ANEMO

ANEMO
CENTRO-SUD
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SIdEM

ROMA
22-23
SETTEMBRE
2011

Presidente: *Luca Pierelli*

Eritropoietina, ferro, predeposito: i mezzi ci sono

G. Inghilleri

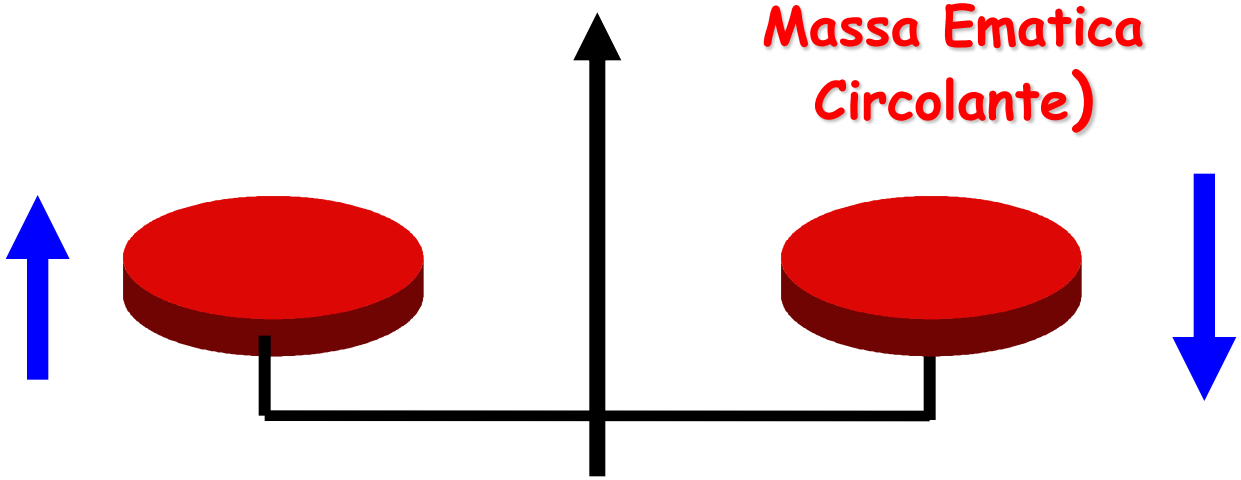
A.O. Fatebenefratelli e Oftalmico
Milano

Fabbisogno trasfusionale

Perdite ematiche perioperatorie

Perdita ematica tollerata

(Condizioni cliniche + Massa Ematica Circolante)



Incremento perdita tollerata

Espansione massa RBC circolante

- Correzione anemia preoperatoria (Ferro)
- Predeposito
- rHuEPO

Terapia marziale

Campi di impiego

- Correzione degli stati anemici;
- Somministrazione perioperatoria per accelerare il recupero dall'anemia indotta dall'intervento
- Terapia di supporto in corso di predeposito e terapia con EPO

Terapia marziale

10-20% dei pazienti candidati ad interventi di chirurgia maggiore presentano conclamata o borderline

Carenza marziale

Tutti i pazienti candidati ad intervento chirurgico per i quali sia prevedibile supporto trasfusionale e che presentano valori di Hb/Hct bassi o borderline devono essere valutati per definire la possibilità di correggere l'"anemia" con appropriata terapia.

Terapia marziale

Diagnosi di anemia sideropenica

Generalmente abbastanza semplice essendo facilmente identificabile mediante il riscontro di:

- **ridotto volume globulare (<80-84 fl)**
- **ferritinemia inferiori a 30 ng/mL,**
- **sideremia inferiori a 40-60 µg/dL**
- **saturazione della transferrina < 15-20%**

Killip S et al. Iron deficiency anemia. Am Fam Physician ,2007;75:671-8

Vari autori raccomandano di inserire la determinazione di almeno una proteina della fase acuta (PCR)

Carenza Marziale

Potential role of MCV as a screening marker to detect iron deficient conditions in blood donors and surgical patients (evaluated donors n° = 2301)

	MCV value		
	< 80	< 84	<86
N° of cases	63 (2,7%)	227 (9.8%)	467 (20%)
Mean Ferritin value	32±47	48±60	62±77
Median ferritin val.	13	24	37
N° of cases with Ferritin <30 µg/mL	50 (79%)	132 (58%)	211 (45%)

Data from Niguarda Hospital and "AVIS Comunale Milano", unpublished

Best Practice & Research Clinical Haematology
Vol. 18, No. 2, pp. 319–332, 2005
doi:10.1016/j.beha.2004.08.022
available online at http://www.sciencedirect.com

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Diagnosis and management of iron-deficiency anaemia

James D. Cook* MD, MSc (Med)

TREATMENT OF IRON DEFICIENCY

Oral iron therapy

Oral iron has been used to treat iron deficiency for centuries and should always be given preference over parenteral iron as the initial approach to treatment. The major difficulty with oral iron is the nausea and epigastric discomfort that occurs within an hour or two of ingestion. These symptoms vary in proportion to the concentration of ionizable iron in the upper gastrointestinal tract and can be reduced by taking the iron with food, the typical recommendation of pharmacists. Nevertheless, I prefer to prescribe a smaller dose of iron between meals and at bedtime as the initial approach because food reduces absorption of medicinal iron by about two thirds. If troublesome gastrointestinal side-effects persist after 2–3 days, I resort to administration with food and accept the resulting decrease in bioavailability. Many patients also complain of either constipation or diarrhoea, but these lower gastrointestinal side-effects are not

Diagnosis and management of iron-deficiency anaemia

Best Practice & Reserch Clinical Haematology 2005;18: 319-332

James D. Cook* MD, MSc (Med)

Table 2. Indications for parenteral iron therapy.

A. High iron requirements:
–gastrointestinal bleeding
–menorrhagia
–chronic haemodialysis
B. Iron malabsorption
–gastric resection, plication, or bypass
–atrophic gastritis
–coeliac disease
C. Failure of oral therapy
–gastrointestinal side-effects
–poor adherence

Treatment of iron deficiency

Chertow GM, et al.
Update on adverse drug events associated with parenteral iron.
Nephrol Dial Transplant (2006) 21: 378–382

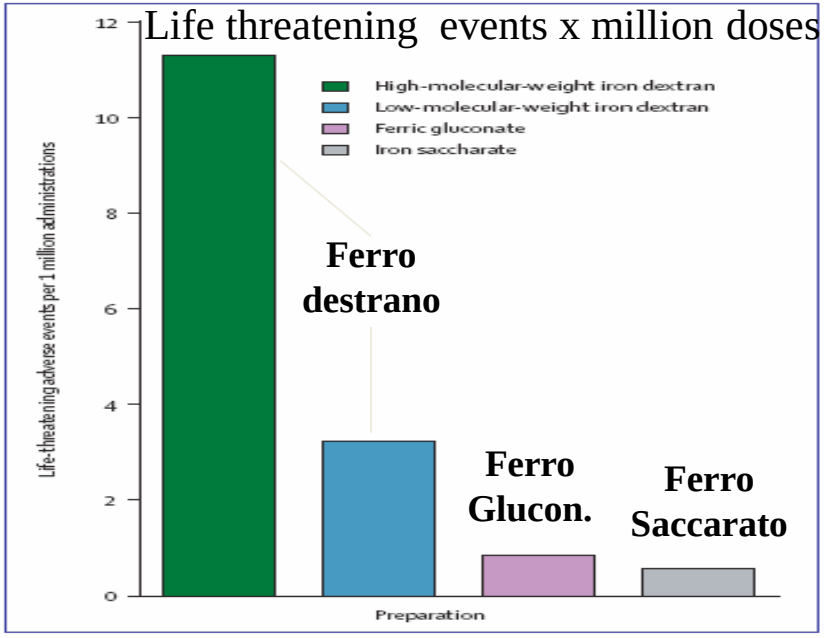

Figure: Relative rates of reported serious adverse events with the four different parenteral iron preparations[35]
From FDA Medwatch reports 2001–03, Chertow et al[15,16] reported that high-molecular-weight iron dextran was associated with 3-2-fold increase in odds

Table 1. Major ADEs by parenteral iron formulation 2001 through 2003

ADE	Ferrlecit® ($n = 11\,973\,800$)	Dexferrum® ($n = 2\,563\,000$)	InFed® ($n = 6\,690\,000$)	Venofer® ($n = 8\,837\,00$
Death	3	2	5	1
Cardiac arrest	3	8	5	0
Coma	1	13	6	4
Anaphylactoid reaction	4	6	6	0
Dyspnea[a]	9	44	28	10
Allergic reaction[b]	23	22	25	18
Abdominal pain	10	2	3	5
Back pain	7	28	8	4
Chest pain	8	32	16	9
Hypotension	20	26	12	12
Nausea	11	8	10	10
Vomiting	13	6	7	3
Sweating	4	15	4	3
Total	232	331	269	175
Life-threatening	11	29	22	5

[a]includes respiratory depression and bronchospasm.

Correzione della carenza marziale in chirurgia

Esperienza Gaetano Pini

Resultati ottenuti in pazienti sideropenici con basso Hct basale

Pts valutati	1186
Pts trattati con Fe IV	52 (4.4%)
Età (anni)	44±15
Feritina Basale	24.2±17
Sideremia	62.4±24
MCV	82±8.5
Hct basale	36.2±2
Fe somministrato (mg)	898±428
Hct dopo terapia marziale	38.9±2.7
Produzione di RBC (mL)	157±87

Mercuriali F et al. Role of presurgery haematological patient's evaluation in transfusion practice. Haematologica 1999, 84 : 218

TRANSFUSION Volume 44, October 2004

Patients with pertrochanteric hip fracture may benefit from preoperative intravenous iron therapy: a pilot study

Jorge Cuenca, José A. García-Erce, Manuel Muñoz, Mónica Izuel, Angel A. Martínez, and Antorio Herrera

MATERIALS AND METHODS

Patients and treatment

Patients undergoing surgery for PHF repair between October 2002 and March 2003 (Group 2; n = 55) received 100 mg of IV iron sucrose (Venofer, Vifor, Saint Galene, Switzerland) at admission and before surgery and an additional 100-mg dose between admission and surgery if the Hb level was less than 12 g per dL. A previous series of PHF patients, operated on between January 2000 and December 2001 and who had not received IV iron, served as the control group (Group 1; n = 102).

Patients with pertrochanteric hip fracture may benefit from preoperative intravenous iron therapy: a pilot study

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TABLE 2. Transfusion requirements in patients with PHF, according to the type of fracture and to admission Hb level

	Number (%) of transfused patients*	
	Group 1 (n = 102)	Group 2 (n = 55)
AO classification of PHF		
1 (stable)	17/40 (37.5)	2/6 (33.3)
2-3 (unstable)	42/62 (67.7)	22/49 (44.9)†
Admission Hb level (g/L)		
≤120	31/39 (79.5)	14/17 (82.4)
>120	26/63 (41.3)	10/38 (26.3)†

* Group 1, control; Group 2, iron sucrose 200–300 mg.
† $p < 0.05$.

Role of perioperative iron therapy in surgical patients

Author	Type of surgery	Type of study	Effect of iron
Karkouti K (2006)	Cardiac & Orthopedic	RCT	No effect
Madi-Jebara SN (2004)	Cardiac	RCT	No effect
Garcia –Erce 2005	Orthopedic (THR)	Observational	Beneficial
Hulin S (2005)	Cardiac pediatric	Observational	Beneficial
Bernière J (2004)	Orthopedic Pediatric (Spine)	Observational	Beneficial

British Journal of Anaesthesia **100** (5): 599–604 (2008)
doi:10.1093/bja/aen054 Advance Access publication March 27, 2008

BJA

REVIEW ARTICLE

Perioperative anaemia management: consensus statement on the role of intravenous iron

P. Beris[1]*†, M. Muñoz[2], J. A. García-Erce[3], D. Thomas[4], A. Maniatis[5]† and P. Van der Linden[6]

- Non-anaemic patients with a serum ferritin level <100 ng ml^{-1} (or ferritin 100–300 ng ml^{-1} and transferrin saturation <20%) undergoing surgical procedures with an expected blood loss >1500 ml (haemoglobin drop of 3–5 g dl^{-1}) may benefit from preoperative oral or i.v. iron administration, depending on the presence of co-morbidities and on the timescale before surgery, as they may not have enough stored iron to replenish their perioperative haemoglobin loss and maintain normal iron stores (serum ferritin ≥30 ng ml^{-1}).[3 7 11 40]

Predeposito di sangue autologo

Anni 80-90

La raccolta di sangue autologo nel periodo preoperatorio con successiva conservazione a 4°C è una tecnica semplice e sicura

METODO PIU' OPPORTUNO PER OTTENERE SANGUE AUTOLOGO

2011

????

Transfusion Medicine, 2007, **17**, 354–365

Guidelines for policies on alternatives to allogeneic blood transfusion. 1. Predeposit autologous blood donation and transfusion

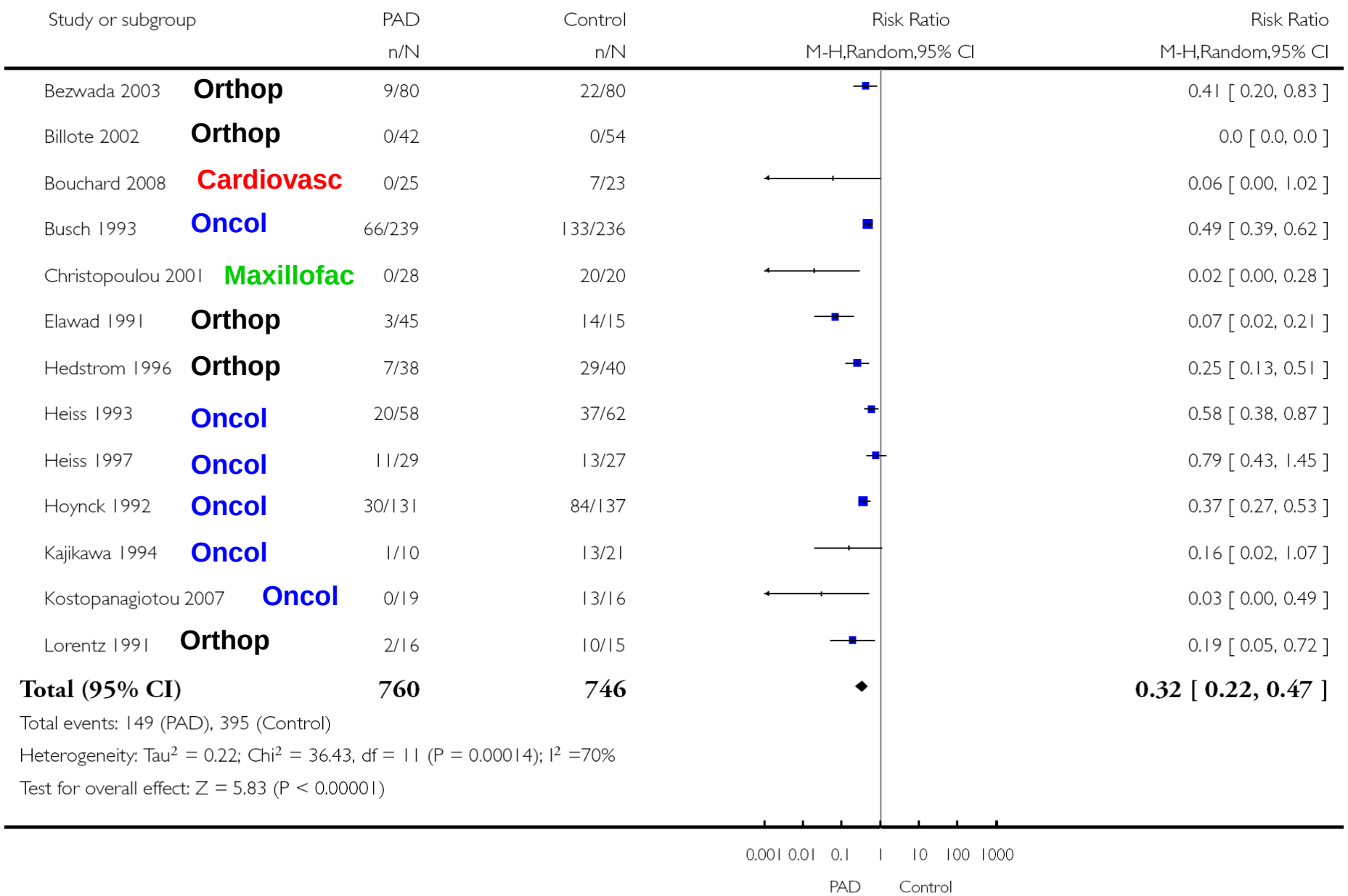
British Committee for Standards in Haematology, Transfusion Task Force

F. E. Boulton* & V. James† **National Blood Service, Southampton, and †National Blood service, Sheffield, UK*

PART 3. BCSH GUIDELINE RECOMMENDATIONS

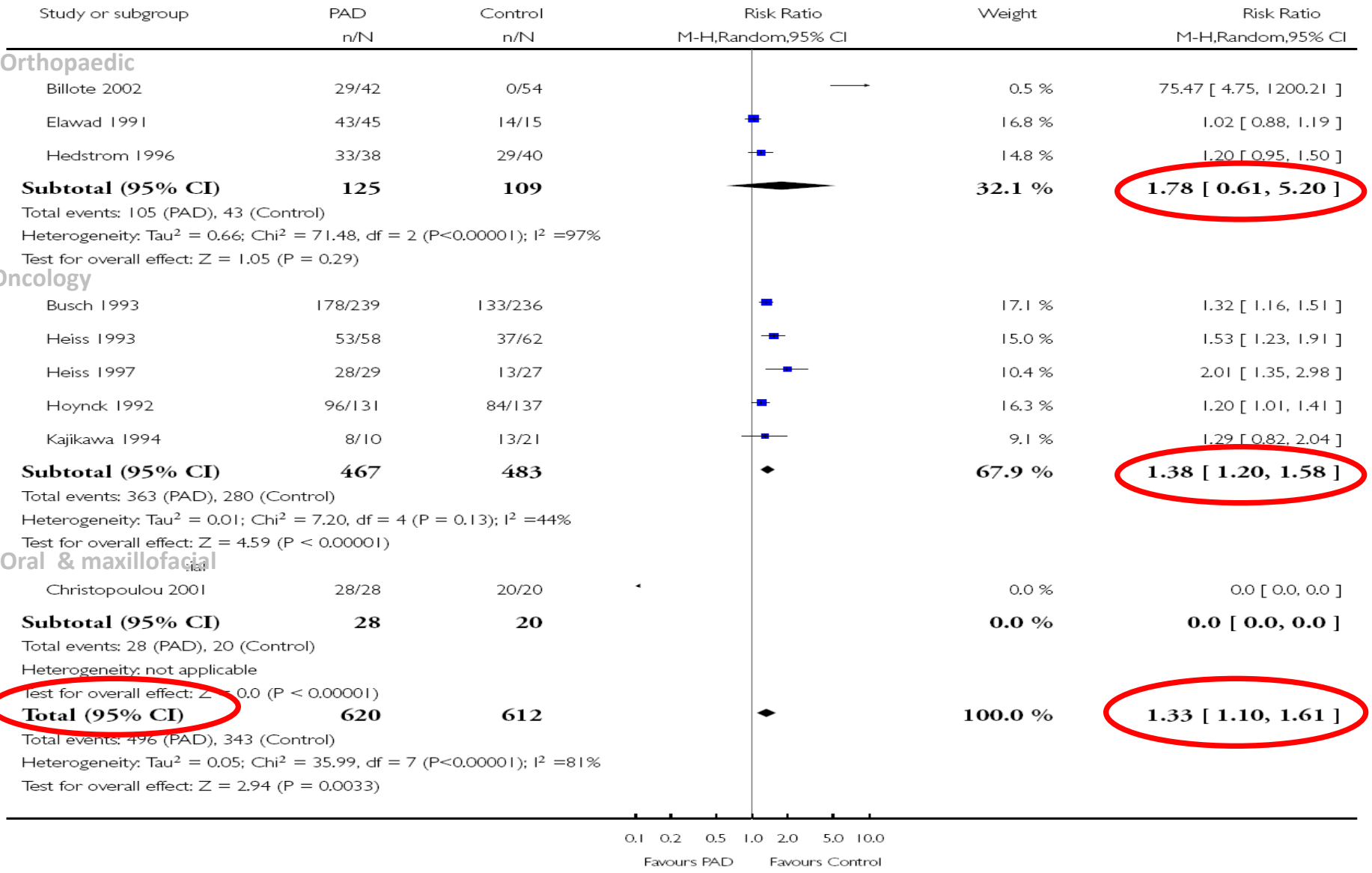
- For each individual case, there should be a clear reason for preferring PAD to allogeneic blood as PAD is not indicated for most patients fulfilling the above criteria. Indeed, the clinical indications for collecting and using PAD are limited: for the majority of patients undergoing elective surgery of a nature likely to require transfusion to treat surgical and postoperative blood loss, allogeneic blood is the preferred option.

Henry DA, Carless PA, Moxey AJ, O'Connell D, Ker K, Fergusson DA. Pre-operative autologous donation for minimising perioperative allogeneic blood transfusion. *Cochrane Database of Systematic Reviews* 2001, Issue 4. Review content assessed as up-to-date: 31 July 2009



Henry DA et al. Pre-operative autologous donation for minimising perioperative allogeneic blood transfusion. *Cochrane Database of Systematic Reviews 2001, Issue 4.*

Exposure to allogeneic + autologous transfusion (PABD vs Control)



Predeposito di sangue autologo

Sicurezza

Il principale limite della tecnica del predeposito di sangue autologo è rappresentato dal fatto che i pazienti ricevono un maggior numero di trasfusioni (unità autologhe + omologhe)

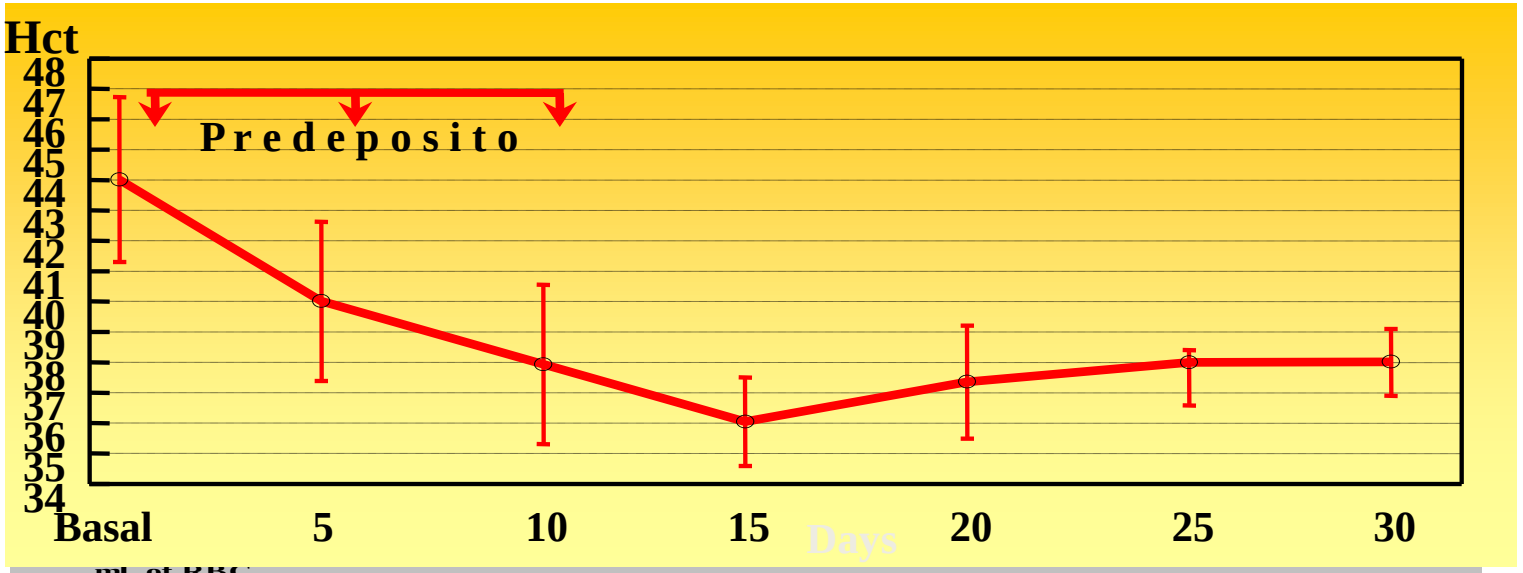
Predeposito di sangue autologo

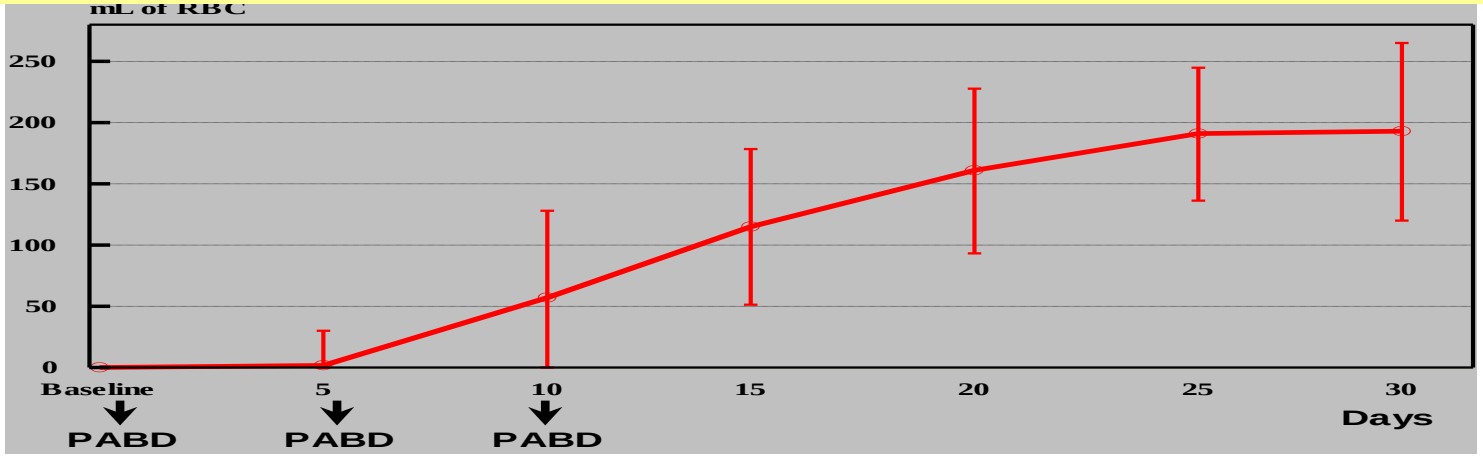
Efficacia e sicurezza

- L'efficacia e la sicurezza della tecnica del predeposito sono strettamente dipendenti dalla capacità della metodica di indurre espansione della massa eritrocitaria.
- L'espansione della massa eritrocitaria indotta dal predeposito dipende dalle modalità di esecuzione del programma di predeposito

Predeposito di sangue autologo

Variazione dei valori di Hct durante il programma di predeposito in 11 donne Prelievo di 3 unità di sangue (350ml) in 10 giorni

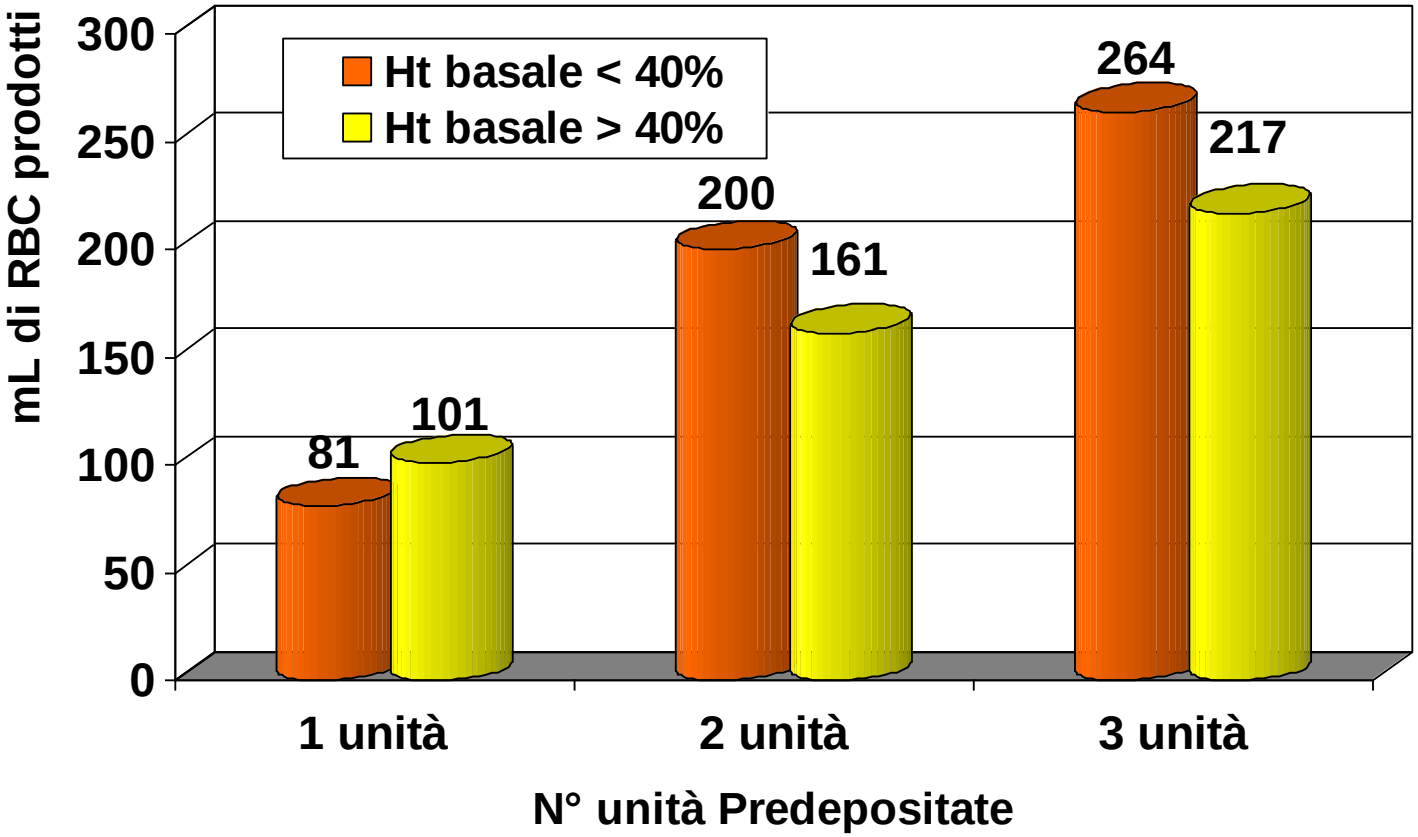




From: Mercuriali F, et al. Curr Med Res Opin 1996; 13: 465-78 (modif.)

Predeposito di sangue autologo

Produzione di eritrociti (in mL) in pazienti inseriti in programma di predeposito suddivisa in base al n° di unità predepositate ed al hct basale



Da: Mercuriali F, Inghilleri G. Efficacy of preoperative autologous blood donation. Minerva Anestesiol 2000; 66 Suppl 1: 24-30 (modif)

Predeposito di sangue autologo

MINERVA ANESTESIOL 2007;73:143-51

Preoperative autologous blood donation - Part I

Only two clinical parameters determine efficacy of the autologous predeposit

G. SINGBARTL

Results. Two parameters were demonstrated of decisive impact to increase in RBC-mass to preopeative autologous blood donation (PABD) (P<0.000): first, time interval between preoperative autologous blood donation and surgery, that correlated positively with efficacy; second, haematocrit-level at predeposit-session that correlated negatively with efficacy. The highest level of RBC-regeneration reached was observed four weeks after last blood donation (one unit:146.6±85.2 mL; two units: 297.4±78.6 mL). Patients with an anaemic initial haematocrit (females: ≤37%; males ≤40%) generated more RBC (*P<0.05) than non-anaemic patients (one unit: females, 148.3±67.6 *vs* 73.8±65.8 mL; males, 170.5±81.6 *vs* 77.0± 93.9 mL. Two units: females, 295.0±58.5 *vs* 226.0±79.7 mL; males, 299.9±82.5 *vs* 234.6± 107.5 mL).

Predeposito di sangue autologo

Efficacia

Per ottimizzare l'efficacia del predeposito è necessario:

- Iniziare la raccolta di unità autologhe almeno 20 giorni prima dell'intervento.
- Prelevare almeno 2 unità di sangue autologo.
- Raccogliere l'ultima unità di sangue autologo almeno 7-10 giorni prima dell'intervento.
- Supplementazione marziale?

Transfusion Medicine, 2007, **17**, 354–365

Guidelines for policies on alternatives to allogeneic blood transfusion. 1. Predeposit autologous blood donation and transfusion

British Committee for Standards in Haematology, Transfusion Task Force

F. E. Boulton* & V. James† **National Blood Service, Southampton, and †National Blood service, Sheffield, UK*

Iron supplementation and PAD

The BSH Guidelines of 1993 recommend that 'oral iron should be prescribed to all patients who predeposit before the first donation and continued until surgery'. More recent studies cast doubt on the efficacy of oral iron alone, particularly in the absence of prior anaemia.

Cid *et al.* (2005) from Spain showed that neither oral iron nor folic acid supplements enhanced the accomplishment of their pre-operative autologous blood collection programme in patients with baseline Hb above 115 g L^{-1}.

Tseliou *et al.* (2002) from Greece concluded that oral iron therapy in non-iron-deficient patients undergoing a moderate programme of three autologous units is not necessary.

Transfusion Alternatives in Transfusion Medicine 2006;8:178–202 TATM

Spanish consensus statement on alternatives to allogeneic transfusions: the 'Seville document'

RAMÓN LEAL-NOVAL*[1], MD, PhD, MANUEL MUÑOZ†[2], MD, PhD, JOSÉ A PÁRAMO‡, MD, PhD & JOSÉ A GARCÍA-ERCE§, MD, PhD, FOR THE SPANISH EXPERT PANEL ON ALTERNATIVES TO ALLOGENEIC BLOOD TRANSFUSION

Iron supplements in preoperative autologous blood donation

Administration of oral or intravenous iron supplement without rHuEPO facilitates preoperative autologous blood donation (PABD) (Grade C recommendation). In one randomized trial, the yield of the PABD program for the group receiving high doses of oral iron was higher than that of the placebo group, although a beneficial effect of the addition of intravenous iron to the oral treatment was not observed.[51] Another randomized study did not find any benefit from the administration of oral or intravenous iron in patients without iron deficiency and not receiving rHuEPO.[52] In contrast, when four PABD units are requested for female patients, a higher yield is obtained with intravenous iron than with oral iron.[53]

- **Kasper SM, *et al.* Efficacy of oral iron supplementation is not enhanced by additional intravenous iron during autologous blood donation. *Transfusion 1998; 38: 764–70***
- **Weisbach V, *et al.* Oral or intravenous iron as an adjuvant to autologous blood donation in elective surgery: a randomized, controlled study. *Transfusion 1999; 39: 465–72.***
- **Gesemann M, et al. Intravenous vs. oral iron supplementation during autologous blood donation. *Beitr Infusionsther Transfusionsmed 1996; 33:***

Predeposito di sangue autologo

Ruolo della supplementazione marziale

Blood removed (donated)				*Blood produced*		
Patients (n)	Baseline RBCs (ml)	Requested/ donated units	RBCs (ml)	RBCs (ml)	Expansion (%)	Iron therapy
22	1936	3/2.8	590	**220**	11%	**None**
45	1991	3/2.9	621	**331**	17%	**PO**
41	1918	3/2.9	603	**315**	16%	**PO + IV**

Kasper SM, et al: Efficacy of oral iron supplementation is not enhanced by additional intravenous iron during autologous blood donation**.** ***Transfusion*** **1998, 38:764-770**.

Oral or intravenous iron as an adjuvant to autologous blood donation in elective surgery: a randomized, controlled study.

Weisbach V et al. Transfusion 1999; 39: 465-72

Net RBC production (mL) in the preoperative period according to the iron supplementation strategy

	Oral iron	IV iron	Controls
All patients	473 ±178	436±170	397 ± 174
Donors of 4 AB	680 ± 272	636 ± 67	553 ± 164
Donors of 3 AB	430 ± 75	431 ± 107	391 ± 132

p > 0.2

Treatment

Oral Iron: 3 x 100 mg of Fe^{2+} per day given orally for 5 weeks before sugery.

IV Iron: 200 mg of Fe^{3+} given IV after each AB donation.

Controls: No iron medication.

Predeposito di sangue autologo

Rapporto Costo-Efficacia

Strategie per rendere il rapporto costo-benefici più favorevole:

- Standardizzare la procedura di preaccertamento.
- Semplificare il processo di donazione ai salassi successivi al primo
- Evitare la separazione in emocomponenti
- **Consentire una ottimale ricostituzione degli eritrociti prelevati con i salassi;**
- Appropriata selezione dei pazienti ed evitare il prelievo di unità autologhe inutili

Eritropoietina (EPO)

- L'EPO è un fattore di crescita obbligatorio che regola, con meccanismo ormonale, la proliferazione, la differenziazione e la maturazione dei precursori degli eritrociti nel midollo emopoietico in relazione alle condizioni di fabbisogno di ossigeno
- Agisce con meccanismo recettoriale sptt sui precursori in fase avanzata di maturazione (CFU-E)
- Stimola il rilascio dei reticolociti da parte del midollo emopoietico
- Inibsce l'apoptosi.

Eritropoietina Umana Ricombinante (rHuEPO)

Effetto biologico

Studi in soggetti sani ed atleti hanno dimostrato:

- Incremento del numero di reticolociti circolanti dopo circa 4-7 giorni dall'inizio dell'assunzione del farmaco, numero di reticolociti che si mantiene elevato fino a 7 giorni dopo la sospensione del farmaco.
- Incremento consistente del numeri degli eritrociti e della concentrazione dell'emoglobina dopo 7–10 giorni dall'inizio della terapia, incremento che si mantiene per alcune settimane dopo il termine del trattamento.

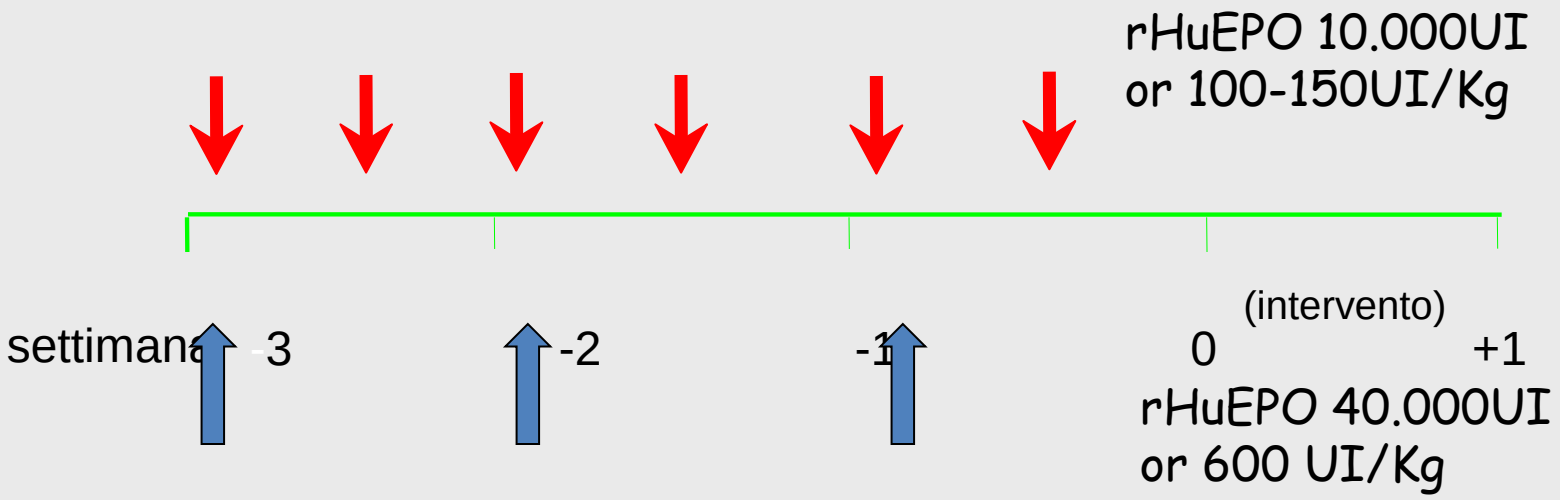
Eritropoietina (EPO)

rHuEPO in associazione a Predeposito

Protocolli

1

Ogni freccia indica una "visita" con somministrazione ed eventuale predeposito (rHuEPO x SC, Ferro EV e predeposito se hct >34%)



Laupacis A et al. Erythropoietin to minimize perioperative blood transfusion: a systematic review of randomized trials. T*ransfusion Medicine*, 1998, 8, 309–317

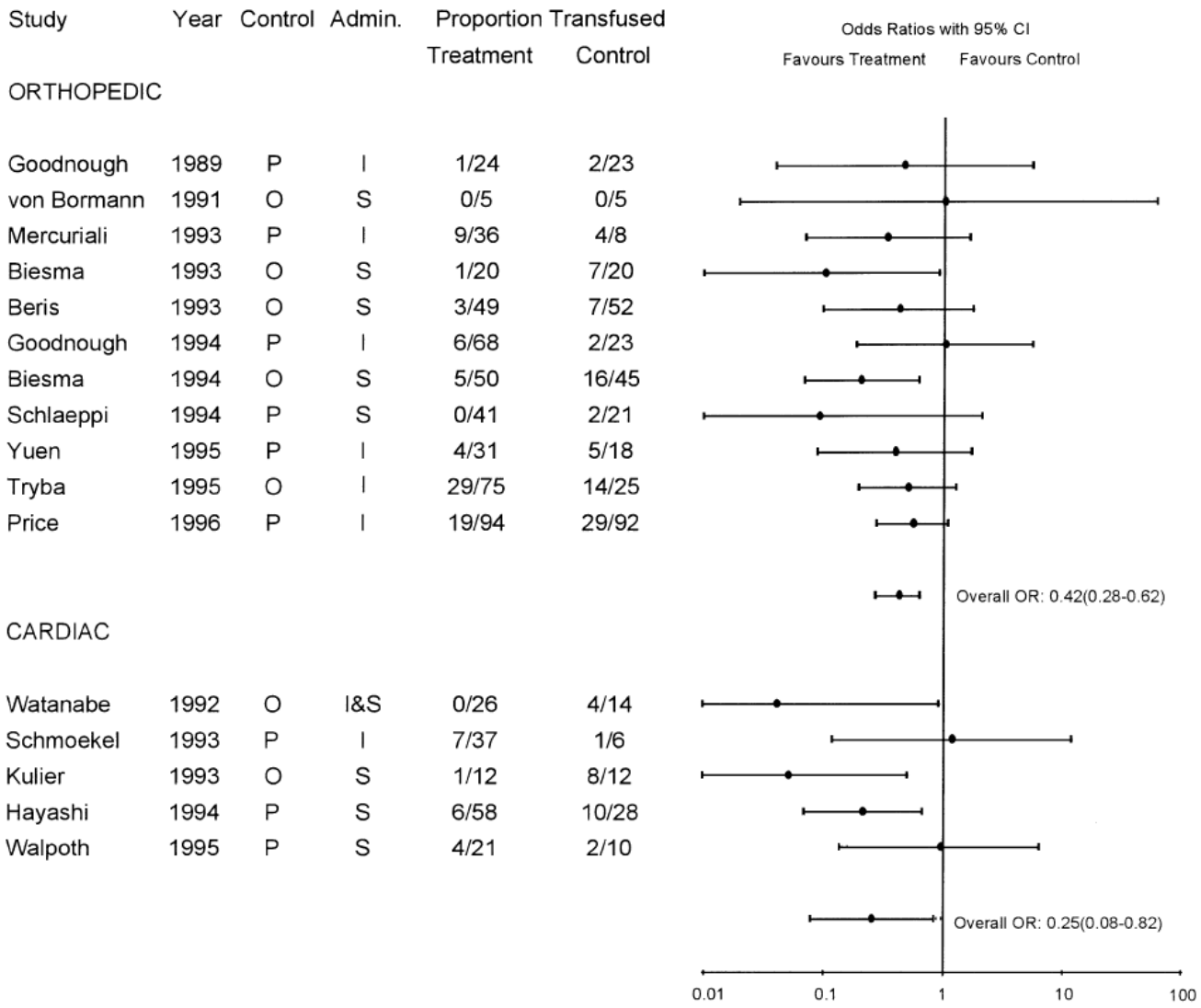


Fig. 1. Proportion of patients transfused in studies of erythropoietin to augment autologous donation in orthopaedic and cardiac surgery. Results expressed as odds ratios with 95% confidence intervals. P, placebo; O, open label control; I, intravenous; S, subcutaneous.

Eritropoietina Umana Ricombinante (rHuEPO)

rHuEPO Perioperatoria

Somministrazione di rHuEPO da sola (senza predeposito) per espandere la massa eritrocitaria circolante del paziente prima dell'intervento chirurgico, consentendo così al paziente di tollerare la perdita di sangue intra e postoperatoria conservando valori di Hct compatibili con le sue condizioni cliniche.

La somministrazione preoperatoria di rHuEPO inoltre fa si che il paziente al momento dell'intervento chirurgico presenti già un elevato grado di stimolazione dell'eritropoiesi così da poter rapidamente compensare la perdita degli eritrociti indotta dall'intervento chirurgico

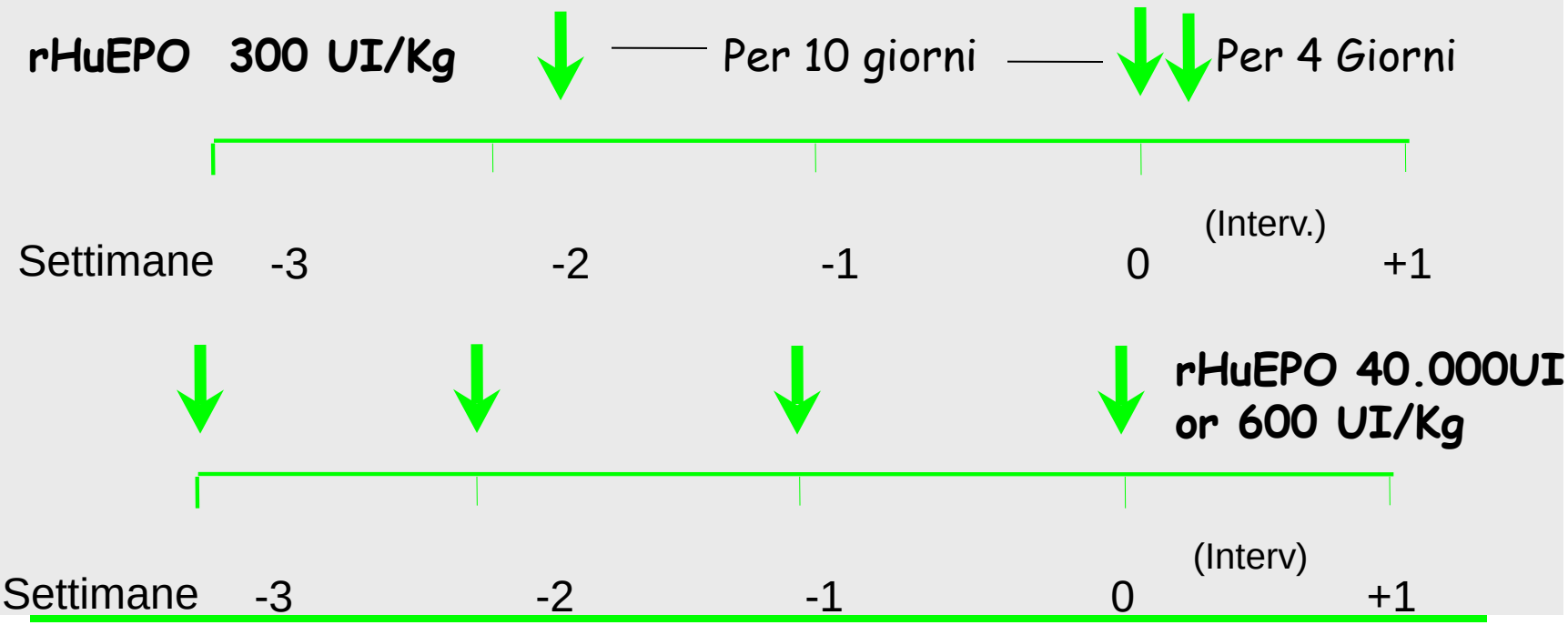
Eritropoietina Umana Ricombinante (rHuEPO)

rHuEPO Perioperatoria

Protocolli approvati (in chir ortopedica)

2

rHuEPO perioperatoria: Ogni freccia indica rHuEPO SC raccomandata associazione con Ferro



Spahn DR. Anemia and Patient Blood Management in Hip and Knee Surgery. A Systematic Review of the Literature. Anestesiology 2010; 113: 482-95

RCT on perioperative EPO

Reference	Study Design	Duration of Observation	Type of Surgery	Study Groups		No. Included		Transfusion Trigger	Allogeneic Blood Transfusion Rate		
				Active	Control	Active	Control		Active	Control	*P* Value
Moonen *et al.*[37] **2008**	RCT	4 weeks	THA/TKA with pretreatment Hb level 10–13 g/dl	rHuEPO 40,000 IU weekly (4×) + ferrofumerate 200 mg tid during 3 weeks before surgery	Cell salvage	50	50	Hb < 8.1 or < 8.9 or < 9.7 g/dl depending on the ASA score	**4%**	**28%**	0.002
Keating *et al.*[38] **2007**	RCT	3 weeks	THA/TKA with pretreatment Hb level 11–14 g/dl	rHuEPO 45,000 IU weekly (4×) + polysaccharide iron complex or the equivalent of 300 mg elemental iron/day per os during 3 weeks before surgery	PAD + polysaccharide iron complex or the equivalent of 300 mg elemental iron/d per os during 3 weeks presurgery	146	132	Hb < 8 g/dl or higher if clinical symptoms	**3%**	**14%**	0.002
Weber *et al.*[41] **2005**	RCT	4–6 weeks	THA/TKA/spine surgery with pretreatment Hb level 10–13 g/dl	rHuEPO 40,000 IU weekly (4×) + oral iron (type and dose NA)	Usual care, including oral or IV iron (type and dose NA)	467	237	Hb < 8 g/dl	**9%**	**37%**	< 0.05
Faris *et al.*[43] **1996**	RCT	4 weeks	Major orthopedic surgery	rHuEPO 7,500 to 22,500 IU/d during 15 days + ferrous sulfate 325 mg tid per os	Placebo + ferrous sulfate 325 mg tid per os	131	69	NA	**21%**	**54%**	< 0.001
Canadian study group[44] **1993**	RCT	3 weeks	THA with pretreatment Hb level 11–16 g/dl	rHuEPO 7,500 to 22,500 IU/d during 14 days + iron sulfate 300 mg tid per os	Placebo + ferrous sulfate 300 mg tid per os	130	78	Hb < 9 g/dl	**27%**	**44%**	NA

A Restrictive Use of Both Autologous Donation and Recombinant Human Erythropoietin Is an Efficient Policy for Primary Total Hip or Knee Arthroplasty

Claude Couvret, MD*, Marc Laffon, MD*, Annick Baud, MD*, Valérie Payen, MD*, Philippe Burdin, MD†, and Jacques Fusciardi*

Departments of *Anesthesiology and Critical Care and †Orthopedic Surgery, Trousseau University Hospital, Tours, France

Study 1

- Indication for PABD was based on comparison of each patient's RBC reserve with mean estimated perioperative RBC loss:
- PABD indicated if RBC reserve was < 800 mL (THA) or <1000 mL (TKA), Hct > 33%, life expectancy of 10 yr, no medical contraindication, and consent of the patient.
- 2 AB units were collected preop.

Study 2

- EPO instead of PABD when Hct <37%, life expectancy > 10 yrs
- 3 weekly SC doses of 600 UI/kg .
- Oral ferrous sulfate 320 mg daily in association with EPO.
- No PABD in case of baseline Hct > 39%. PABD only in Pts with baseline hct between 37%-39%. Triggers for any transfusion (autologous or allogeneic) were identical

A Restrictive Use of Both Autologous Donation and Recombinant Human Erythropoietin Is an Efficient Policy for Primary Total Hip or Knee Arthroplasty

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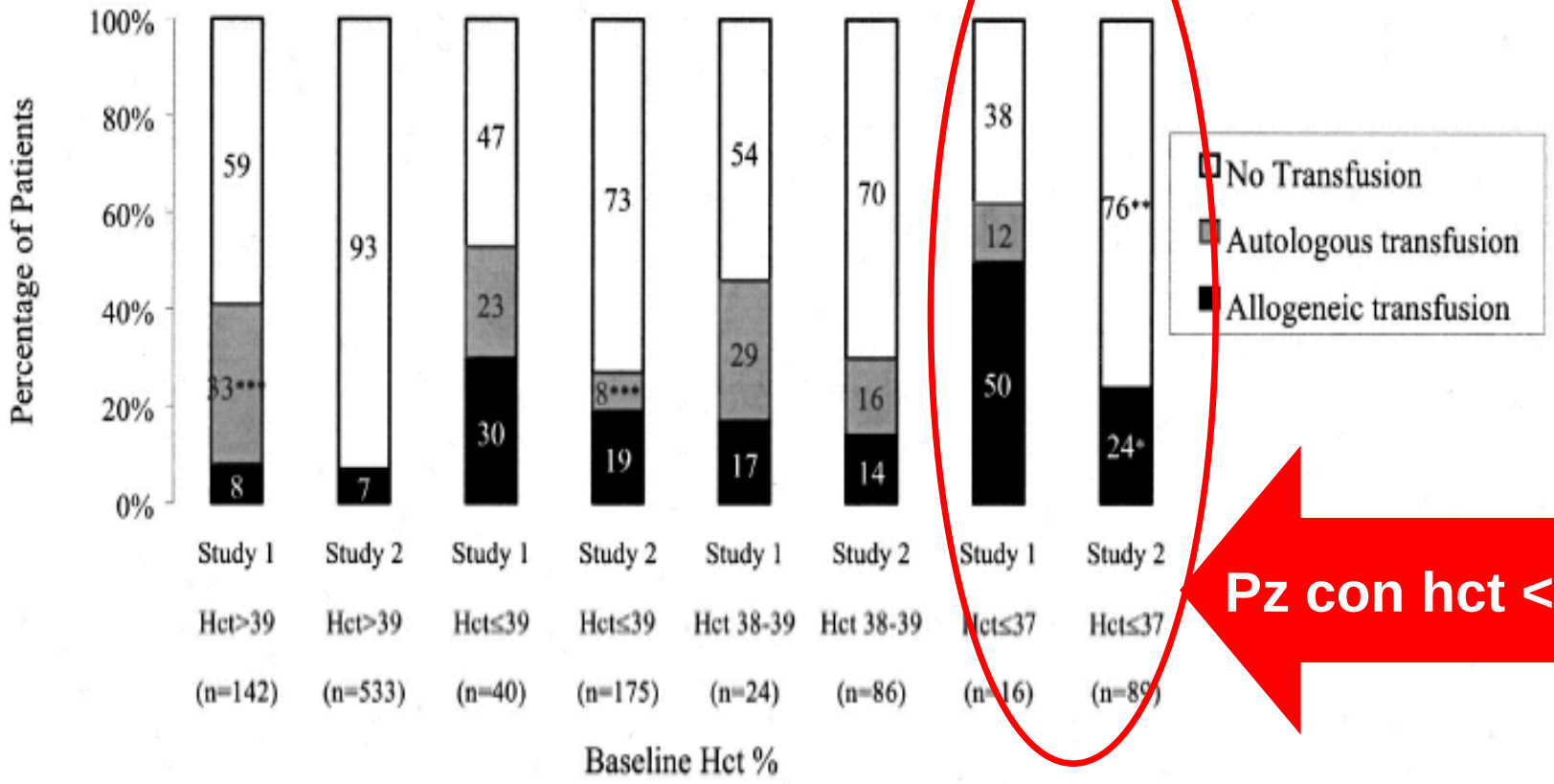


Pz con hct < 37%

Eritropoietina Umana Ricombinante (rHuEPO)

Sicurezza

La sicurezza del trattamento con EPO in pazienti chirurgici (non cardiovascolari) è stata dimostrata da una simile distribuzione degli eventi avversi nei pazienti trattati rispetto ai controlli in oltre 1000 pazienti inseriti in studi clinici.

Rischi potenziali

- **Anemia aplastica** (osservata solo in terapia cronica)
- **Effetto favorente la crescita tumorale**
- **Eventi tromboembolici (associata a crescita rapida ed incontrollata dell'HcT)**

Eritropoietina Umana Ricombinante (rHuEPO)

rHuEPO e supplementazione marziale

1 Un adeguato supporto di ferro è indispensabile per ottenere l'effetto ottimale dalla terapia con rHuEPO

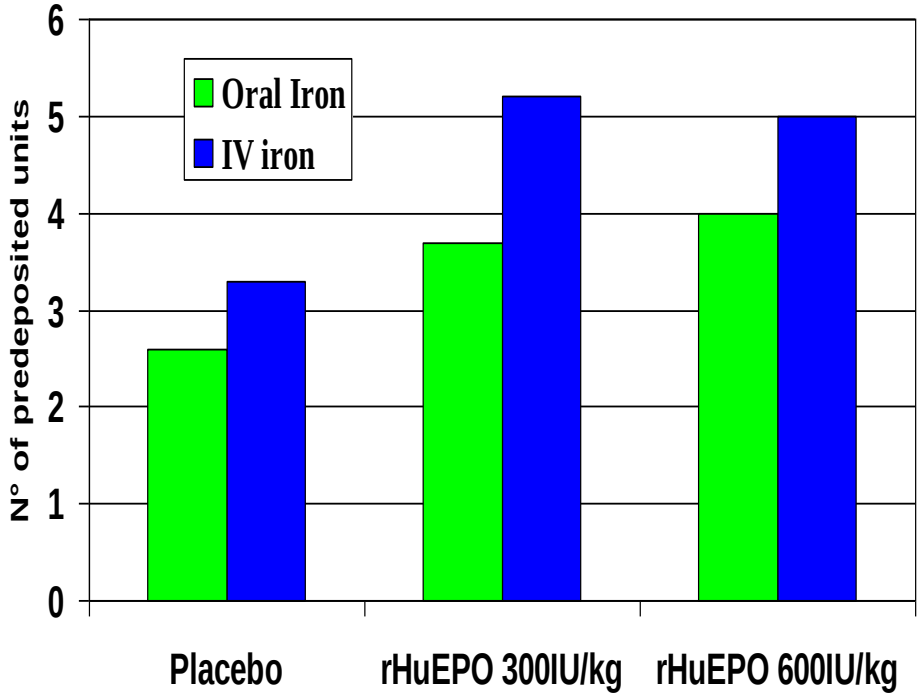
2 In pazienti trattati con rHuEPO si osserva un aumentata produzione di eritrociti ipocomici anche in presenza di adeguati depositi di ferro e di supplementazione marziale per os.

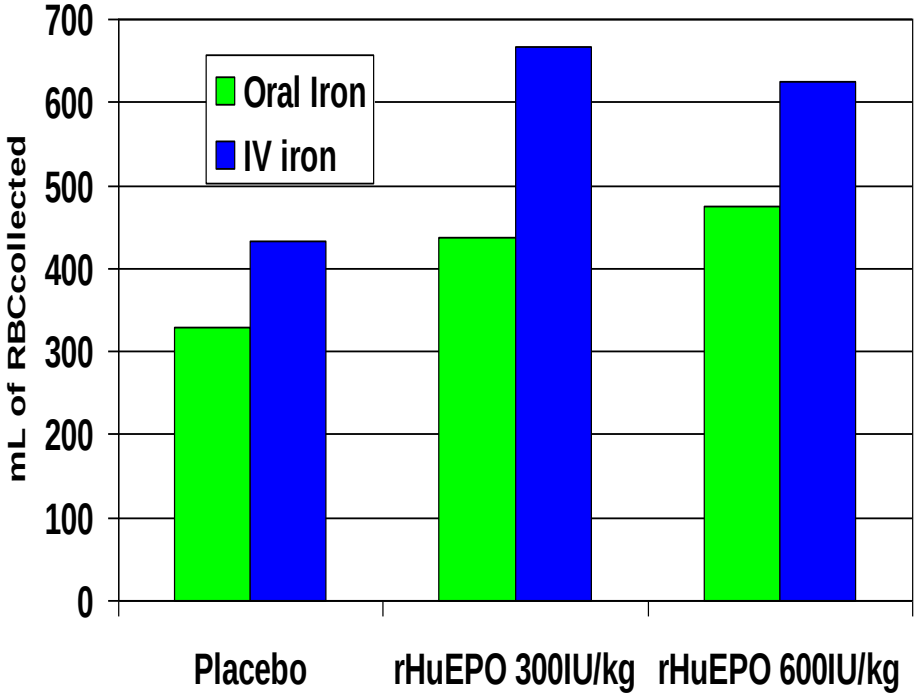
3 La somministrazione marziale per via endovenosa è stato dimostrato garantire una supplementazione più adeguata al grado di stimolazione dell'eritropoiesi, permettendo di ottenere a parità di dosi totali di rHuEPO una maggior produzione di nuovi eritrociti o di ridurre il dosaggio di rHuEPO richiesto

Eritropoietina Umana Ricombinante (rHuEPO)

Supplementazione Marziale

Fe x Os vs Fe IV iron





Mercuriali F, Zanella A, Barosi G, et al Use of erythropoietin to increase the volume of autologous blood donated by orthopedic patients. Transfusion 1993; 33: 55-60

Definizione del fabbisogno trasfusionale in chirurgia

Le strategie attualmente disponibili per coprire il fabbisogno trasfusionale di un paziente chirurgico hanno, così come ogni procedura sanitaria, dei costi e dei rischi associati.

Tali **strategie devono essere utilizzate solo** quando necessario, ossia **quando sussista una reale probabilità** che il paziente necessiti di supporto trasfusionale.

E' pertanto necessario che ciascun paziente venga valutato da un esperto di medicina trasfusionale al fine di definirne il suo specifico fabbisogno trasfusionale previsto.

Conclusioni

- L'applicazione accurata delle differenti strategie disponibili per coprire il fabbisogno trasfusionale nel paziente chirurgico offre al paziente la possibilità di ricevere il miglior trattamento ad un costo accettabile
- La decisione di utilizzare una specifica strategie o una combinazione di esse si deve basare sulle caratteristiche cliniche dello specifico paziente e su valutazioni di carattere logistico-organizzativo