

INVITED COMMENTARY

ROTEM and Propensity: Two Strategies to Save Blood and Empower Papers

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“Life is endless battle and conflict, and you cannot fight effectively unless you can identify your enemies.”¹

The article by Monaco et al.,² beyond its clinical significance, managed two medical challenges: rotational thromboelastometry (ROTEM)/thromboelastography (TEG) in complex aortic surgery and propensity score (PS) to enhance articles’ robustness.

ROTEM/TEG

Blood product transfusions can be either “reactive,” after coagulopathy or “pre-emptive,” in its absence. For both, large quantities of blood products are required.

Wikkelsø’s study³ based on a Cochrane Review states: “Transfusion strategies guided by TEG/ROTEM may reduce the need for blood products ... but the results are mainly based on trials of elective cardiac surgery ... with low quality evidence.” Monaco et al.’s article attempts to fill the gap by assessing ROTEM/TEG in surgery for thoraco-abdominal aortic aneurysm.

Both ROTEM and TEG identify malfunctioning of blood components either measuring prolonged clotting time or reaction time requiring not full blood but fresh frozen plasma and prothrombin concentrate, respectively. ROTEM also identifies specific cascade abnormalities: deficits of fibrinogen (FIBTEM) and abnormalities of the intrinsic (INTEM) and extrinsic (EXTEM) pathways. As noted, functionality is the key, knowing how the “enemy” behaves so that it can be beaten.

ROTEM/TEG should be in general use, and not restricted to severe or life threatening haemorrhage. Hanke⁴ suggests that, when used in patients with aortic arch replacement, both treatments achieve non-inferior outcomes with decreased use of blood products and reduction of costs.

PROPENSITY SCORE

To properly assess ROTEM/TEG, large RCTs are needed using a variety of clinical settings, populations, and patients with transfusion requirements. However, in surgical practice, designing and performing RCTs is cumbersome or simply not viable. Non-experimental studies, non-exempt of bias, may be more representative of the real world than RCTs. PS weighting is a tool for causal inference to adjust for measured confounders in observational studies, which has helped researchers in the design of observational studies.

In practice there may be unmeasured variables that are related to both the treatment assignment and the outcome. PS compares treated individuals who have similar “propensities” or likelihoods for receiving treatment, conditional on several covariates. Given the widespread applications of PS methods for addressing causal questions using observational studies, it is crucial to keep in mind, like other regression methods that can only be applicable for measured confounding variables: covariates are the “enemy” we must know. Knowledge is associated with treatment likelihood but not with outcome. PS analysis is as good as the completeness of potential confounding variables. Unobserved confounding is the Achilles heel of most non-experimental studies.⁵

As Austin⁶ acknowledges, analysis of PS matched samples tends to be poor in the cardiovascular surgery literature, thus Monaco’s paper contributes to increase scientific reliability after properly measuring and analysing confounders.

On 18 June 1815, Napoleon was in a hurry to attack the British and allied forces before the Prussians arrived. The soil was too muddy (it rained torrentially) and most cannonballs failed to bounce into the enemy but disappeared into the mud. This proved crucial at Waterloo. Echoing the initial sentence, winning bets for blood product transfusion will assess functionality and for PS will measure confounders.

REFERENCES

- 1 Greene R. *The 33 strategies of war*. Joost Elffers Books; 14 December 2007.
- 2 Monaco F, Barucco G, Nardelli P, Licheri M, Notte C, de Luca M, et al. A rotational thromboelastometry driven transfusion 1 strategy reduces allogenic blood transfusion during thoracoabdominal aortic aneurysm open repair: a propensity-score match study. *Eur J Vasc Endovasc Surg* 2019;58:13–22.
- 3 Wikkelsø A, Wetterslev J, Møller AM, Afshari A. Thromboelastography (TEG) or rotational thromboelastometry (ROTEM) to monitor haemostatic treatment in bleeding patients: a systematic review with meta-analysis and trial sequential analysis. *Anaesthesia* 2017;72:519–31.
- 4 Hanke AA, Herold U, Dirkmann D, Tsagakis K, Heinz J, Görlinger K. Thromboelastometry based early goal-directed coagulation management reduces blood transfusion requirements, adverse events, and costs in acute type A aortic dissection: a pilot study. *Transfus Med Hemother* 2012;39:121–8.
- 5 Liu W, Kuramoto SJ, Stuart EA. An introduction to sensitivity analysis for unobserved confounding in non-experimental prevention. *Res Prev Sci* 2013;14:570–80.
- 6 Austin PC. Propensity-score matching in the cardiovascular surgery literature from 2004 to 2006: a systematic review and suggestions for improvement. *J Thorac Cardiovasc Surg* 2007;134:1128–35.

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