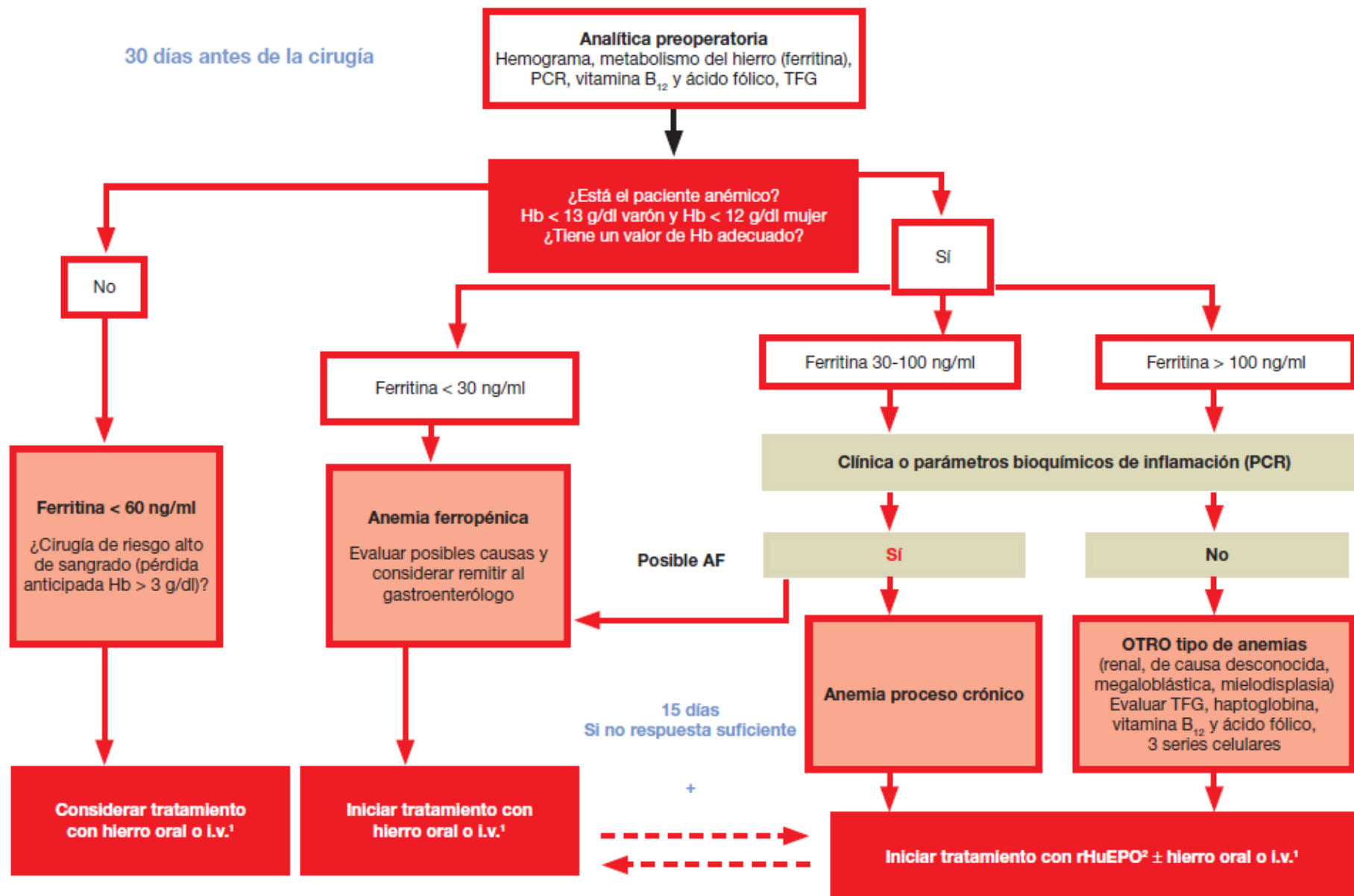
We recommend that elective surgical patients have an Hb level determination as close to 28 days before the scheduled surgical procedure as possible (Grade **1C**).

Recommendation 2:

We suggest that the patient's target Hb before elective surgery be within the normal range (female > 12 g/dL, male > 13 g/dL), according to WHO criteria (Grade **2C**).

De aplicación en cirugía con riesgo elevado de sangrado/transfusión como cirugía ortopédica mayor, cirugía cardíaca, cirugía oncológica, etc.

30 días antes de la cirugía





We treat anaemia for reducing the **transfusion rate**
and to improve **outcomes**

The preoperative hematinic deficiency has to be treated even if patient is not anemic

- Almost 90% develop postoperative anemia
- Every gram of Hb lost by bleeding requires 150 mg iron
- The surgical inflammation compromises anemia recovery and blocks intestinal iron absorption

Recommendation: to treat iron deficiency, even in non anemic patients and to arrive to surgery with ferritin value over $60 \mu\text{g/L}$ and without vitamin B12 or folic deficiency

Evidence in perioperative anaemia treatment



Special Conference

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Rome, 15th October 2015





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DOCUMENTO DE CONSENSO

2013. Documento Sevilla de Consenso sobre Alternativas a la Transfusión de Sangre Alogénica. Actualización del Documento Sevilla☆☆☆☆

S.R. Leal-Noval^{a,*}, M. Muñoz^a, M. Asuero^b, E. Contreras^c, J.A. García-Erce^c, J.V. Llau^b, V. Moral^b, J.A. Páramo^c, M. Quintana^a, M. Basora^b, F.J. Bautista-Paloma^d, E. Bisbe^b, J.L. Bóveda^a, A. Castillo-Muñoz^d, M.J. Colomina^b, C. Fernández^c, E. Fernández-Mondéjar^a, C. Ferrándiz^a, A. García de Lorenzo^a, C. Gomar^b, A. Gómez-Luque^b, M. Izuel^d, V. Jiménez-Yuste^d, E. López-Briz^d, M.L. López-Fernández^c, J.A. Martín-Conde^d, B. Montoro-Ronsano^d, C. Paniagua^b, J.A. Romero-Garrido^d, J.C. Ruiz^a, R. Salinas-Argente^c, C. Sánchez^b, P. Torradabella^a, V. Arellano^a, A. Candela^d, J.A. Fernández^b, E. Fernández-Hinojosa^a y A. Puppo^{a,1}



Estimulation of erythropoiesis

Iron therapy

Preoperative IV iron

*For anemic patients with absolute or functional iron deficiency awaiting for major elective surgery, we **suggest** the administration of IV iron to improve Hb levels and/or decrease ABT rate.*

2A

- In 2 RCTs and 1 Obs study of women with anemia due to gynecological bleeding, preoperative IV iron administration (600 mg to TID) improved Hb levels and/or reduced ABT rate (**1B**).
- In 1 RCTs in colorectal cancer, IV did not increase Hb levels, but resulted in a trend to lower ABT rate in anemic patients (22% vs. 55%)
- In 2 series of patients undergoing elective orthopedic surgery, preoperative IV iron (900-1000 mg over 3-4 weeks) improved Hb levels.
- No clinically relevant side effect of IV iron was observed.

A multicentre comparative study on the efficacy of intravenous ferric carboxymaltose and iron sucrose for correcting preoperative anaemia in patients undergoing major elective surgery

E. Bisbe, JA García- Erce, A. Díez-Lobo, M Muñoz (www.awge.org)

Prospective, observational and multicentre study

100 patients with **Preoperative ID anaemia**

Scheduled for:

COT, Gynaecological or Colon cancer surgery

RESULTS

PATIENTS CHARACTERISTICS

	FE SACAROSA	FE CARBOXIMALTOSA
Patients (n)	84	76
Gender (F/M)	59/25	66/10
Age (years)	60±14	62 ±14
Weight (Kg)	72±12	71±14
Ferritin (ng/ml)	18±20	21±21
CRP (mg/dl)	1.0 ±1.3	0.8 ±1.4
TID (mg)	1000 ±220	950 ±310

RESULTS

RESPONSE TO PREOPERATIVE IV IRON

	FE SUCROSE	FE CARBOXIMALTOSE
Doses IVI (mg)	1010 ± 440	1120 ± 530
Adherence Ttm (%)	52 (62)	62 (82)*
Sessions (n)	5±2	2 ±1**
basal Hb (g/dl)	10,1±1,3	10,4±1,6
final Hb (g/dl)	12,1±1,4	12,5±1,0*
Δ Hb (g/dl)	2,0 ±1,6	2,1 ±1,4
Response rate n(%)	56 (67)	53 (70)
Anemia correction	50 (59)	55 (72)
Transfusion, n(%)	20 (24)	7 (9) *

	Iron sucrose				Ferric carboxymaltose			
	All	Colon cancer resection	Abdominal hysterectomy	Lower limb arthroplasty	All	Colon cancer resection	Abdominal hysterectomy	Lower limb arthroplasty
Patients (n) [†]	84	30	33	21	76	15	19	42
Gender (female/male)	59/25	8/22	33/0	17/4	66/10	5/10	19/0	37/5
Age (yr)	60 (32–88)	67 (36–83)	45 (32–55)	72 (53–88)	62 (36–87)	65 (36–87)	48 (36–75)	68 (46–82)
Weight (kg)	72 (12)	74 (9)	68 (16)	76 (7)	71 (14)	68 (14)	62 (10)	75 (14)
Ferritin (ng ml ⁻¹)	18 (20)	15 (10)	12 (14)	33 (31)	21 (21)	16 (19)	20 (19)	23 (22)
C-reactive protein (mg dl ⁻¹)	1.0 (1.3)	1.6 (1.2)	0.5 (0.6)	1.5 (1.6)	0.8 (1.4)	1.1 (1.4)	0.3 (0.3)	1.0 (1.7)
Total iron deficiency (mg)	1000 (220)	1025 (240)	1050 (210)	920 (190)	950 (310)	1125 (230)	935 (210)	900 (350)
Total i.v. iron dose (mg)	1010 (440)	1140 (570)	1000 (350)	830 (270)	1120 (530)	1550 (650)*	1030 (330)	1000 (490)
Sessions (n)	5 (2)	6 (3)	5 (2)	4 (4)	2 (1)**	3 (1)**	2 (1)**	2 (1)**
Baseline Hb (g dl ⁻¹)	10.1 (1.3)	10.1 (1.2)	9.7 (1.2)	10.7 (1.1)	10.4 (1.6)	9.2 (1.0)*	10.6 (1.3)	10.9 (1.7)
Final Hb (g dl ⁻¹) [‡]	12.1 (1.4)	11.0 (1.4)	12.7 (0.8)	12.6 (1.0)	12.5 (1.0)*	11.7 (0.8)**	12.4 (1.2)	12.8 (0.9)
Hb increment (g dl ⁻¹) [¶]	2.0 (1.6)	0.9 (1.5)	3.0 (1.2)	1.8 (1.1)	2.1 (1.4)	2.5 (1.3)*	2.3 (1.1)	1.8 (1.4)
Response rate [n (%)] [§]	56 (67)	10 (33)	32 (97)	14 (67)	53 (70)	11 (73)*	13 (68)*	29 (69)
Anaemia correction [n (%)]	50 (59)	6 (20)	29 (88)	15 (71)	55 (72)	5 (33)	13 (68)	37 (88)
Allogeneic transfusion [n (%)]	20 (24)	12 (40)	2 (6)	6 (29)	7 (9)*	1 (7)*	0 (0)	6 (14)
Adverse events [n (%)]	6 (7)	0 (0)	5 (15)	1 (5)	4 (5)	1 (7)	1 (5)	3 (7)
Iron treatment costs (€)								
Acquisition costs	117 (51)				224 (106)			
Administration costs	190 (83)				21 (10)			
Total costs	307 (133)				244 (134)			

CONCLUSIONS OF THE STUDY

- **FCM** was effective for correcting iron deficiency anemia
- The average **increase of Hb** was **2 p in 21-30 days**
- The response to treatment was similar to **IS**, except in cancer
- **FCM** treatment was **more comfortable** for the patients because fewer sessions were required
- FCM seems to be as safe as iron sucrose
- Despite the cost of iron is higher, appears that FCM may offers a significant **cost savings and time benefits**



Stimulation of erythropoiesis

Iron therapy

Perioperative IV iron

For major surgical patients at risk of developing severe postoperative anemia, we suggest IV iron administration during the perioperative period.

2B

Very-short-term perioperative intravenous iron administration and postoperative outcome in major orthopedic surgery: a pooled analysis of observational data from 2547 patients

Manuel Muñoz, Susana Gómez-Ramírez, Jorge Cuenca, José Antonio García-Erce, Daniel Iglesias-Aparicio, Sami Haman-Alcober, Daniel Ariza, and Enrique Naveira

Type: Retrospective observational study of pooled clinical and analyses data (2002-2011)

Population: THR and TKR (N=2547).

Comparing: Intravenous Iron \pm EPO vs control (historical group without iron)

Exclusion criteria: preoperative Hb < 10g/dl

Iron Doses : 100-200 IS POD preop doses, +1,+2+3

FCM 600 mg POD 1

Very-short-term perioperative intravenous iron administration and postoperative outcome in major orthopedic surgery: a pooled analysis of observational data from 2547 patients

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TABLE 4. Demographic and clinical data of patients undergoing elective surgery for THR or TKR

Parameter	All patients		THR		TKR	
	Control	Iron ± rHuEPO	Control	Iron ± rHuEPO	Control	Iron ± rHuEPO
Patients	648	538	360	132	288	406
Age (years)	68 ± 10	70 ± 8*	66 ± 12	67 ± 10	71 ± 6	70 ± 7
Sex (male/female)	253/395	185/354	177/183	55/77	76/212	130/276
ASA II/III (n, %)	630 (97.2)	511 (94.8)	339 (94.2)	132 (100)*	288 (100)	398 (98.0)*
Treatment, n (%)						
IV iron	0	477	0	132	0	345
IV iron + rHuEPO	0	61	0	0	0	61
Hb (g/dL)						
Preoperative	13.7 ± 1.3	13.8 ± 1.3	13.7 ± 1.4	13.7 ± 1.3	13.7 ± 1.1	13.8 ± 1.3
POD 1	9.7 ± 1.8	10.7 ± 1.4*	9.5 ± 1.4	10.9 ± 1.5*	10.0 ± 2.2	10.6 ± 1.3*
POD 7	10.1 ± 1.1	10.3 ± 1.3	10.1 ± 1.1	10.7 ± 1.2*	10.3 ± 0.9	10.1 ± 1.3
Patients transfused, n (%)	196 (30.2)	48 (8.9)*	124 (34.4)	22 (16.7)*	69 (24.0)	25 (6.2)*
Transfusion index (U/patient)	0.7 ± 1.2	0.2 ± 0.6*	0.8 ± 1.2	0.3 ± 0.7*	0.5 ± 1.0	0.1 ± 0.5*
Postoperative infection, n (%)	24 (3.7)	15 (2.8)	16 (4.4)	5 (3.8)	8 (2.8)	10 (2.5)
UTI	11	12	8	4	3	8
RTI	2	1	1	0	1	1
SWI	7	1	3	1	4	0†
Other	4	1	4	0	0	1
LHS (days)	10.7 ± 5.3	8.4 ± 2.9†	8.9 ± 5.4	8.1 ± 2.4	13.0 ± 4.0	8.5 ± 3.0*

* p < 0.01, control versus treatment.

† p < 0.05, control versus treatment.

Iron ± rHuEPO = 300 to 600 mg iron sucrose or ferric carboxymaltose IV with or without 40,000 IU rHuEPO sc; POD = postoperative day.

Randomized trial comparing ferric carboxymaltose vs oral ferrous glycine sulphate for postoperative anaemia after total knee arthroplasty

E. Bisbe^{1,3*}, L. Moltó¹, R. Arroyo¹, J. M. Muniesa² and M. Tejero²

Nº Eudra:2010-023038-22

METHODS

Prospective, single-blinded, randomised controlled trial

N= 120 TKA patients

Randomized in 2 groups (**Hb<12 g/dl**):

- **group FCM** (IV dose the day after surgery)
- **group FS** (oral iron sulphate at discharge)

PBM program

Follow up: until 30 days postop

Randomized trial comparing ferric carboxymaltose vs oral ferrous glycine sulphate for postoperative anaemia after total knee arthroplasty

E. Bisbe^{1,3*}, L. Moltó¹, R. Arroyo¹, J. M. Muniesa² and M. Tejero²

Nº Eudra:2010-023038-22

PRIMARY ENDPOINTS

Δ Hb level from postoperative day 4 to day 30

% patients without anaemia (Hb >12 g/dL) at day 30

SECONDARY ENDPOINTS

Changes in quality of life (EQ-5D and Barthel questionnaires) from before surgery to the end of the study period (Day 30),

Distance in the 6 minute walking test (6MWT),

Percentage of transfused patients

Adverse events (AEs).

FEV-POST. RESULTS

	FCM (n= 60)	FE ORAL (n=62)
Hb 24h (g/dl)	10.5 ±1.0	10.5 ±1.0
Hb 4 d (g/dl)	9.7±1.3	9.7 ±1.0
Hb 30d (g/dl)	11.5±1.2	11.0 ±1.1
Increase Hb	1.7 ±1.2	1.3 ±1.0
Responders n(%)	20 (40)	13 (27.7)
Anemia corrected	22 (42.3)	12 (23.5)*
TSAT >20 n (%)	28 (87.5)	13 (35.1)**
Platelets	321 ±100	384±189 **
Length stay (d)	7.9 ±1.7	7.6 ±0.9
Transfusion n(%)	3 (5)	4 (6.4)

*p<0.05 ** p<0.001

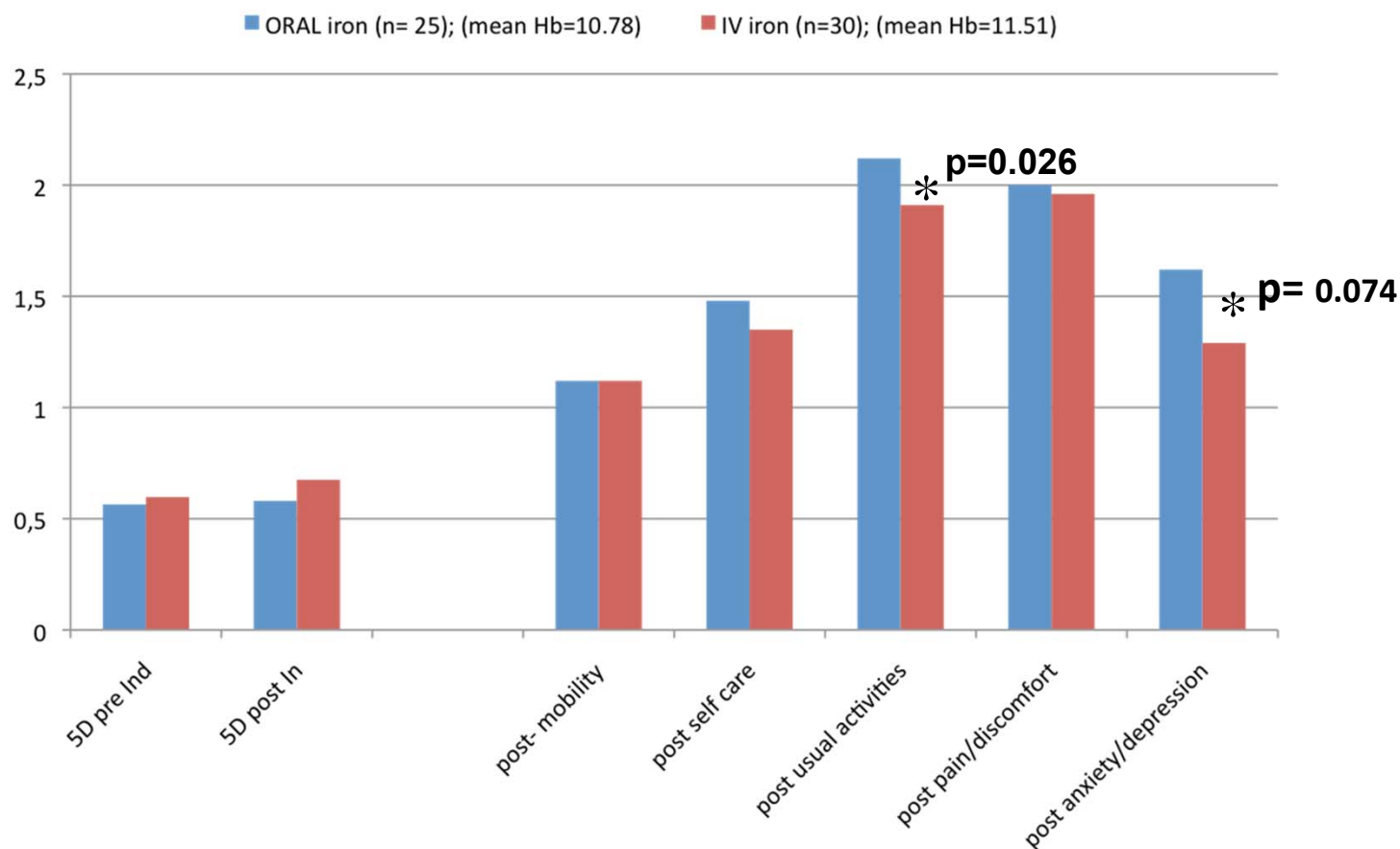
FEV-POST. RESULTS

$$\Delta \text{Hb (g/dl)} = \text{Hb} + 4\text{d} - \text{Hb} + 30\text{d}$$

Population	FCM	OI	P
Hb <10 g/dl	2.4±0.3	1.1±0.4	0.018
Ferritin< 100ng/dl	1.9±0.3	1.2±0.2	0.03
Hb<10+ ferritin<100	2.7±1	1.2 ±1.2	0.005

Bisbe et al. Br J Anaesth. 2014; 113: 402-9.

FEV-POST. EuroQol EQ-5D



Bisbe et al. Br J Anaesth. 2014; 113: 402-9

Intravenous iron isomaltoside 1000 (Monofer[®]) reduces postoperative anaemia in preoperatively non-anaemic patients undergoing elective or subacute coronary artery bypass graft, valve replacement or a combination thereof: a randomized double-blind placebo-controlled clinical trial (the PROTECT trial)

N=60 CABG

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Conclusion A single perioperative 1000 mg dose of intravenous iron isomaltoside 1000 significantly increased the haemoglobin level and prevented anaemia 4 weeks after surgery, with a short-term safety profile similar to placebo. Future

The safety of intravenous iron preparations: systematic review and meta-analysis.

Avni T and col. Mayo Clin Proc 2015;90(1):12-23.

103 randomized clinical trial between 1965-2013

10.390 IVI vs 4044 OI, 1329 no iron, 3335 placebo, 155 IMI

RESULTS

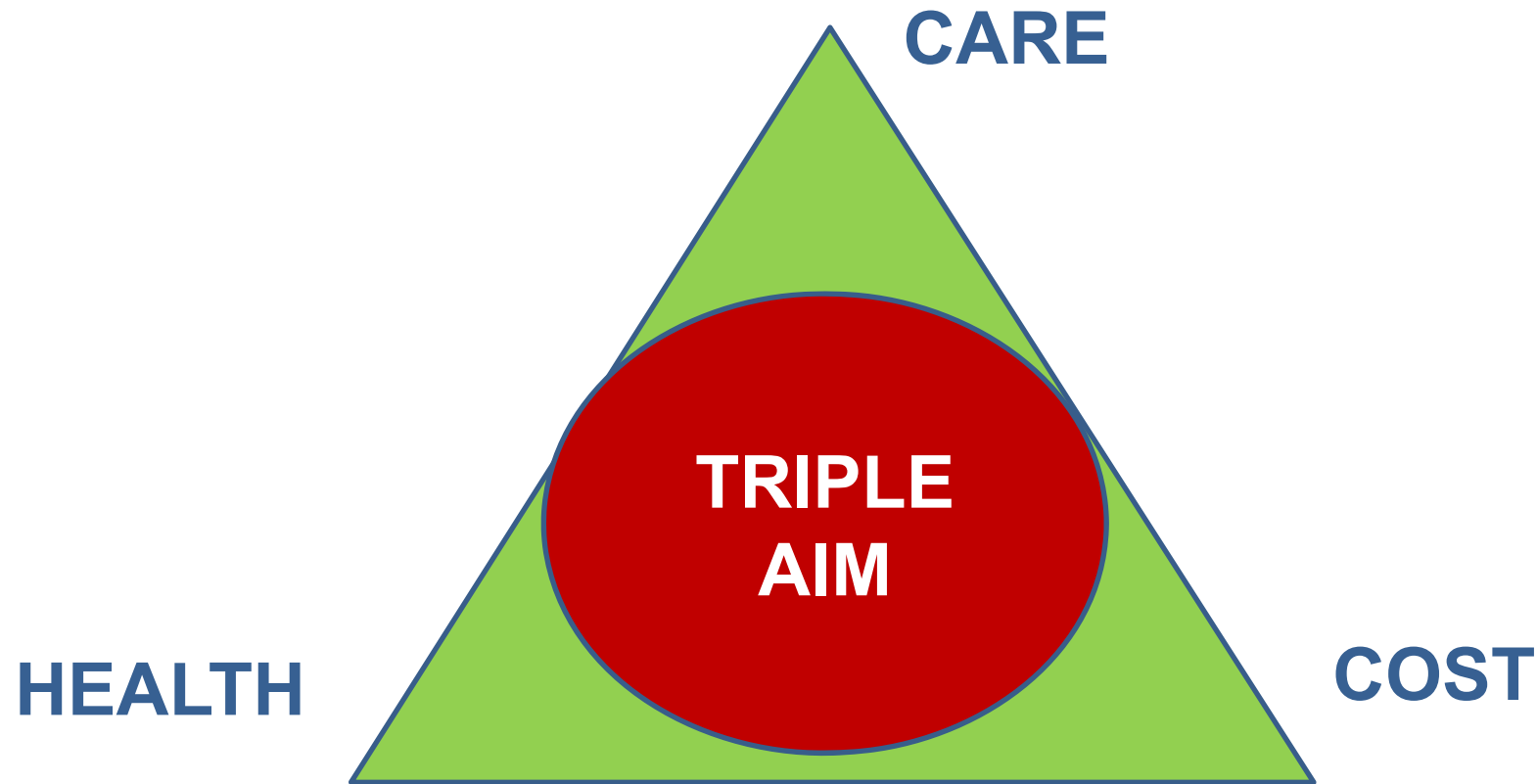
- No increased risk of SAEs with IV iron (RR:1.04; 95%CI,0.93-1.17)
- Subgroup analysis revealed a decreased rate of SAEs when IV iron was used to treat heart failure (RR:0.45; 95% CI,0.29-0.70)
- Severe infusion reactions were more common with IV iron
- There was **no increased risk of infections** with IV iron.
- Gastrointestinal AEs were reduced with IV iron.



Conclusions

- Prevalence of pre and postoperative anaemia is high
- Treatment of preoperative anemia decreases the need for transfusion and may improve outcomes
- The iron formulations allowing for the administration of large dose in a single session, are more comfortable and cost-effective.
- Patients undergoing major elective surgery at risk of receiving ABT should have an Hb level and Iron status 30 days before surgery and **should arrive at the surgery without anemia** .
- Well-designed RCTs enrolling patients with perioperative anemia focusing on the need of RBCT and outcomes, are warranted.

“Patient Blood management” paradigm



SOCIAL BENEFIT

Preserves blood for those patients who we can't avoid ABT



SAVE BLOOD, SAVE LIVES

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