UNIKLINIK KÖLN

Klinik und Poliklinik für Herz- und Thoraxchirurgie

Point-of-care based coagulation management in cardiac surgery
A meta-analysis of 8332 patients

.

Dr. A.-C. Deppe

07.11.2016

Surgery 2016. Alicante - Spain

European Journal of Cardio-Thoracic Surgery 42 (2012) 114–120
doi:10.1093/ejcts/ezr242 Advance Access publication 12 January 2012

ORIGINAL ARTICLE

Transfusion of blood during cardiac surgery is associated with higher long-term mortality in low-risk patients

Carl-Johan Jakobsen[a,*], Pia Katarina Ryhammer[a], Mariann Tang[b], Jan Jesper Andreasen[c] and Poul Erik Mortensen[d]

Abstract

OBJECTIVE: Numerous reports have emphasized the need for reduction in transfusions of allogeneic red blood cells (RBC) due to increased morbidity and mortality. Nevertheless, transfusion rates are still high in several cardiac surgery institutions. Reports on long-term survival after cardiac surgery and RBC transfusion are few.

METHODS: Data from the Western Denmark Heart Registry (WDHR) were used to identify all (25 117) adult cardiac surgery performed in four centres during 1999–2010. Patients with multiple entries (1049), re-do cardiac surgery (985), special/complex procedures (2329), dying within 30 days (668) and not eligible for follow-up (85) were excluded leaving a cohort of 20 001. Registration in the WDHR is mandatory. WDHR and the unique Danish Civil Registration System with continuous sequential updates of the Danish population ensure that all patients and outcomes are accounted for.

RESULTS: Kaplan–Meier survival plot for low-risk patients (EuroSCORE 0–4), undergoing simple cardiac surgery showed a significantly lower estimated survival after >4500 days (0.637 vs. 0.745) when receiving perioperative RBC transfusion ($P < 0.0001$). The difference was less evident in patients with EuroSCORE 5–9 (0.373 vs. 0.4436, $P < 0.0001$), while high-risk patients showed no difference. Adjusted risk ratio, after RBC transfusion, containing among others age, sex, EuroSCORE and diabetes, was 1.83 (95% CI (confidence interval) 1.67–2.01). The survival rate was independent of up till six units of RBC.

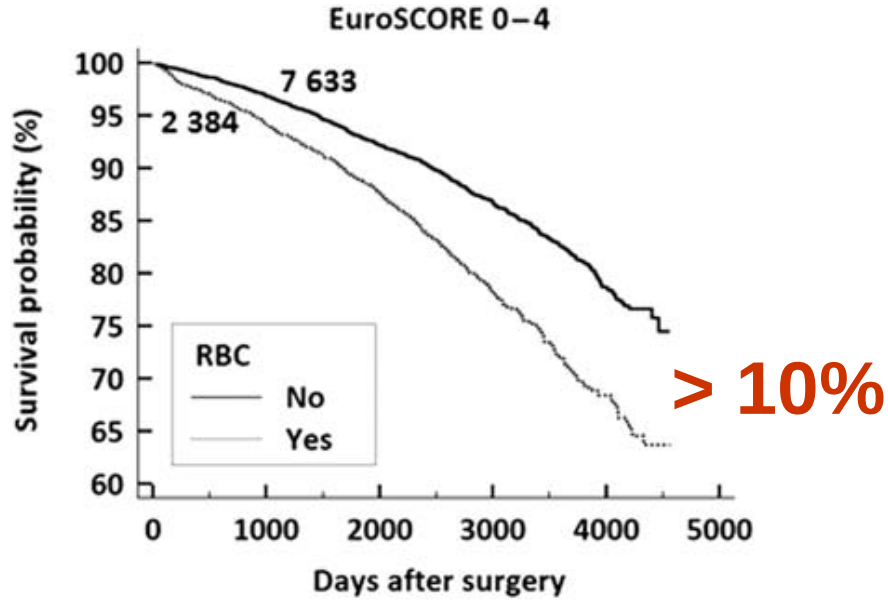
CONCLUSION: Long-term follow-up of low-risk patients undergoing simple cardiac surgery demonstrates a more than 10% higher mortality when receiving perioperative RBC transfusion. Even transfusion of 1–2 units seems to carry a risk of that magnitude.

European Journal of Cardio-Thoracic Surgery 42 (2012) 114–120
doi:10.1093/ejcts/ezr242 Advance Access publication 12 January 2012

ORIGINAL ARTICLE

Transfusion of blood during cardiac surgery is associated with higher long-term mortality in low-risk patients

Carl-Johan Jakobsen[a,*], Pia Katarina Ryhammer[a], Mariann Tang[b], Jan Jesper Andreasen[c] and Poul Erik Mortensen[d]



> 10%

Blood Transfusion and Infection After Cardiac Surgery

Keith A. Horvath, MD, Michael A. Acker, MD, Helena Chang, MS, Emilia Bagiella, PhD,

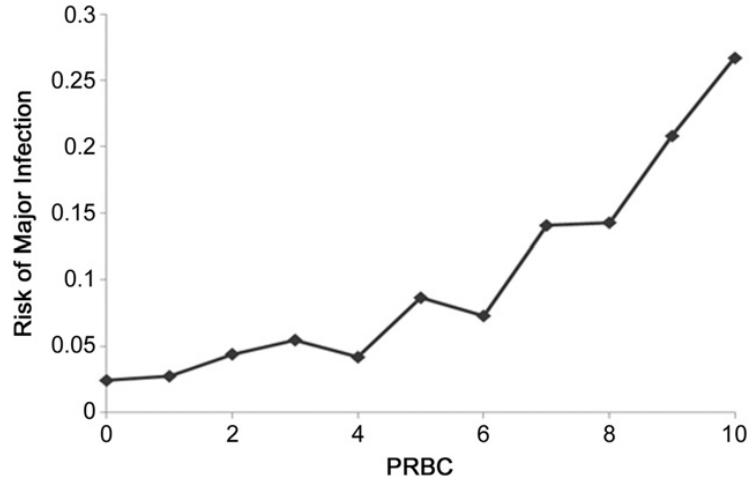
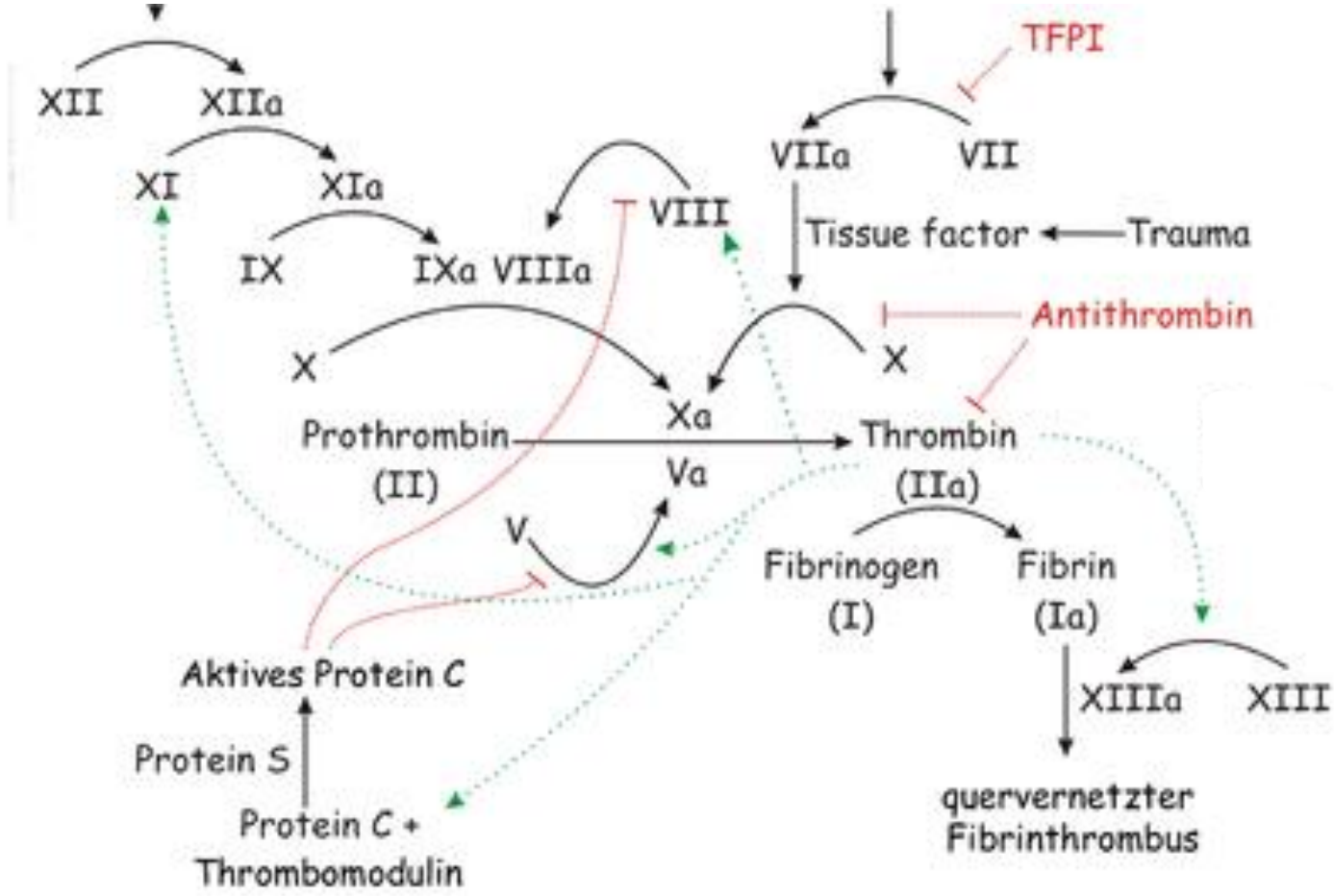


Fig 2. Risk of major infection as a function of number of packed red blood cell (PRBC) units transfused.

(Ann Thorac Surg 2013;95:2194–201)



http://de.wikipedia.org/wiki/Hämostase

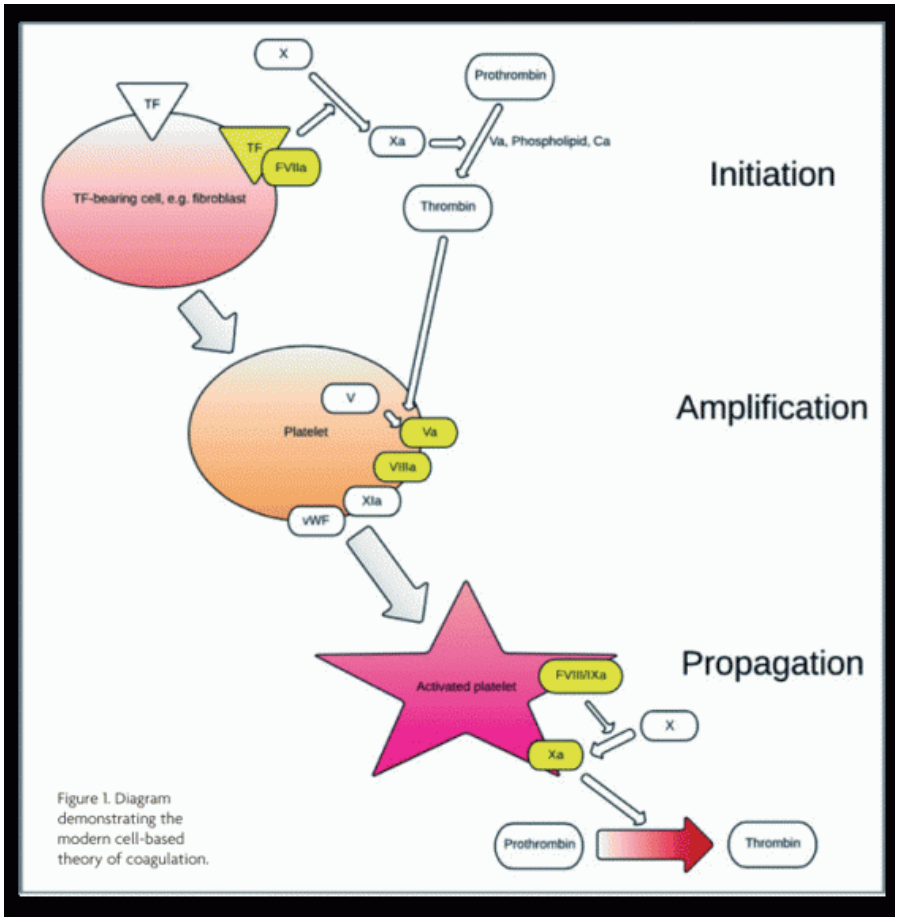
Management of Hemorrhage in Cardiothoracic Surgery

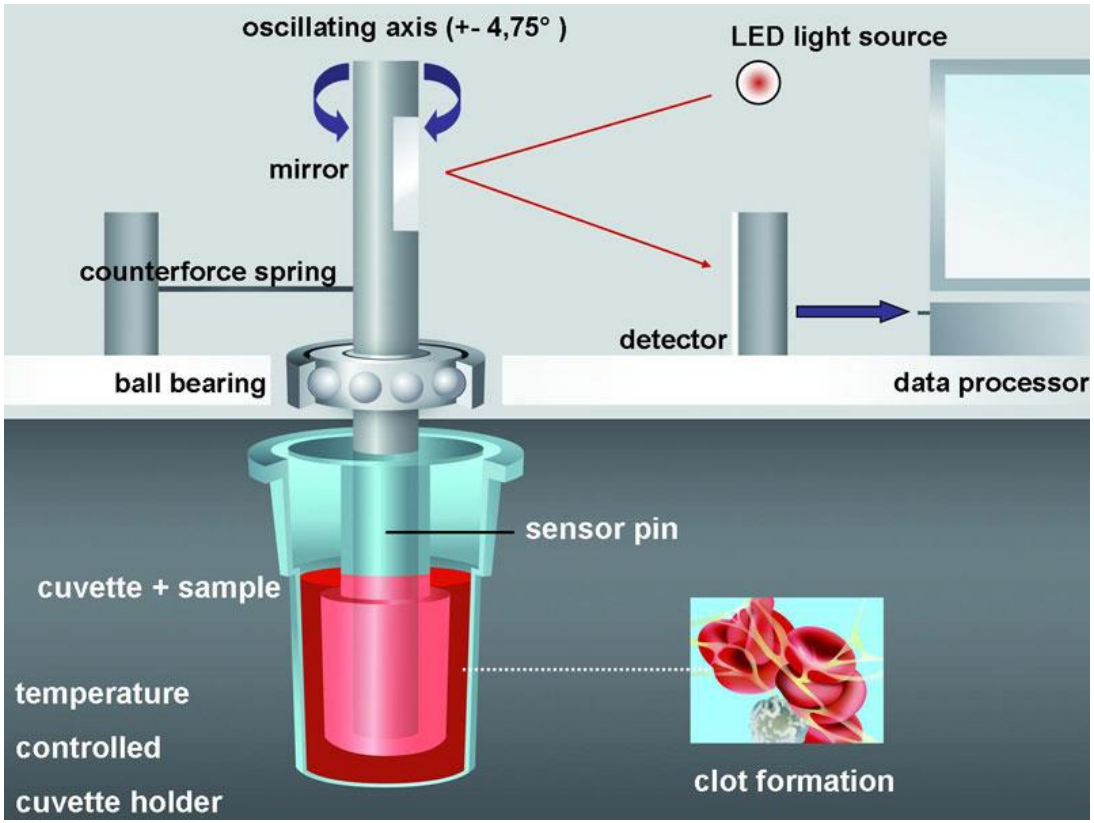
Klaus Görlinger, MD,[*] Linda Shore-Lesserson, MD,[†] Daniel Dirkmann, MD,[*] Alexander A. Hanke, MD,[‡] Niels Rahe-Meyer, MD,[‡,§] and Kenichi A. Tanaka, MD, MSc[¶]

Turnaround Time of Laboratory Tests

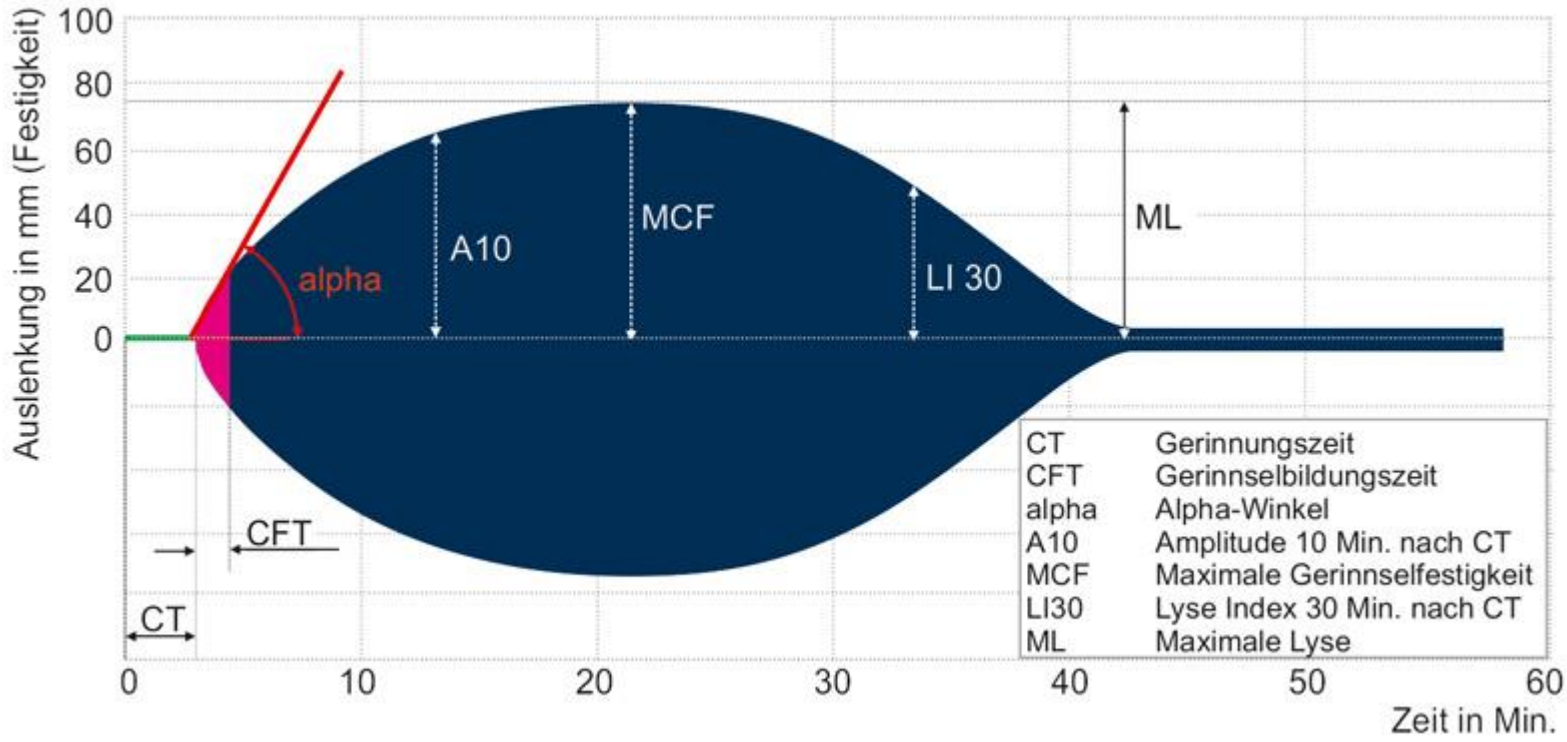
The turnaround time of routine laboratory tests such as prothrombin time (PT), international normalized ratio (INR), activated partial thromboplastin time (aPTT), and platelet count is generally 45-60 minutes, and this is not practical in guiding hemostatic therapy in severe perioperative bleeding. The results of thromboelastometry (ROTEM, Tem International, Munich, Germany) and whole-blood impedance aggregometry (Multiplate, Roche Diagnostics GmbH, Mannheim, Germany) are available within 15-20 minutes.[54,55] Studies have shown that early values of clot firmness, such as the amplitude of clot firmness 5 (A5) or 10 minutes (A10) after coagulation time (CT), reliably predict MCF in cardiac and noncardiac surgery (Fig 1).[56,57]

Journal of Cardiothoracic and Vascular Anesthesia, Vol 27, No 4S (August), 2013: pp S20–S34

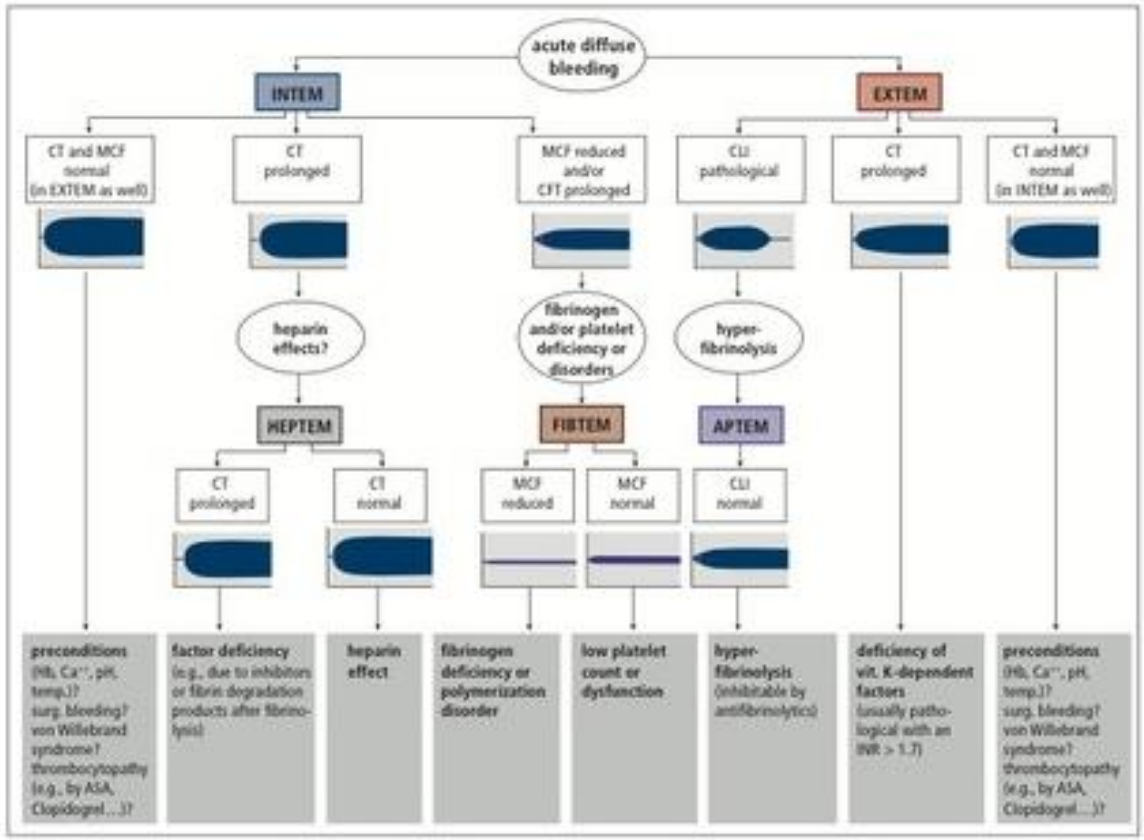




http://www.rotem.de



http://www.rotem.de



ROTEM diagnostic algorithm of the „Essener Runde“. http://www.rotem.de

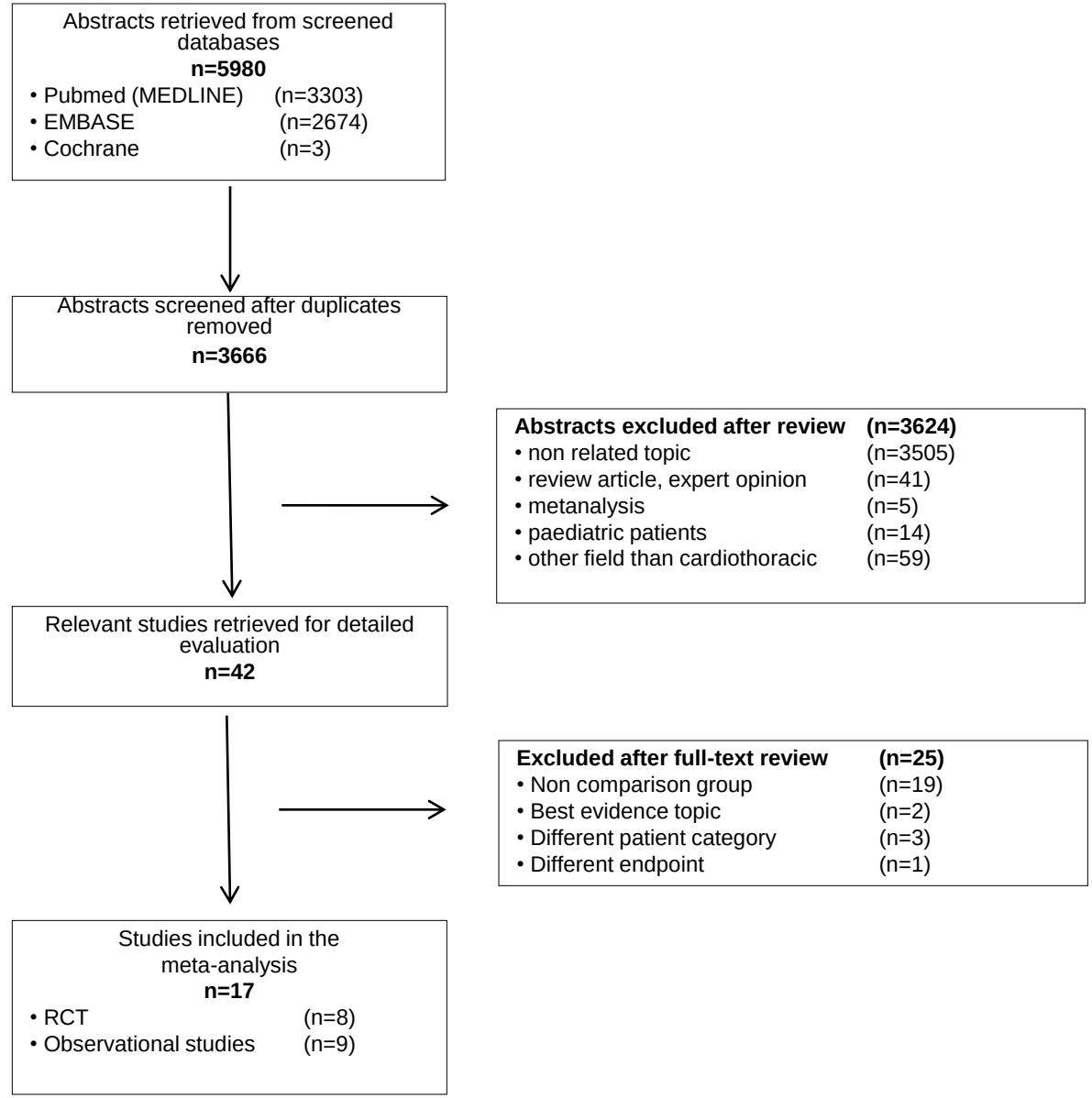
Point-of-care tests (POCT)

→ rapid detection of changes in blood coagualation

→ goal-directed individualized coagulation management

→ Standard laboratory tests are quantitative tests measuring exact concentration, whereas TEG®/ROTEM® focus on functionality

→ Current evidence for or against POCT-guided algorithm with ROTEM®/TEG® in patients with severe bleeding after cardiac surgery?



Deppe et al. J Surg Res., 2016; 203: 424-33.

Study		Design	Size POC	Size Control	POC
Ak, K.	2009	RCT	114	110	TEG
Anderson, L.	2006	R	502	488	ROTEM
Avidan, S.	2004	RCT	51	51	TEG
Fassel, J.	2013	PO	31	31	ROTEM
Girdauskas, E.	2010	RCT	27	29	ROTEM
Görlinger K.	2011	R	2147	1718	ROTEM
Hanke A.A.	2012	R	5	5	ROTEM
Kultufan Turan, S.	2006	RCT	20	20	TEG
Nuttall, G., A.	2001	RCT	41	51	TEG
Rahe-Meyer, N.	2009	R	6	12	ROTEM
Royston, D.	2001	PO	30	30	TEG
Shore-Lesserson, L.	1999	RCT	53	52	TEG
Spalding, G.J.	2007	PO	693	729	ROTEM
Spiess, B.D.	1995	R	591	488	TEG
Sun, W.	2014	PO	19	20	TEG
Weber, C.F.	2012	RCT	50	50	ROTEM
Westbrook, A. J.	2009	RCT	32	37	TEG
17 Studies		**8,332**	**4,411**	**3,921**	

Deppe et al. J Surg Res., 2016; 203: 424-33.

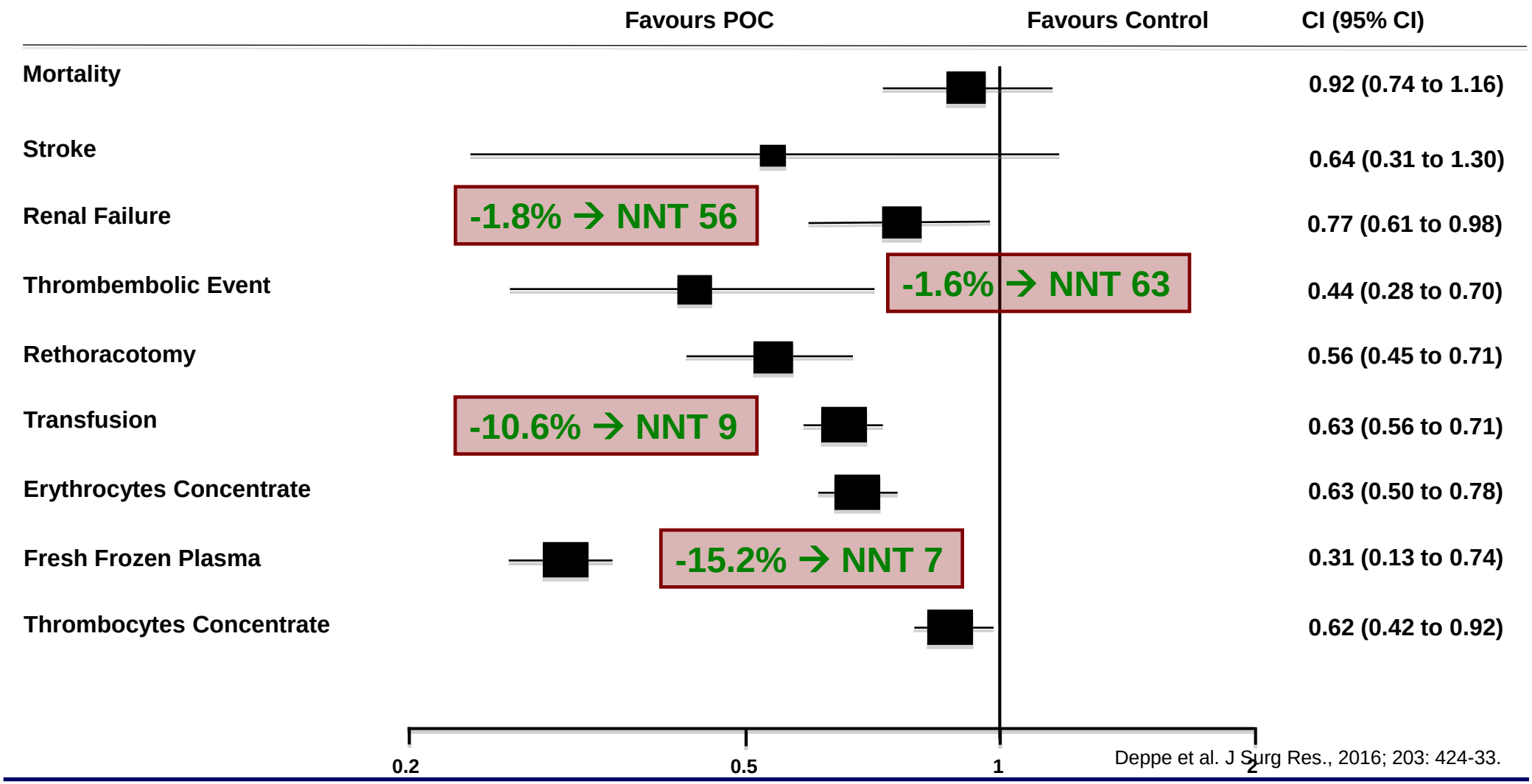
Dichotomous	Sample size (N)	Prevalence % (N)	Treatment groups % (N)	X^2 - test (*P*-value)
Female gender	8,272	29.8% (2,461)	**Control** 29.2% (1,136) **POC** 30.2% (1,325)	0.3091
Diabetes	298	27.2% (81)	**Control** 28.5% (43) **POC** 25.9% (38)	0.7045
Hypertension	298	36.2% (108)	**Control** 29.1% (44) **POC** 43.5% (64)	0.0137
COPD	298	20.8% (62)	**Control** 19.9% (30) **POC** 21.8% (32)	0.7937

Continuous	Sample size (N)	WMD	95% CI	*Overall effect* (*P*-value)
Age (years)	7,969	0.63	-0.26 to 1.53	0.1643
BMI (kg/m²)	236	0.29	-0.95 to 1.55	0.6425
EUROScore	2,791	0.39	-0.14 to 0.92	0.1516
ection Fraction (%)	280	-3.81	-7.96 to 0.33	0.0715
CPB time (min)	1,541	-5.66	-12.43 to 1.10	0.1010
Cross-Clamp time (min)	1,492	-2.91	-7.96 to 2.15	0.2599

Deppe et al. J Surg Res., 2016; 203: 424-33.

Dichotomous	Sample size (N)	Prevalence% (N)	POC % (N)	Control % (N)	OR (95% CI)	X^2-test (*P*-value)
Mortality	5,899	5.4% (319)	5.2% (163)	5.7% (156)	0.92 (0.74 to 1.16)	0.4520
CVA	4,054	0.7% (30)	0.5% (12)	1.0% (18)	0.64 (0.31 to 1.30)	0.1345
Renal Failure	4,263	6.8% (292)	6.0% (142)	7.8% (150)	0.77 (0.61 to 0.98)	0.0278
Thromboembolic events	3,975	2.0% (79)	1.3% (28)	2.9% (51)	0.44 (0.28 to 0.70)	0.0005
Rethoracotomie	8,163	4.2% (339)	3.0% (130)	5.5% (209)	0.56 (0.45 to 0.71)	<0.0001
Transfusion	5,223	54.4% (2,839)	49.6% (1,426)	60.2% (1,413)	0.63 (0.56 to 0.71)	<0.0001

Deppe et al. J Surg Res., 2016; 203: 424-33.



Deppe et al. J Surg Res., 2016; 203: 424-33.

Conclusion

TEG®/ROTEM® guided coagulation management in cardiac surgery

→ reduces the amount of transfused blood products

→ results in lower re-exploration rate

→ decreases the incidence of postoperative acute kidney injury

Should be recommended in (cardiac) surgery.

Deppe et al. J Surg Res., 2016; 203: 424-33.