CONTROVERSIE NELLA GESTIONE TRASFUSIONALE DEL PAZIENTE SOTTOPOSTO A TRASFUSIONE MASSIVA

Dott. M . Marietta

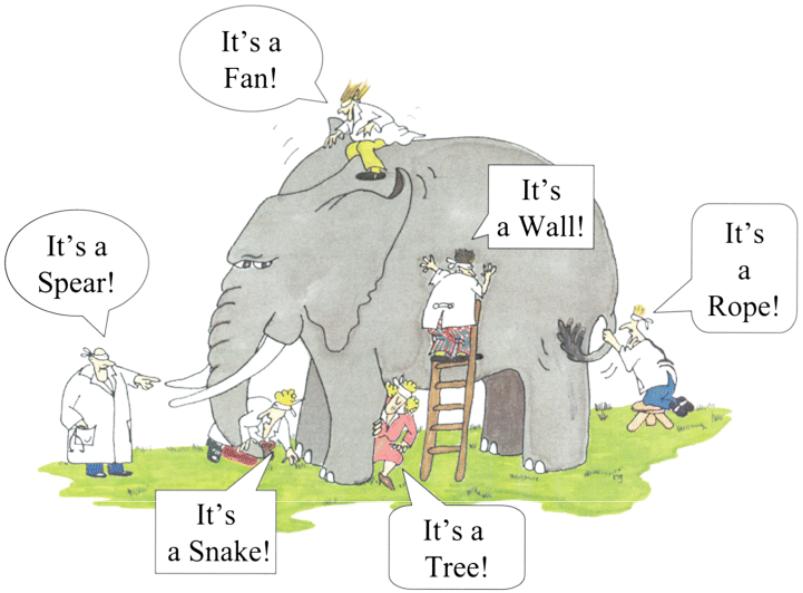
Azienda Ospedaliero-Universitaria Modena

Relazioni con soggetti portatori di interessi commerciali in campo sanitario

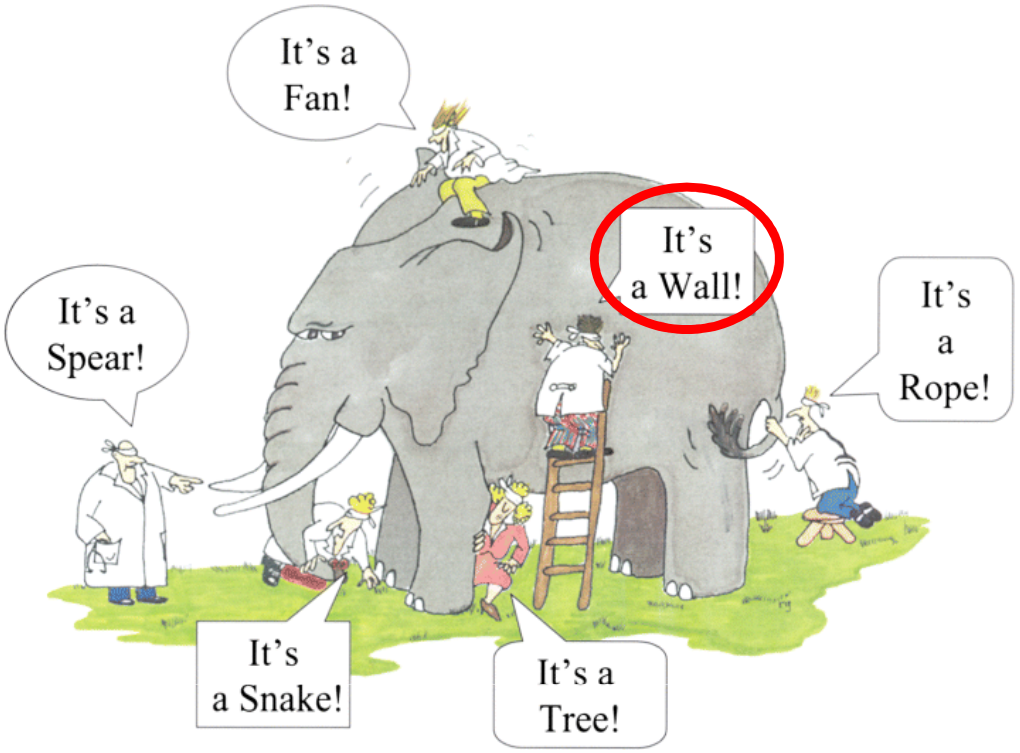
Ai sensi dell'art. 3.3 sul Conflitto di Interessi, pag. 17 del Regolamento Applicativo dell'Accordo Stato-Regione del 5 novembre 2009, dichiaro che negli ultimi due anni ho avuto i seguenti rapporti anche di finanziamento con soggetti portatori di interessi commerciali in campo sanitario:

- ✓ Partecipazione in qualità di relatore a convegni per l' Azienda Italchimici
- ✓ Partecipazione ad Advisory Board per l' Azienda Novo-Nordisk

C'era una volta un re che ordinò al suo ministro:" Riunisci in una piazza tutti gli uomini del regno, che sono ciechi fin dalla nascita!". Il ministro eseguì l'ordine e quindi lo annunziò al re. Questi si recò sulla piazza dov'erano riuniti i ciechi e ordinò che ognuno di essi toccasse l'elefante reale, per poi dirgli a che cosa l'elefante rassomigliasse.



E siccome ognuno sosteneva la sua opinione, cominciarono a discutere e finirono con l'accapigliarsi e percuotersi, gridando:" L'elefante rassomiglia a questo, non a quello! Non rassomiglia a questo, rassomiglia a quello!" "



✓Il rapporto PFC:RBC

Hemostatic resuscitation for massive bleeding: the paradigm of plasma and platelets—a review of the current literature

TRANSFUSION 2010;50:701-710.

Pär I. Johansson and Jakob Stensballe

	N Pazienti (tipo)	Tipo studio	PFC:EC e sopravvivenza
Gonzalez, 2007	97 (trauma)	Retro Coorte	1: 1.8 (vs 1:3.2)
Borgman, 2007	246 (combat)	"	1:1.4 > 1:2.5 >1: 8
Holcomb, 2008	466 (trauma)	"	≥ 1:1.2
Duchesne, 2008	135 (trauma)	"	1:1 (vs. 1:4)
Kashuk, 2008	133 (trauma)	"	1:2 (vs 4)
Maegele, 2008	713 (trauma)	"	> 1:1.1
Sperry, 2008	415 (trauma)	Prosp Coorte	> 1:1.5

Evidence-based practice guidelines for plasma transfusion

TRANSFUSION 2010;50:1227-1239.

John D. Roback, Stephen Caldwell, Jeff Carson, Robertson Davenport, Mary Jo Drew, Anne Eder, Mark Fung, Marilyn Hamilton, John R. Hess, Naomi Luban, Jeremy G. Perkins, Bruce S. Sachais, Aryeh Shander, Toby Silverman, Ed Snyder, Christopher Tormey, John Waters, and Ben Djulbegovic

*Recommendation: We **suggest** that plasma be transfused to trauma patients requiring massive transfusion (quality of evidence = **moderate**).*

*Recommendation: We **cannot recommend** for or against transfusion of plasma at a plasma : RBC ratio of 1:3 or more in trauma patients during massive transfusion (quality of evidence = **low**).*

*Recommendation: We **cannot recommend** for or against transfusion of plasma for patients undergoing surgery in the absence of massive transfusion (quality of evidence = **very low**).*

*Recommendation: We **suggest against** plasma transfusion in other groups for which data were available (acute pancreatitis, organophosphate poisoning, coagulopathy*

The effect of plasma transfusion on morbidity and mortality: a systematic review and meta-analysis

TRANSFUSION 2010;50:1370-1383.

Mohammad Hassan Murad, James R. Stubbs, Manish J. Gandhi, Amy T. Wang, Anu Paul, Patricia J. Erwin, Victor M. Montori, and John D. Roback

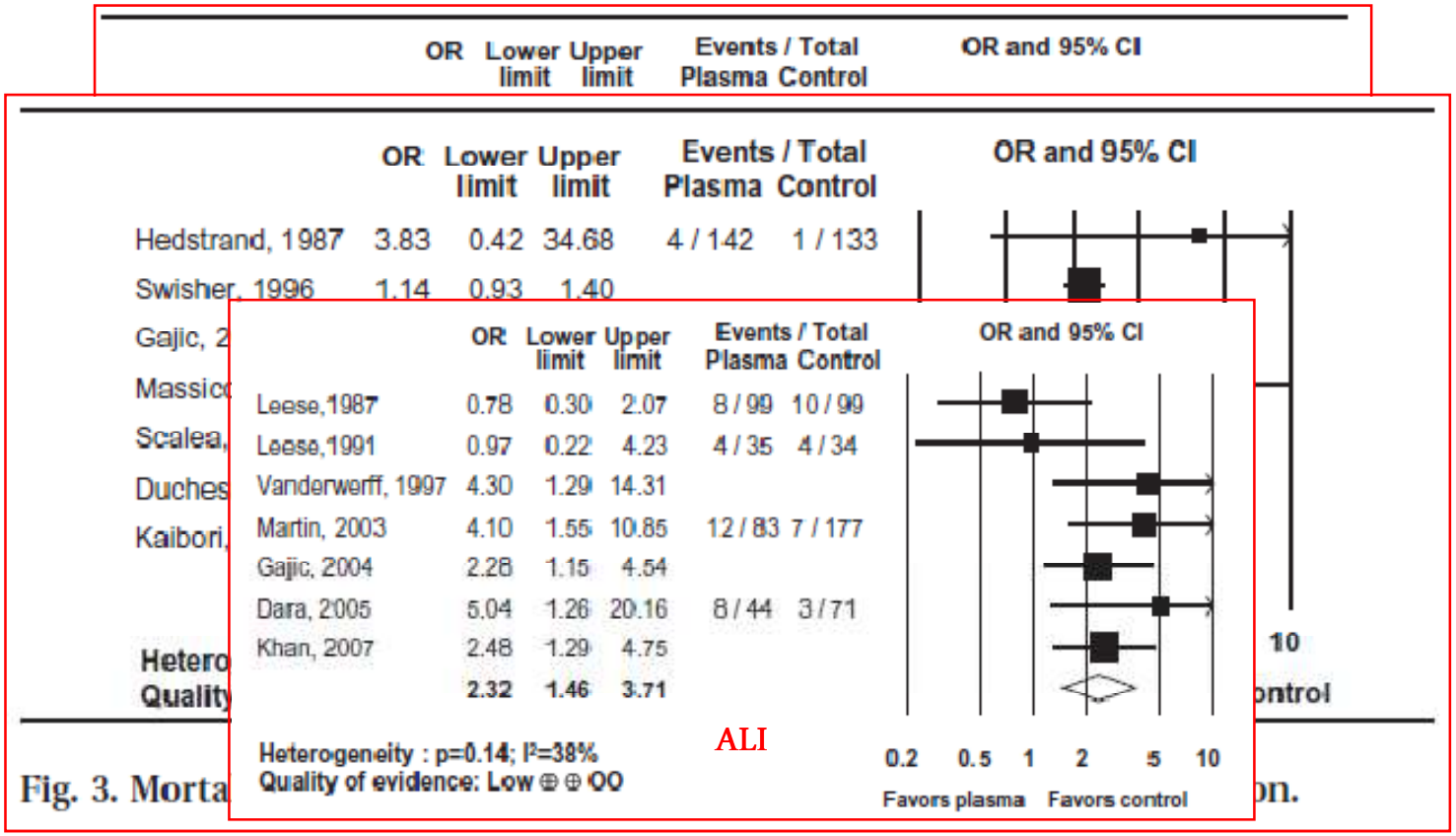


Fig. 3. Morta on.

World J Surg (2008) 32:2185–2189
DOI 10.1007/s00268-008-9655-0

World Journal of Surgery

ORIGINAL SCIENTIFIC REPORTS

Outcome Analysis of Blood Product Transfusion in Trauma Patients: A Prospective, Risk-Adjusted Study

Grant V. Bochicchio · Lena Napolitano · Manjari Joshi · Kelly Bochicchio · Walter Meyer · Thomas M. Scalea

	PRBCs OR (CI)	FFP OR (CI)	Platelets OR (CI)
Infection	2.8 (1.96–3.94)*	1.02 (1.01–1.04)*	0.94 (0.96–1)
Hospital LOS	8.1 (6.6–9.03)*	1.3 (1.3–1.41)*	−0.15 (−0.023 to 0.07)*
ICU LOS	5.6 (4.2–7.06)*	1.25 (1.2–1.31)*	−0.08 (−0.14 to 0.01)*
Mortality	1.05 (1.03–1.07)*	1.03 (1.02–1.05)*	1.03 (1.02–1.04)

+3.5% rischio di morte per ogni unità di PFC trasfusa

Vox Sanguinis (2005) 89, 92–96
© 2005 Blackwell Publishing
DOI: 10.1111/j.1423-0410.2005.00668.x

ORIGINAL PAPER

Transfusion practice in massively bleeding patients: time for a change?

P. I. Johansson, M. B. Hansen & H. Sørensen
Department of Clinical Immunology, University Hospital of Copenhagen, Copenhagen, Denmark

Materials and Methods Patients receiving > 10 units of red blood cells (RBC) within 24 h of admission and ≥ 30 blood components within 7 days of admission were reviewed.

Thirteen patients were inadequately transfused (IT), either not receiving PC transfusions or receiving ≥ 20 RBC units before FFP substitution commenced. Six of the patients received no substitutions of PC, despite bleeding requiring an estimated median blood component transfusion, of RBC and FFP, of 67 units (range: 33–116 units) – in seven patients ≥ 20 RBC units were transfused before substitution with FFP commenced (Table 3). Survival was lower (one out of 13)

	Transfusion therapy	
	Not adequate	
	PLT = 0 (n = 6)	> 20 SAG-M
Transfusion		
RBC	28·5 (18–79)	47 (27–78)
FFP	13·5 (4–37)	20 (3–54)
PC	0	4 (1–6)
Total	67 (33–116)	77 (31–133)
Platelet count ($\times 10^9$/l)	41	58
MVB (Y/N)		10
Survival (Y/N)	0/6	1/6

Survival rate: not adequately transfused 1/13 (7.7%)

Survival rate: adequately transfused 13/26 (50%) P=0.013

Blood product use in trauma resuscitation: plasma deficit versus plasma ratio as predictors of mortality in trauma

TRANSFUSION 2011;51:1925-1932.

Andreas R. de Biasi, Lynn G. Stansbury, Richard P. Dutton, Deborah M. Stein, Thomas M. Scalea,

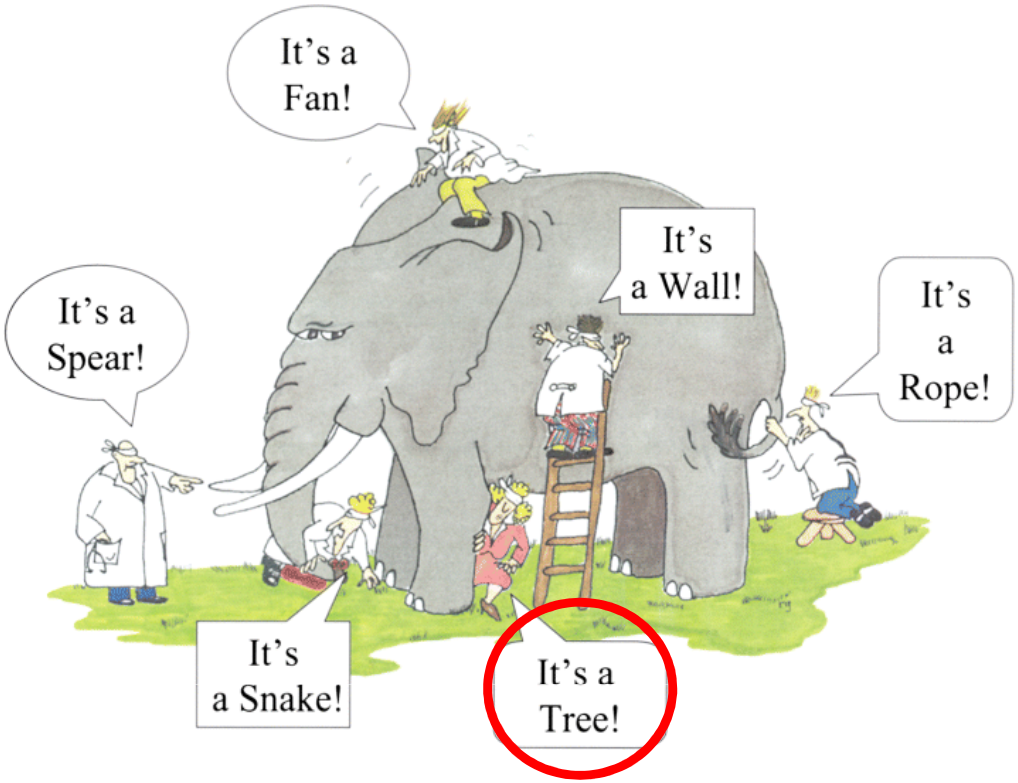
TABLE 4. Plasma deficit (units of RBCs transfused minus units of plasma transfused) and ratio of plasma repletion (expressed as units of plasma divided by units of RBCs) as predictors of mortality in rapidly bleeding trauma patients

	Deficit status				Ratio status			
Patient characteristics	Low 0-2	3-6	High > 6	p value*	Good > 0.66	0.66-0.34	Poor < 0.34	p value
A. At 24 hr into resuscitation								
All patients (%)†	184 (40.0)	148 (33.0)	106 (24.2)		249 (56.9)	111 (25.3)	78 (17.8)	
TRISS, mean (SD)‡	0.658 (0.32)	0.571 (0.75)	0.501 (0.36)	0.001	0.625 (0.34)	0.537 (0.35)	0.559 (0.36)	0.06
Deaths, number (%)	59 (32.1)	62 (41.9)	61 (57.5)	<0.001	97 (39)	50 (45.1)	35 (44.9%)	0.5
5 to 9 units (%)	83 (49.1)	71 (42.0)	15 (8.9)		80 (43.3)	36 (21.3)	53 (31.4)	
TRISS, mean (SD)	0.659 (0.31)	0.581 (0.34)	0.586 (0.40)	0.3	0.658 (0.31)	0.580 (0.32)	0.589 (0.37)	0.1
Deaths, number (%)	21 (25.3)	25 (32.2)	6 (40.0)	0.3	21 (26.3)	9 (25)	22 (41.5)	0.1
>9 units (%)	101 (37.6)	77 (28.6)	91 (33.8)		169 (62.8)	75 (27.9)	25 (9.3)	
TRISS, mean (SD)	0.658 (0.34)	0.561 (0.36)	0.492 (0.35)	0.01	0.609 (0.35)	0.519 (0.35)	0.496 (0.34)	0.4
Deaths, number (%)	38 (37.6)	37 (48.1)	55 (60.4)	0.007	76 (45)	41 (54.7)	13 (52)	0.4
B. At 3 hr into resuscitation								
All patients (%)	176 (40.2)	170 (38.8)	92 (21)		202	117	119	
TRISS, mean (SD)‡	0.667 (0.32)	0.561 (0.35)	0.500 (0.36)	<0.001	0.622 (0.35)	0.526 (0.35)	0.602 (0.34)	0.05
Deaths, number (%)	54 (30.7)	72 (42.4)	56 (60.9)	0.001	80 (39.6)	57 (48.7)	45 (37.8)	0.2
5 to 9 units (%)	87 (51.5)	68 (40.2)	14 (8.3)		63	32	74	
TRISS, mean (SD)	0.678 (0.31)	0.562 (0.34)	0.537 (0.40)	0.06	0.674 (0.33)	0.555	0.602	0.2
Deaths, number (%)	19 (21.8)	27 (39.7)	6 (42.9)	0.03	16 (25.4)	11 (34.4)	25 (33.8)	0.5
>9 units (%)	89 (33.1)	102 (37.9)	78 (29)		139	85	45	
TRISS, mean (SD)	0.656 (0.33)	0.560 (0.35)	0.493 (0.36)	0.01	0.598 (0.35)	0.514 (0.35)	0.603 (0.34)	0.2
Deaths, number (%)	35 (39.3)	45 (44.1)	50 (64.1)	0.003	64 (46.0)	46 (54.1)	20 (44.4)	0.4

* Probability of no true difference between plasma status groups by ANOVA F statistic for continuous and chi square for categorical variables.

† All – 5 or more units of RBCs at 24 hours into resuscitation.

‡ TRISS: probability of survival.



✓ **Piastrine**

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B **30 Day Survival**

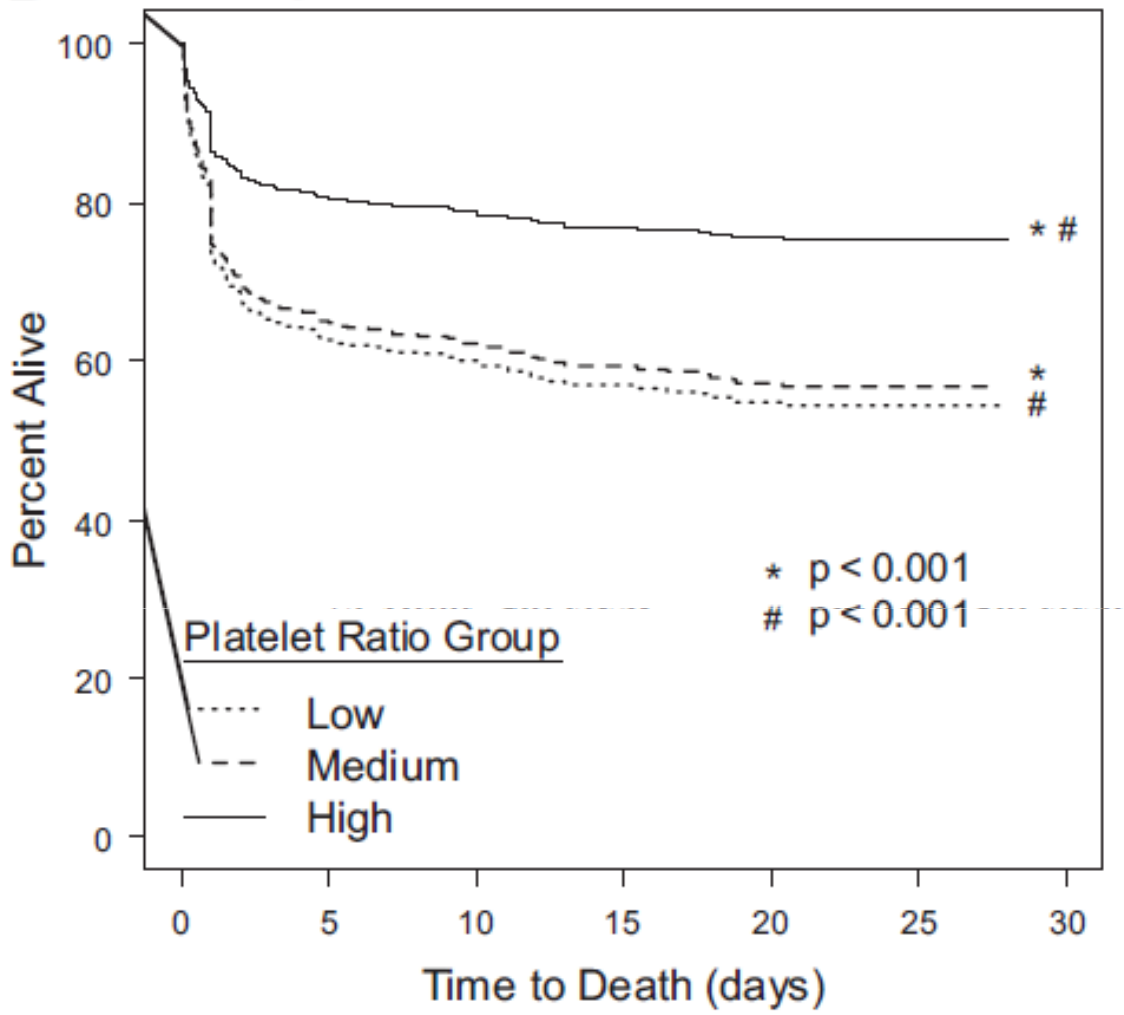

Figure 1. (*A*) Propensity adjusted Kaplan-Meier survival plot for the first 24 hours after admission for the three platelet ratio groups: low (>1:20), medium (1:2), and high (1:1). (*B*) Propensity adjusted Kaplan-Meier survival plot for the first 30 days after admission for the three platelet ratio groups: low (>1:20), medium (1:2), and high (1:1).

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High Ratios of Plasma and Platelets to Packed Red Blood Cells Do Not Affect Mortality in Nonmassively Transfused Patients

(*J Trauma.* 2011;71: S329–S336)

Chitra N. Sambasivan, MD, Nicholas R. Kunio, MD, Prakash V. Nair, MS, Karen A. Zink, MD, Joel E. Michalek, PhD, John B. Holcomb, MD, Martin A. Schreiber, MD, and the Trauma Outcomes Group

Methods: Records of 1,788 transfused trauma patients who received <10 units of PRBC in 24 hours at 23 United States Level I trauma centers were reviewed. The relationship between ratio category (low and high) and in-hospital mortality was assessed with propensity-adjusted multivariate

TABLE 12. In-Hospital Mortality Summary by Blood Ratio Type (FFP:PRBC, PLT:PRBC) and Ratio Category (<1:2, ≥1:2)

Blood Ratio Type	Ratio Category	n	In-Hospital Mortality, n (%)	*p*
FFP:PRBC	<1:2	837	100 (11.9)	0.20*
	≥1:2	344	73 (21.2)	
PLT:PRBC	<1:2	1,100	159 (14.5)	0.28†
	≥1:2	81	14 (17.3)	

* Multivariate proportional hazards model of time to death in terms of FFP:PRBC ratio, age, mechanism, ISS, GCS, and PTT (Table 10) (n = 934 used in the model).

† Multivariate propensity-adjusted proportional hazards model of time to death in terms of PLT:PRBC ratio, ISS, GCS, and propensity score (from Table 11) (n = 685 used in the model).

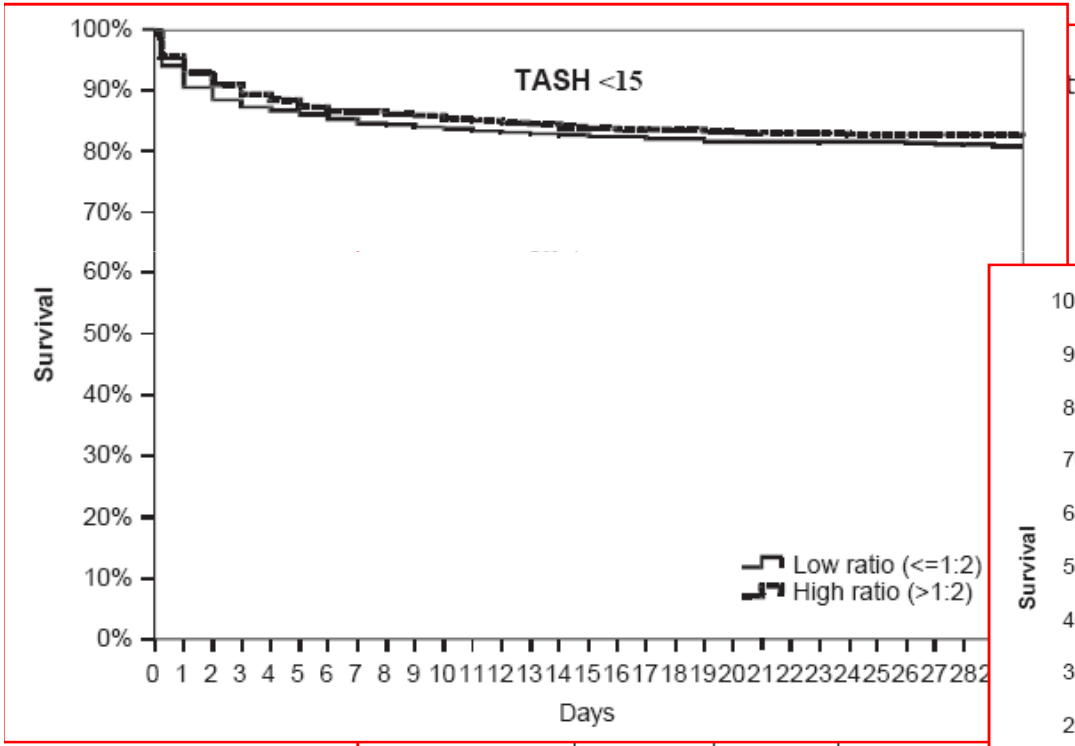
Vox Sanguinis (2011)

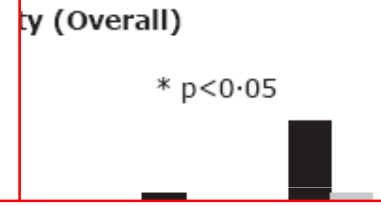
DOI: 10.1111/j.1423-0410.2011.01466.x

ORIGINAL PAPER

The effect of FFP:RBC ratio on morbidity and mortality in trauma patients based on transfusion prediction score

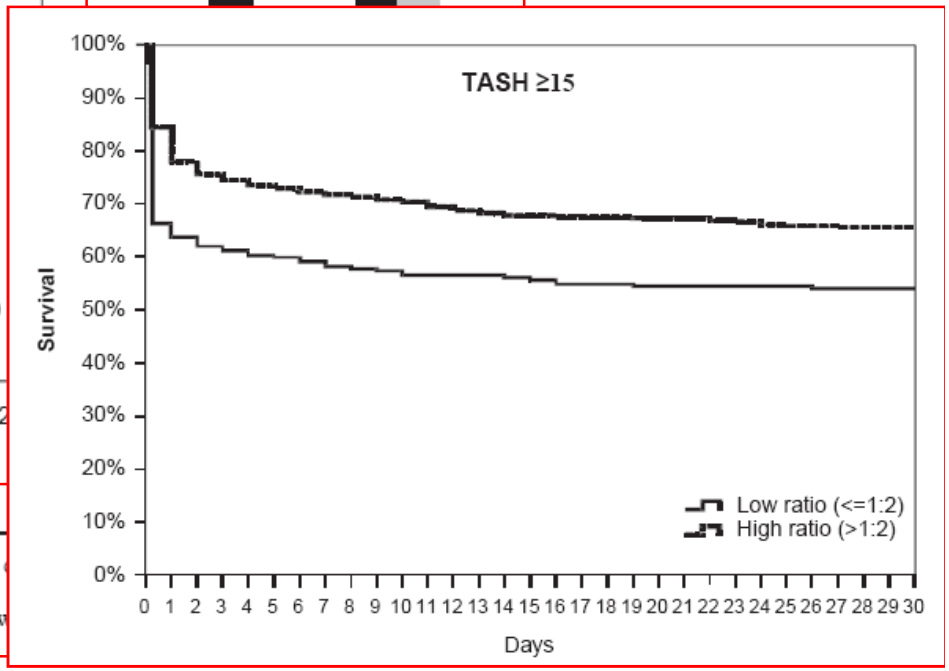
M. A. Borgman,[1] P. C. Spinella,[2] J. B. Holcomb,[3] L. H. Blackbourne,[4] C. E. Wade,[3] R. Lefering,[5,6,7] B. Bouillon[5,7] & M. Maegele[5,6,7]

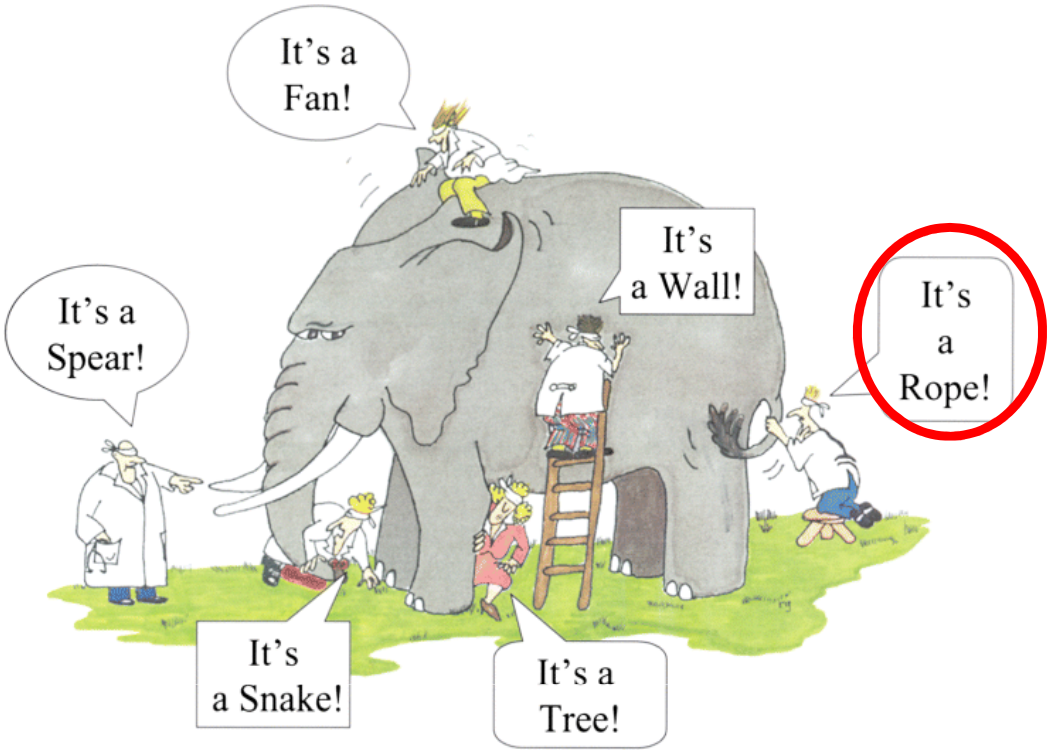




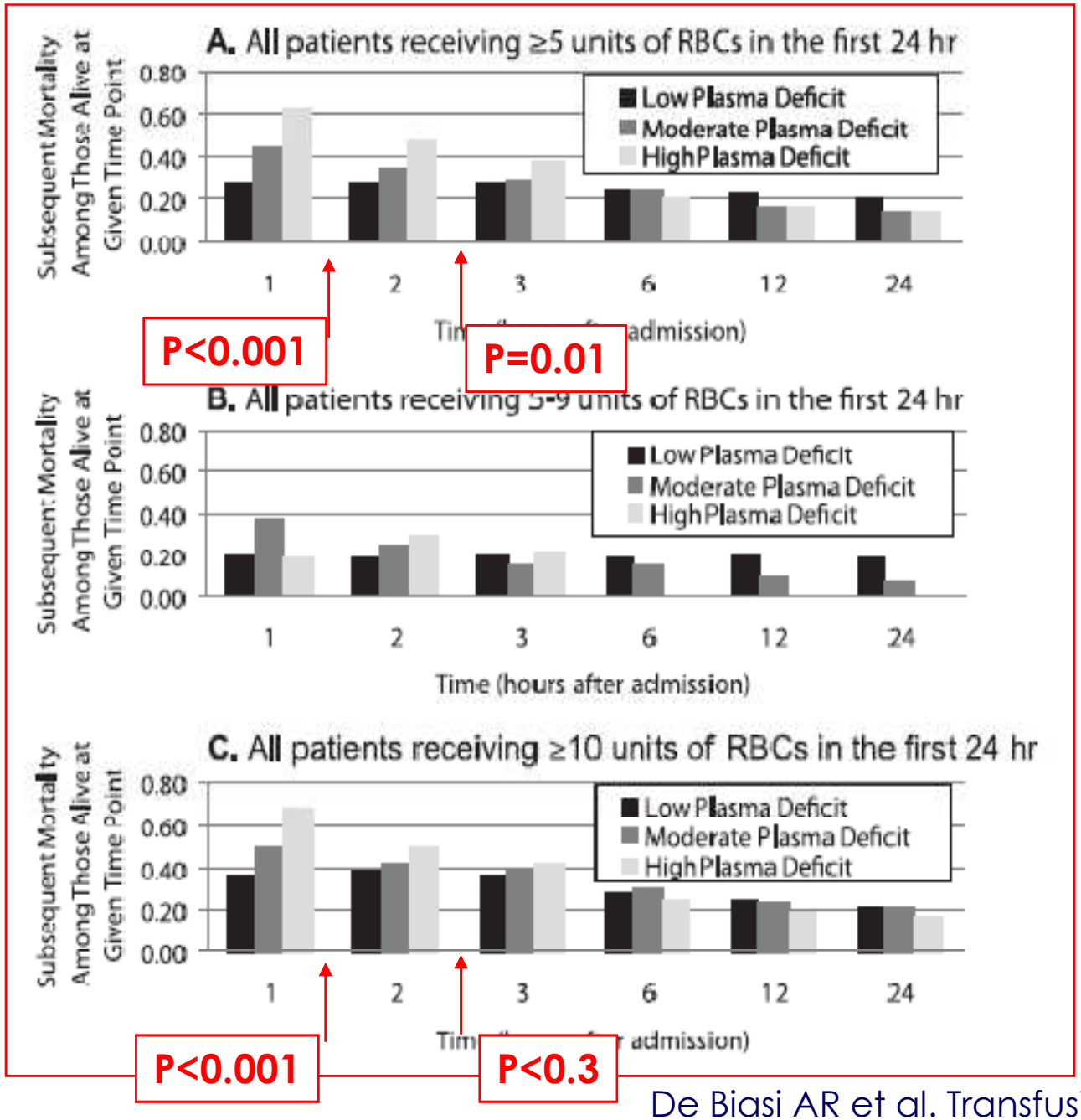
p value *	n.s.	n.s.	n.s.

FFP:pRBC, fresh frozen plasma: packed red blood
hemorrhage; MT, massive transfusion
* Chi Square test of mortality between high and low





✓Il timing dell'intervento



De Biasi AR et al. Transfusion 2011

Acute Traumatic Coagulopathy: Initiated by Hypoperfusion

Modulated Through the Protein C Pathway?

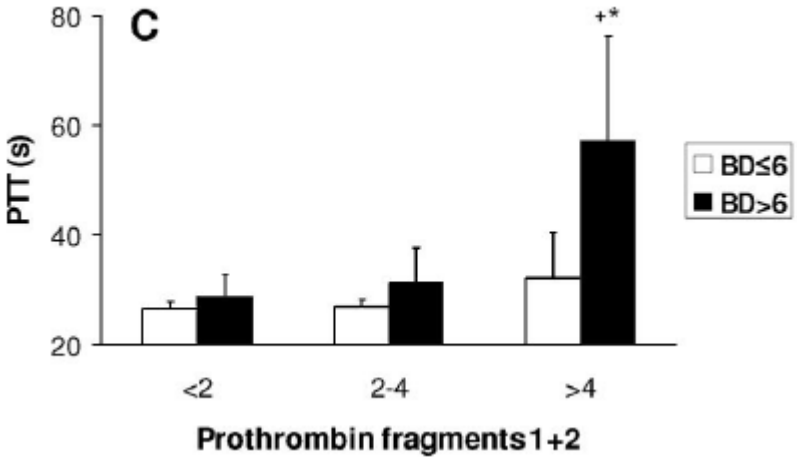
(*Ann Surg* 2007;245: 812–818)

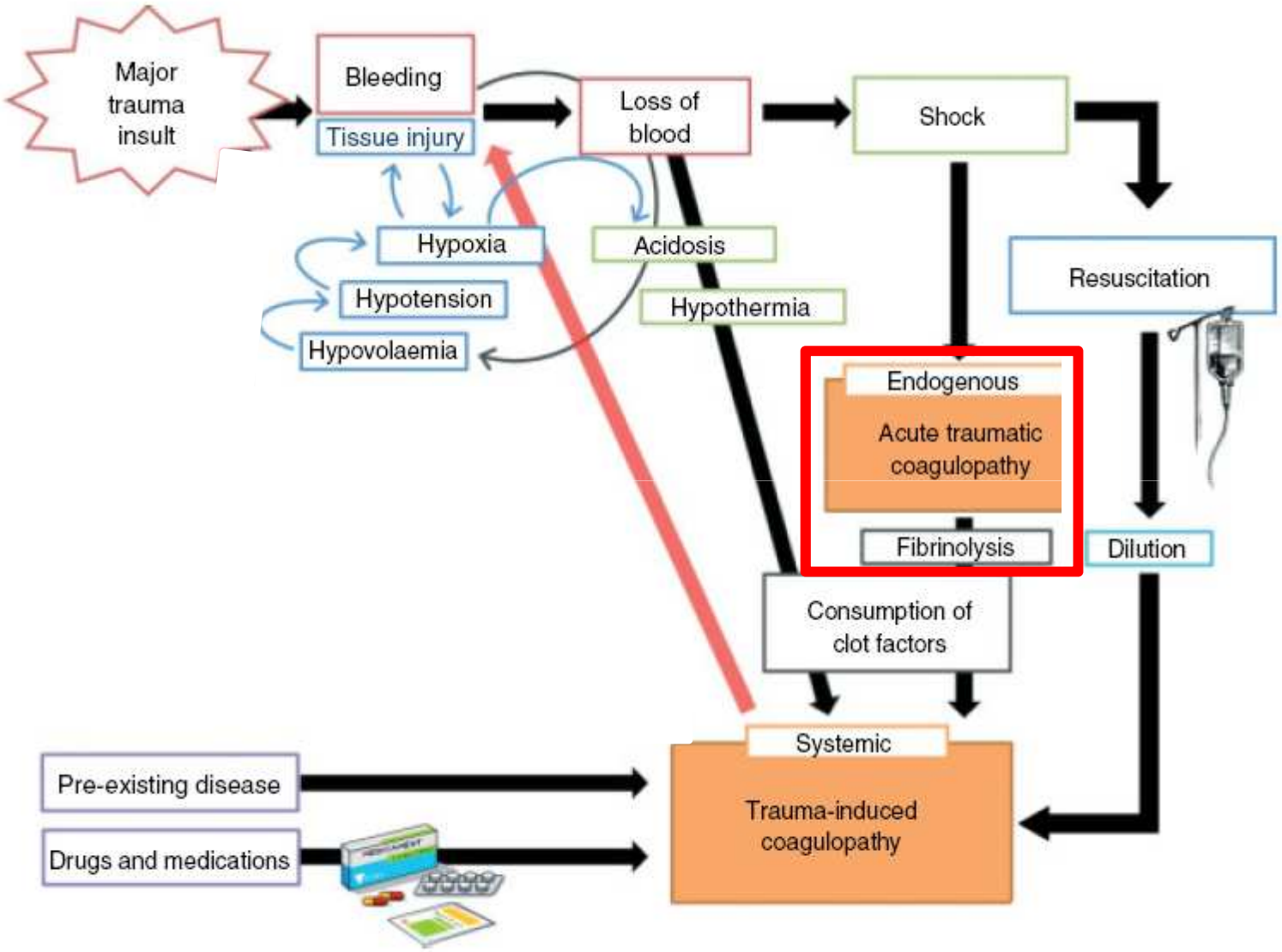
Karim Brohi, FRCS, FRCA, Mitchell J. Cohen, MD,* Michael T. Ganter, MD,†*
Michael A. Matthay, MD,‡ Robert C. Mackersie, MD, and Jean-François Pittet, MD†‡*

TABLE 1. Clinical Characteristics of Major Trauma Patients

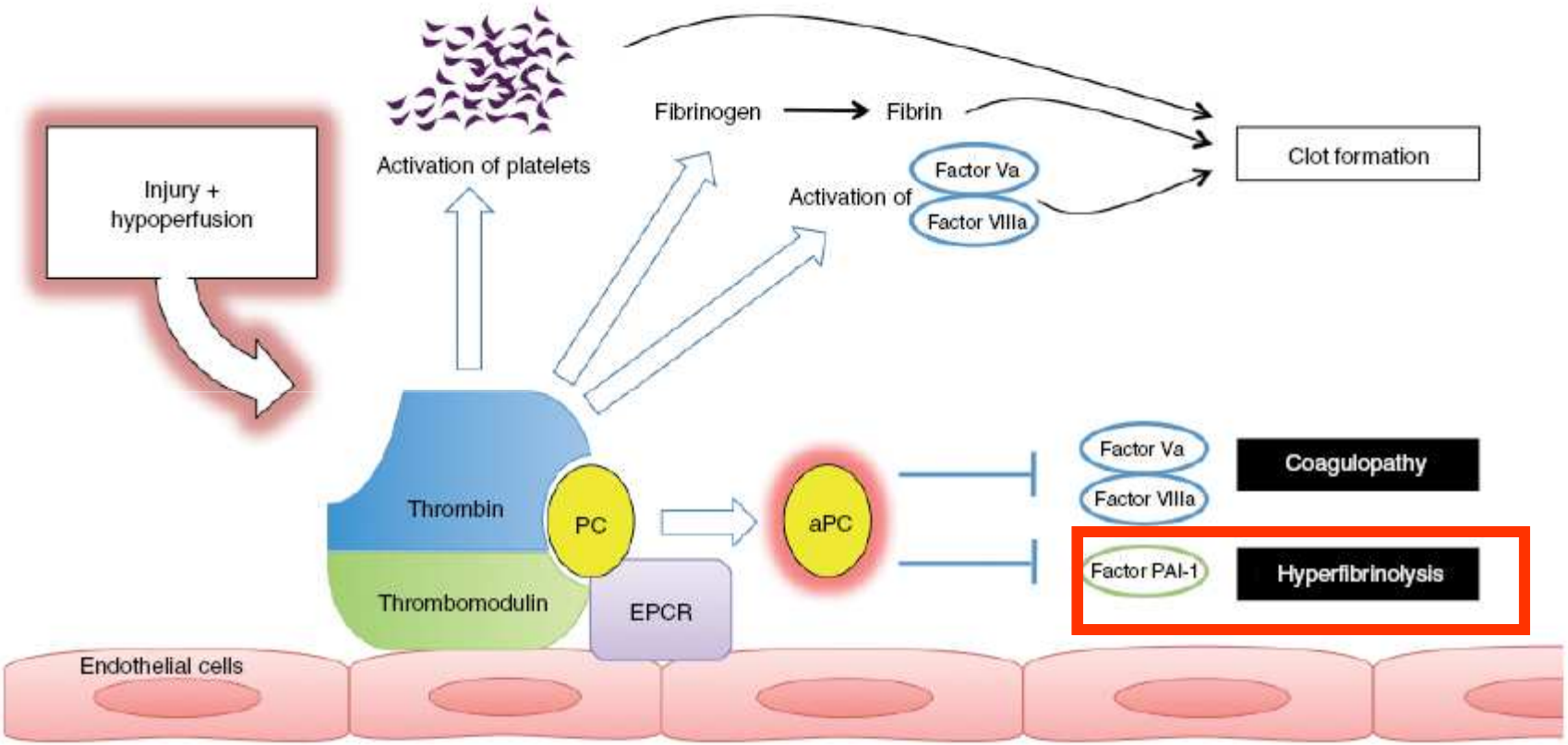
Patients	
Number	208
Age (yr)	41 (27–63)
Male patients	155 (75%)
Time from injury to emergency department arrival (min)	28 (23–29)
Time from emergency department arrival to sample (min)	4 (1–9)
Injuries	
Injury severity score	17 (9–26)
Penetrating injury	53 (25%)
Physiology	
Heart rate >100/min	84 (41%)
Systolic blood pressure <100 mm Hg	38 (18%)
Base deficit >6 mEq/L	56 (27%)
Intravenous fluids prior to initial blood sample (mL)	100 (0–200)

Values are median (inter-quartile range) and number (%).





Thorsen K et al. Br J Surg 2011;98:894-907



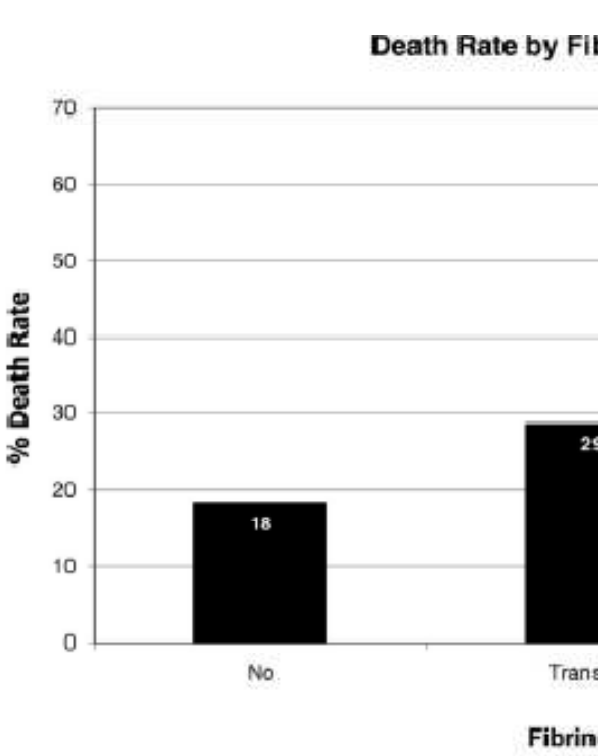
Thorsen K et al. Br J Surg 2011;98:894-907

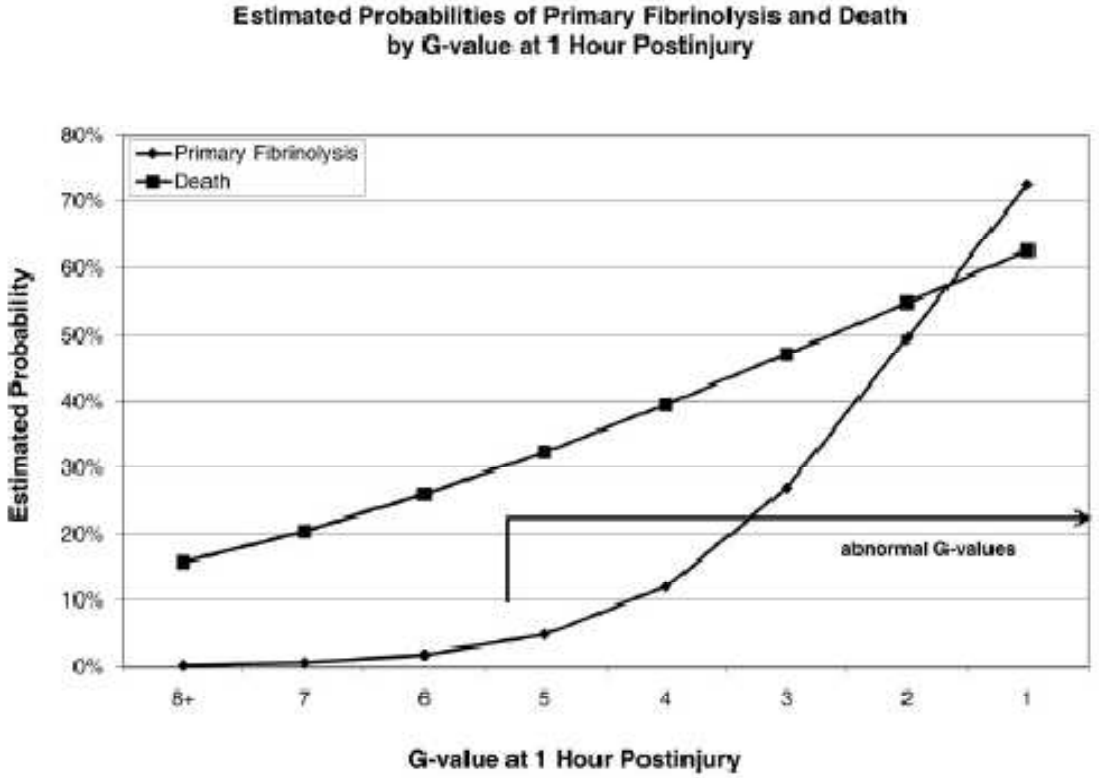
ACoT e iperfibrinolisi

Primary Fibrinolysis Is Integral in the Pathogenesis of the Acute Coagulopathy of Trauma

(*Ann Surg* 2010;252: 434–444)

Jeffry L. Kashuk, MD,† Ernest E. Moore, MD,*† Michael Sawyer, MD,*† Max Wohlauer, MD,*† Michael Pezold, BA,*† Carlton Barnett, MD,*† Walter L. Biffl, MD,*† Clay C. Burlew, MD,*† Jeffrey L. Johnson, MD,*† and Angela Sauaia, MD, PhD*†*





The importance of early treatment with tranexamic acid in bleeding trauma patients: an exploratory analysis of the CRASH-2 randomised controlled trial

Published Online
March 24, 2011

*The CRASH-2 collaborators**

	Tranexamic acid allocated	Placebo allocated	Risk ratio (95% CI)
Time to treatment (h)			
≤1	198/3747 (5·3%)	286/3704 (7·7%)	0·68 (0·57–0·82)
>1–3	147/3037 (4·8%)	184/2996 (6·1%)	0·79 (0·64–0·97)
>3	144/3272 (4·4%)	103/3362 (3·1%)	1·44 (1·12–1·84)
χ^2=23·516; p<0·0000			
Systolic blood pressure (mm Hg)			
>89	146/6878 (2·1%)	163/6761 (2·4%)	0·88 (0·71–1·10)
76–89	110/1609 (6·8%)	114/1689 (6·7%)	1·01 (0·79–1·30)
≤75	233/1562 (14·9%)	295/1599 (18·4%)	0·81 (0·69–0·95)
χ^2=2·235; p=0·33			
Glasgow coma score			
Severe (3–8)	168/1789 (9·4%)	186/1830 (10·2%)	0·92 (0·76–1·13)
Moderate (9–12)	93/1349 (6·9%)	121/1344 (9·0%)	0·77 (0·59–0·99)
Mild (13–15)	228/6915 (3·3%)	265/6877 (3·8%)	0·86 (0·72–1·02)
χ^2=1·275; p=0·53			
Type of injury			
Blunt	308/6788 (4·5%)	347/6817 (5·1%)	0·89 (0·77–1·04)
Penetrating	181/3272 (5·5%)	227/3250 (7·0%)	0·79 (0·66–0·96)
χ^2=0·923; p=0·34			
All deaths	489/10060 (4·9%)	574/10067 (5·7%)	0·85 (0·76–0·96)
Two-sided p=0·0077			

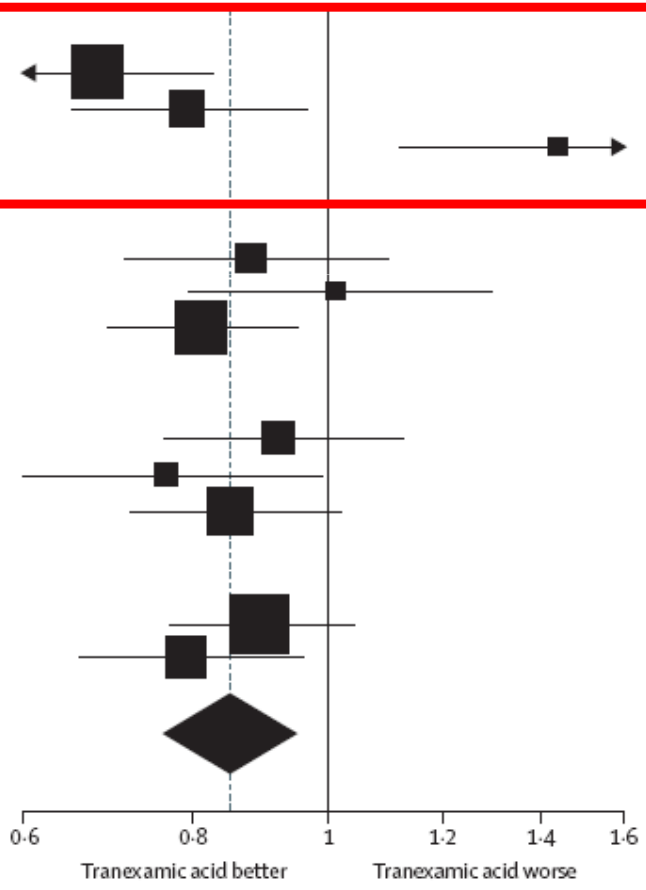
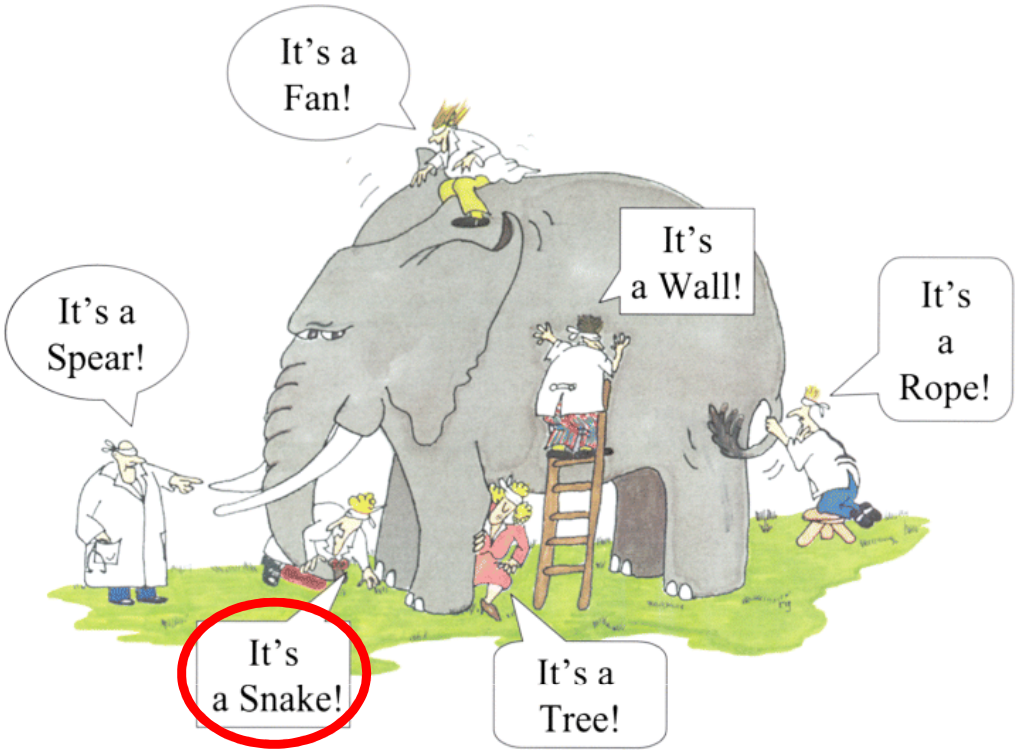


Figure 1: Mortality due to bleeding by subgroups

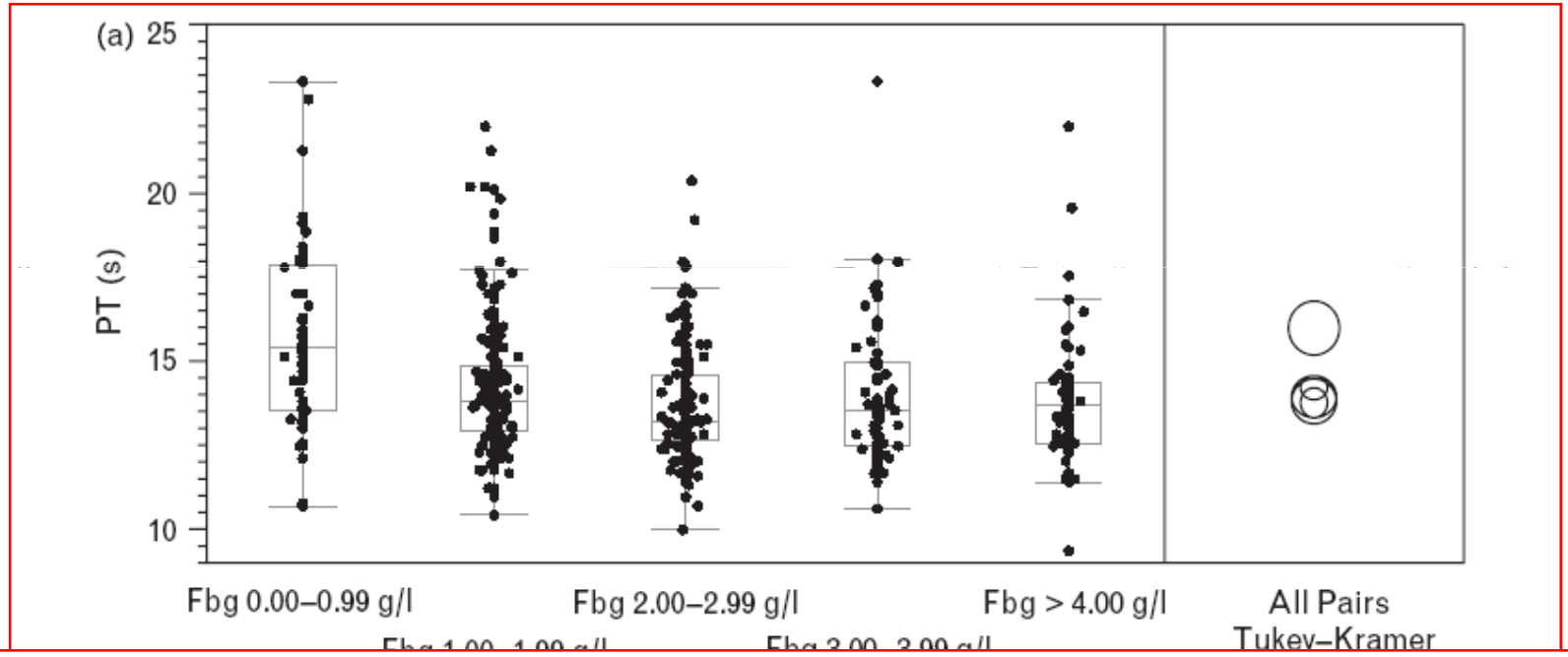


✓ **Il fibrinogeno**

Impact of fibrinogen concentration in severely ill patients on mechanical properties of whole blood clots

Carl-Erik Dempfle[a], Thorsten Kälsch[a], Elif Elmas[a], Nenad Suvajac[a], Thomas Lücke[b], Elke Münch[b] and Martin Borggrefe[a]

Blood Coagulation and Fibrinolysis 2008, 19:765–770



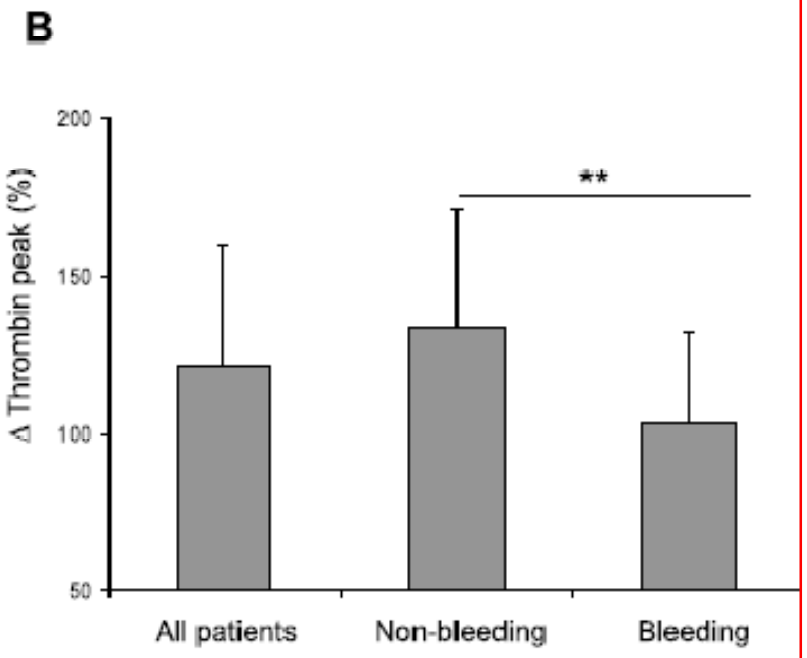
Valore di fibrinogeno > 1g/L è una soglia solo per PT/APTT, mentre le proprietà meccaniche del coagulo migliorano in continuo

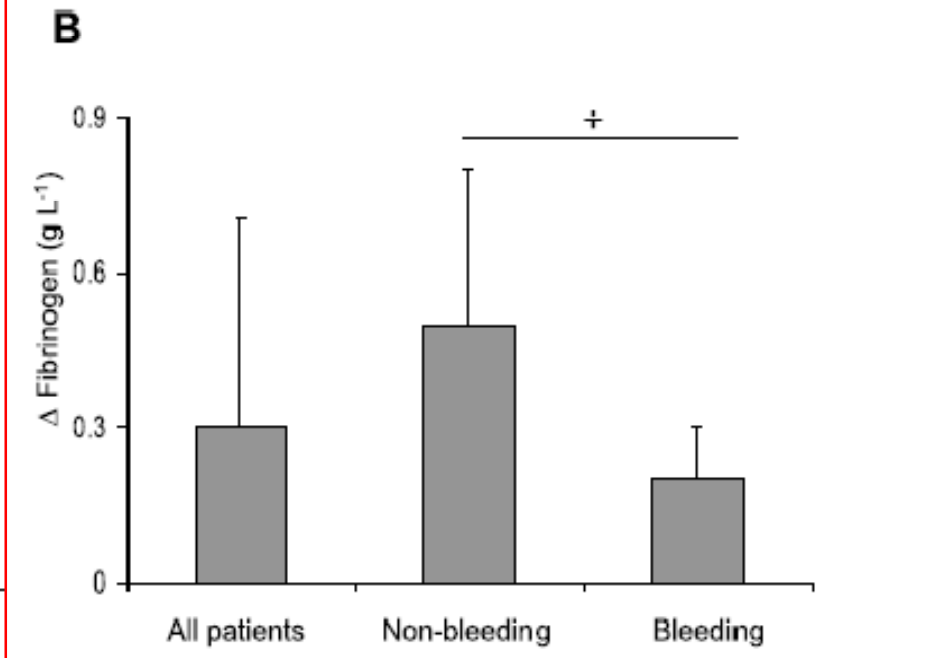
Increased thrombin generation and fibrinogen level after therapeutic plasma transfusion: Relation to bleeding

Saskia E. M. Schols[1,2], Paola E. J. van der Meijden[1], René van Oerle[1,2], Joyce Curvers[3], Johan W. M. Heemskerk[1], Elisabeth C. M. van Pampus[2]

[1]Department of Biochemistry (CARIM), Maastricht University and [2]Department of Internal Medicine, University Hospital Maastricht, Maastricht, The Netherlands; [3]Catharina Hospital, Eindhoven, The Netherlands

Thromb Haemost 2008; 99: 64–70





BJA Advance Access published September 25, 2008

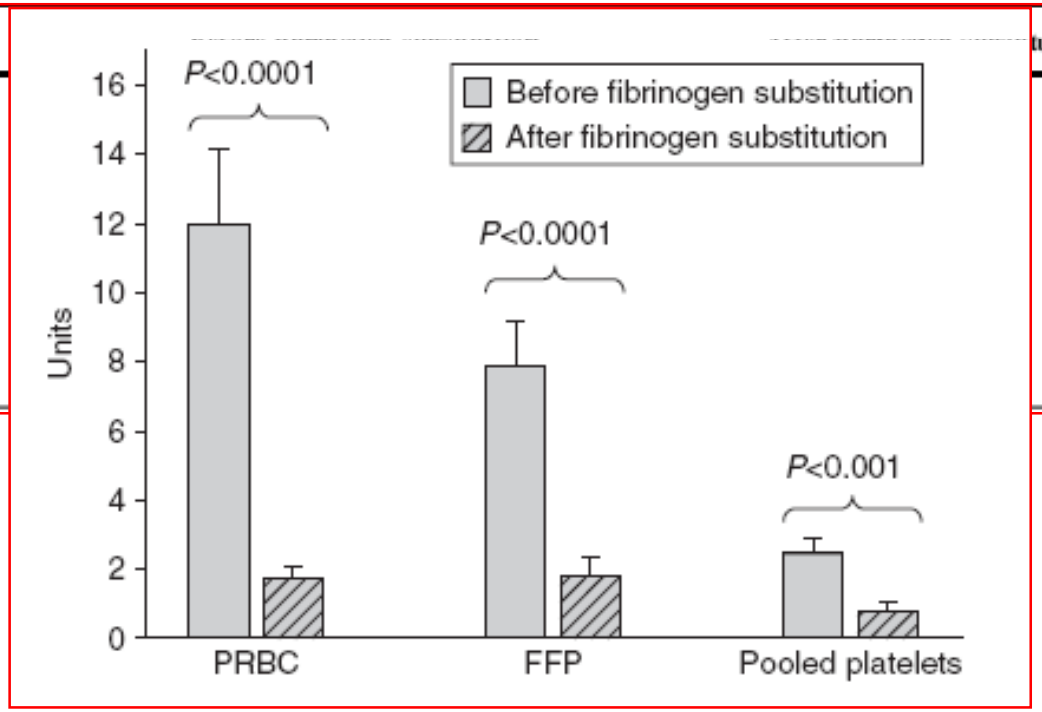
British Journal of Anaesthesia Page 1 of 5
doi:10.1093/bja/aen270

BJA

Fibrinogen concentrate substitution therapy in patients with massive haemorrhage and low plasma fibrinogen concentrations

C. Fenger-Eriksen[1], M. Lindberg-Larsen[1], A. Q. Christensen[1], J. Ingerslev[1]* and B. Sørensen[1,2]

			P-value
Laboratory data			
Platelet count (10^9 litre^{-1})			
APTT (s)			<0.05*
PT (relative)			<0.05*
Fibrin D-dimer (mg litre^{-1})			0.51
P-fibrinogen (g litre^{-1})			<0.05*
Blood loss (ml)			
Adult			<0.05*
Paediatric			0.19



Critical Care

CRITICAL CARE

Management of bleeding following major trauma: an updated European guideline

Critical Care 2010, **14**:R52 doi:10.1186/cc8943

Rolf Rossaint (rrossaint@ukaachen.de)

Recommendation 26

We recommend treatment with fibrinogen concentrate or cryoprecipitate if significant bleeding is accompanied by thrombelastometric signs of a functional fibrinogen deficit or a plasma fibrinogen level of less than 1.5-2.0 g/l. (Grade 1C) We suggest an initial fibrinogen concentrate dose of 3-4 g or 50 mg/kg of cryoprecipitate, which is approximately equivalent to 15-20 units in a 70 kg adult. Repeat doses may be guided by thrombelastometric monitoring and laboratory assessment of fibrinogen levels. (Grade 2C).

Accepted for publication in the *Journal of Thrombosis and Haemostasis*
doi: 10.1111/j.1538-7836.2010.04083.x

Received 6 September 2010, accepted 6 September 2010

Debate

What is the appropriate level of fibrinogen to trigger treatment? And what is the optimal dose of fibrinogen?

TITLE : Fibrinogen concentrate for management of bleeding : Against indiscriminate use

AUTHORS : Yves Ozier [1], Beverley J Hunt [2]

Accepted for publication in the *Journal of Thrombosis and Haemostasis*

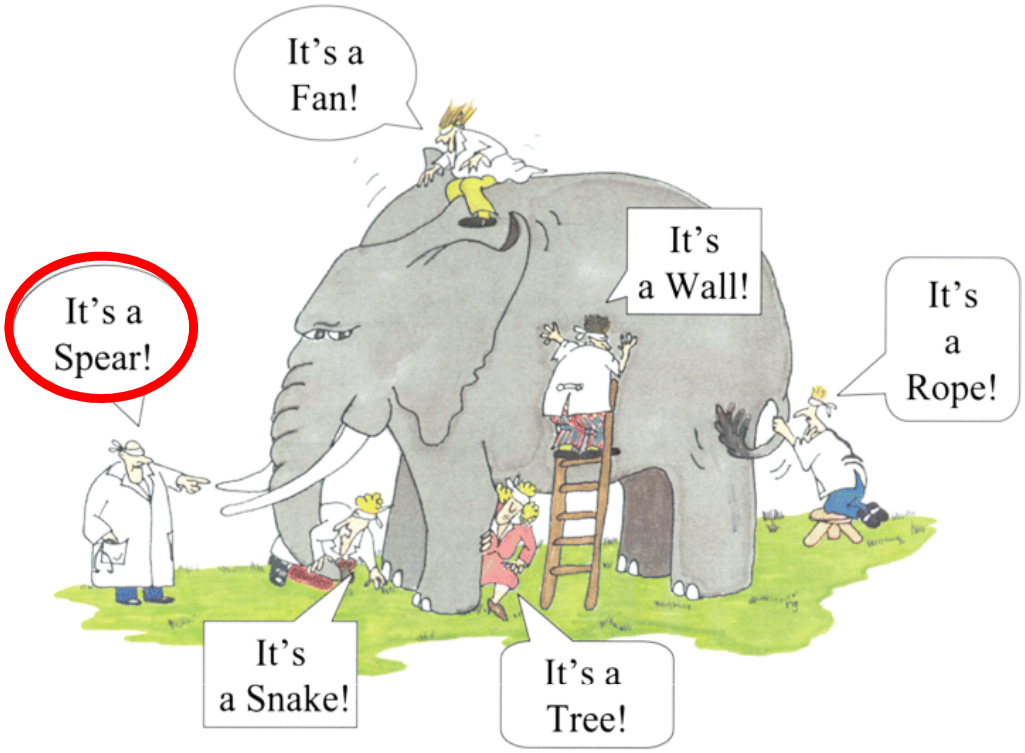
doi: 10.1111/j.1538-7836.2010.04099.x

Received 6 September 2010, accepted 21 September 2010

Debate

Fibrinogen concentrate for management of bleeding

In our opinion the key question for this debate is 'How should we supplement fibrinogen levels?' rather than 'Should we supplement fibrinogen levels?'.



- ✓ **I Concentrati del Complesso Protrombinico**

Impaired thrombin generation and fibrin clot formation in patients with dilutional coagulopathy during major surgery

Saskia E. M. Schols[1]; Marcus D. Lancé[3]; Marion A. H. Feijge[1]; Jan Damoiseaux[4]; Marco A. Marcus[3]; Karly Hamulyák[2]; Hugo ten Cate[2]; Johan W. M. Heemskerk[1*]; Elisabeth C. M. van Pampus[2S*]

Thromb Haemost 2010; 103: ■■■

Variable	Study B + C (diluted) (n=84)	Study B after CPB(n=30)	Study C before FFP (n=54)	Study C after FFP (n=54)
Thrombin generation (R^2)	0.32***	0.10	0.44***	0.46***
fibrinogen (β)	ns	ns	–0.33*	ns
prothrombin (β)	ns	ns	0.68***	ns
factor X (β)	0.32*	+	ns	0.97***
factor XIII (β)	ns	ns	ns	ns
antithrombin (β)	ns	ns	ns	–0.45*
IgG (β)	0.33*	+	ns	ns
Fibrin clot formation (R^2)	0.60***	0.41***	0.74***	0.88***
fibrinogen (β)	0.78***	0.64***	0.58***	0.66***
factor X (β)	ns	ns	ns	0.21*
factor XIII (β)	ns	ns	0.38**	ns
antithrombin (β)	ns	ns	ns	ns
IgG (β)	+	+	ns	0.26**

For multiple regression analysis of all indicated parameters, associations are indicated as R^2 values. For individual parameters, values are standardized β coefficients. ns, not significant, +p<0.1 (borderline), *p<0.05, **p<0.01, ***p<0.001.

EFFICACIA DEI PCC
IN MODELLI ANIMALI DI EMORRAGIA MASSIVA

Autore, anno	Modello	PCC Comparatore	Efficacia In rosso i valori significativi
Dickneite, 2008	Coagulopatia diluizionale in maiali, quindi lesione ossea o splenica	35 UI/kg Salina	↓ tempo di emostasi ↓ perdite
Dickneite, 2009	Coagulopatia diluizionale in maiali, quindi lesione ossea o splenica	25 UI/kg 15 ml/kg PFC 40 ml/kg PFC	↓ tempo di emostasi ↓ perdite rispetto a entrambi
Pragst, 2009	Coagulopatia diluizionale in conigli, quindi lesione renale	25 UI/kg Salina 180 µg/kg rFVIIa	↓ tempo di emostasi ↓ perdite rispetto a entrambi
Kaspereit, 2010	Sanguinamento „a nappo“ dopo BPCP in maiali	30 UI/kg Salina	↓ perdite
Dickneite, 2010	Coagulopatia diluizionale in maiali, quindi lesione splenica	35 UI/kg Salina 180 µg/kg rFVIIa	↓ tempo di emostasi ↓ perdite

RESEARCH Open Access

Goal-directed coagulation management of major trauma patients using thromboelastometry (ROTEM®)-guided administration of fibrinogen concentrate and prothrombin complex concentrate

Schöchl et al. Critical Care 2010, 14:R55
http://ccforum.com/content/14/2/R55

Herbert Schöchl[1,2], Ulrike Nienaber[3], Georg Hofer[1], Wolfgang Voelckel[1], Csilla Jambor[4], Gisela Scharbert[5], Sibylle Kozek-Langenecker[5] and Cristina Solomon*[6]

- ✓ 131 paz con trauma > 5 U di EC/24 ore
- ✓ Fibrinogeno in prima battuta in base a ROTEM→ se non miglioramento CP
- ✓ PCC aggiunto se TAO o ExTEM>1.5
  - 128 solo FIB, 101 anche CCP, 12 PFC, 29 plt
  - **Mortalità osservata (esclusi cranici) 14%**
  - Mortalità attesa TRISS 27.8% (p=0.0018)
  - Mortalità attesa RISC 24.3 % (p=0.014)

Table 3
Morbidity and mortality.

	All patients (n = 36)	TR-DGU (n = 18)	Innsbruck TB (n = 18)	p-Value
Sepsis (n; %)	9 (25)	6 (33.3)	3 (16.7)	0.443
Multiple organ failure (n, %)	14 (38.9)	11 (61.1)	3 (16.7)	0.015
Ventilator days (days, range)	12 (6–20)	15 (6–22)	10 (5–20)	0.673
ICU LOS (days, range)	18 (10–29)	16 (13–25)	19 (9–33)	0.628
In-hospital LOS (days, range)	31 (19–49)	38 (21–48)	26 (19–50)	0.481
In-hospital mortality overall (n; %)	5 (13.9)	2 (11.1)	3 (16.7)	0.500

Data are presented as median (IQR_{25-75}).
ICU = intensive care unit; LOS = length of stay.

	(n=18)	(n=18)
PFC Unità <6 ore	0	6
PFC >24 ore	0	10
RBC Unità <6 ore	1	7.5
RBC Unità >24 ore	3	12.5
PLT (tutte >24 ore)	0	2
Fattori della coagulazione (tutti < 6 ore)	Fibrinogeno 4 gr PCC 1200 IU	0

Critical Care

CRITICAL CARE

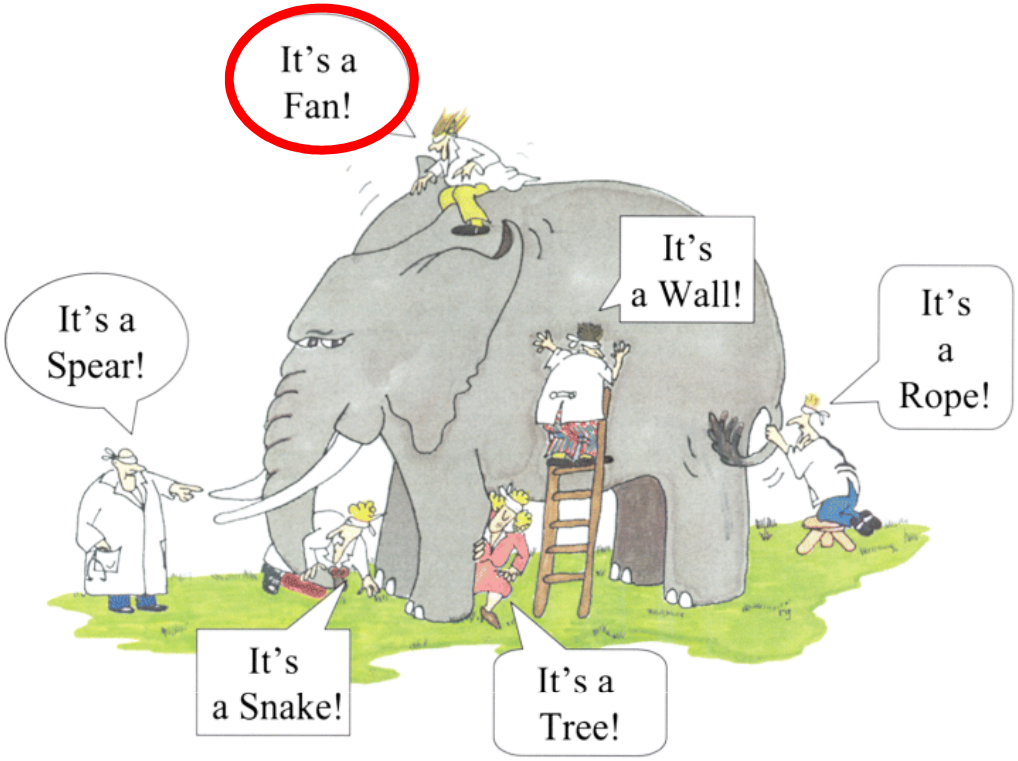
Transfusion in trauma: thromboelastometry-guided coagulation factor concentrate-based therapy versus standard fresh frozen plasma-based therapy

Table 1. Inclusion criteria

	Fibrinogen-PCC group (Salzburg Trauma Centre)	FFP group (TR-DGU)
Type of therapy	ROTEM-guided administration of coagulation factor concentrates	According to local protocols
ISS	≥ 16	
AIS thorax, abdomen, extremities	At least in one region, one injury with severity degree ≥3, $AIS_{head/neck}$ <5	
Age (years)	18–70	
Base deficit at admission	≥2 mmol/L	
FFP administered	No FFP	≥2 units FFP
Fibrinogen/PCC administered	≥1 g fibrinogen; ≥ 500 U PCC	No fibrinogen or PCC
Investigated time period	2005–2009	2005–2008
Patients included in database	353	21263
Patients fulfilling inclusion criteria	80	601

GRUPPO FIBRINOGENO (n=80)	GRUPPO FFP (n=601)
6 grammi fibrinogeno 1200 UI PCC 6 UI RBC	6 UI FFP 5.5 UI RBC
No RBC 29%	No RBC 3%
No PLT 91%	No PLT 56%
Mortalità 7.5%	Mortalità 10%
LOS ICU = 14.5 gg LOS-H = 23 gg	LOS ICU = 14 gg LOS-H = 32 gg

Schoechl H et al. Critical Care 2011, 15:R83



✓ II TEG

Vox Sanguinis (2009) **96**, 111–118

ORIGINAL PAPER

DOI: 10.1111/j.1423-0410.2008.01130.x

Effect of Haemostatic Control Resuscitation on mortality in massively bleeding patients: a before and after study

R. J. Johansson[1,2]

TABLE 4. TEG treatment algorithm

TEG variable	Treatment
R 11-14 min	2× FFP or 10 mL/kg
R >14 min	4× FFP or 20 mL/kg
MA 46-50 mm	1 PC or 10 mL/kg
MA <46 mm	2 PC or 20 mL/kg
Angle <52°	2× FFP or fibrinogen
Ly30 >8%	Tranexamic acid

MA = maximum amplitude; R = reaction time.

Thrombelastography (TEG) or thromboelastometry (ROTEM) to monitor haemotherapy versus usual care in patients with massive transfusion (Review)

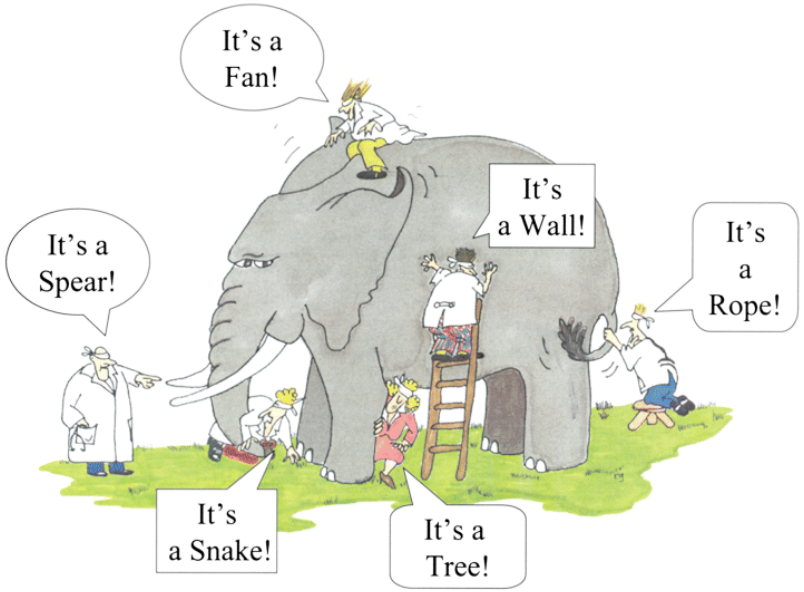
Cochrane Database of Systematic Reviews 2011,

Authors' conclusions

There is an absence of evidence that TEG or ROTEM improves morbidity or mortality in patients with severe bleeding. Application of a TEG or ROTEM guided transfusion strategy seems to reduce the amount of bleeding but whether this has implications for the clinical condition of patients is still uncertain. More research is needed.

Proportion of patients receiving platelets	Study population		RR 0.77 (0.47 to 1.26)	619 (6 studies)	⊕⊕⊕○ moderate[1,4]
	230 per 1000	177 per 1000 (108 to 290)			
	Medium risk population				
	171 per 1000	132 per 1000 (80 to 215)			
Combined transfusion volume (mL) of platelets		The mean Combined transfusion volume (mL) of platelets in the intervention groups was **31.95 lower** (70.43 lower to 6.52 higher)		545 (6 studies)	⊕⊕⊕○ moderate[1,4,5]
Combined transfusion volume (mL) of FFP		The mean Combined transfusion volume (mL) of FFP in the intervention groups was **96.35 lower** (277.54 lower to 84.84 higher)		545 (6 studies)	⊕⊕⊕○ moderate[1,4,6]
Rate of surgical re-intervention: TEG or ROTEM vs control	Study population		RR 0.91 (0.44 to 1.87)	708 (7 studies)	⊕⊕⊕○ moderate[1]

E il re si divertì a quella zuffa.

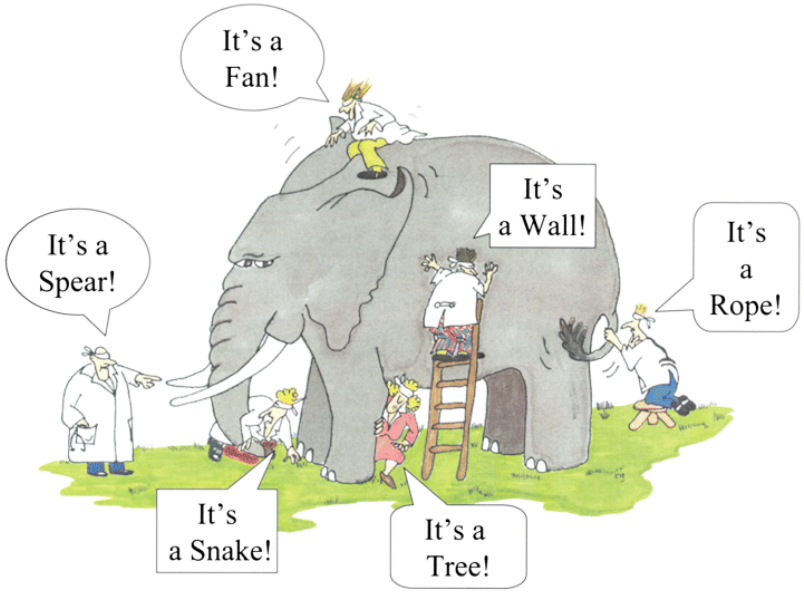


Trauma-Induced Coagulopathy—A Review of the Systematic Reviews: Is There Sufficient Evidence to Guide Clinical Transfusion Practice?

Nicola Curry, Simon Stanworth, Sally Hopewell, Carolyn Dorée, Karim Brohi, and Chris Hyde

Transfusion Medicine Reviews, Vol 25, No 3 (July), 2011: pp 217-231.e2

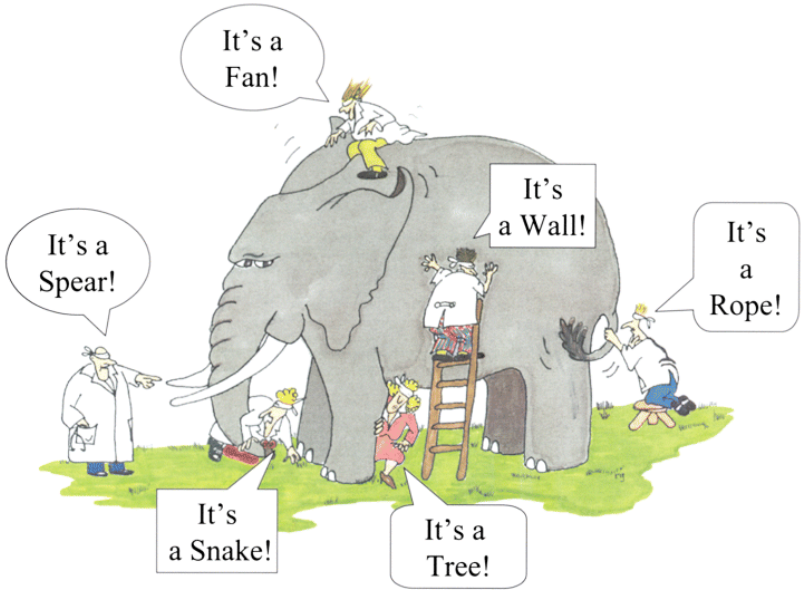
Systematic reviews are accepted as a robust and less biased means of appraising and synthesizing results from high-quality studies. This report collated and summarized all the systematic review evidence relating to the diagnosis and management of trauma-related coagulopathy and transfusion, thereby covering the widest possible body of literature. We defined 4 key clinical questions: (1) What are the best methods of predicting and diagnosing trauma-related coagulopathy? (2) Which methods of clinical management correct coagulopathy? (3) Which methods of clinical management correct bleeding? and (4) What are the outcomes of transfusion in trauma? Thirty-seven systematic reviews were identified through searches of MEDLINE (1950–July 2010), EMBASE (1980–July 2010), *The Cochrane Library* (Issue 7, 2010), National Guidelines Clearing House, National Library for Health Guidelines Finder, and UKBTS SRI Transfusion Evidence Library (www.transfusionevidencelibrary.com). The evidence from the systematic review literature was scanty with many gaps, and we were not able to conclusively answer any of our 4 questions. Much more needs to be understood about how coagulopathy and bleeding in trauma are altered by transfusion practices and, most importantly, whether this translates into improved survival. There is a need for randomized controlled trials to answer these questions. The approach described in this report provides a framework for incorporating new evidence.



Il principe ascoltò i sei ciechi che descrissero di nuovo l'elefante. Dopo un lungo silenzio, egli dichiarò: "Tutti e sei dicono la verità, ma ognuno di essi ha toccato solo una parte dell'animale, e quindi conosce solo quella parte di verità. Finché ognuno crede di essere il solo ad avere ragione, nessuno conoscerà la verità intera. I diversi colori del caleidoscopio non si mescolano forse per formare un solo e splendido disegno?"

In sintesi…

- ✓ Il rapporto PFC:EC [o meglio il deficit di PFC] è importante ma occorre distinguere meglio fra singoli pazienti
- ✓ Il timing dell'intervento è fondamentale [scenari organizzativi]
- ✓ Proprio per questo è interessante la possibilità di gestire l'emergenza emorragica con CCP/FIB/ROTEM riducendo uso di PFC
- ✓ Tranexamico utile ma solo entro 3 ore



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Il principe descrisse allora l'elefante mettendo insieme le sei descrizioni e gli abitanti del villaggio seppero finalmente che aspetto aveva quello straordinario animale."