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Letter to the Editor

Massive transfusion in critical haemorrhage following trauma: Aren't we missing something?

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We read with interest the recent review by Olaussen et al., presenting 36 models for prediction of critical haemorrhage following trauma.[1] The authors present the different models, their respective variables and their performance. They also discuss the utility of the individual variables. As mentioned in the publication, early diagnosis of haemorrhagic shock is a key step in improving outcomes after severe trauma. Critical bleedings indeed require aggressive treatments and need them to be applied as early as possible. Moreover, any unilateral approach would cause harm as critical bleedings require integrative care associating a mechanical (surgical or endovascular) strategy to stop the bleeding with adequate haemostatic resuscitation. Damage control resuscitation (DCR) associates damage control surgery (DCS), massive transfusion (MT) with the optimal 1/1/1 ratio of blood products, permissive hypotension and careful attention for identification and correction of the early acute coagulopathy of trauma (EACT). Adequate and early selection of trauma patients in need for DCR is pivotal to prevent wasting time as well as unnecessary activation of the technical and human resources needed for DCR.

The presented models all have been developed by retrospective identification of individual parameters independently associated with MT. Massive transfusion is commonly defined as the transfusion of more than 10 units of red blood cells (RBC) within the first 24 hours of care. This definition is problematic since it excludes trauma patients presenting to hospital with active bleeding and a need for an emergent surgical control of the bleeding. Thanks to a highly effective DCR, some of those patients do not need a large number of RBC transfusions. Moreover, severe blunt trauma patients can suffer from an EACT and are in need of a specific haemostatic resuscitation (associating treatments such as tranexamic acid, plasma, platelets or fibrinogen concentrate) and not necessarily in need of massive RBC transfusion.

Defining critical haemorrhage with MT therefore does not properly consider the other crucial components of DCR (DCS and correction of EACT) which are as important as RBC transfusion. Shouldn't we both in the clinical setting and in clinical research change our perspective, going from a massive transfusion approach to a critical haemorrhage approach?

Other scoring systems have been developed with a different endpoint. The coagulopathy of severe trauma (COAST) score, developed by the same team of the present review, aims to identify trauma patients suffering from EACT.[2] The trauma induced coagulopathy clinical score (TICCS) aims to identify trauma patients associating EACT, the need for blood products transfusion and the need for emergent surgery.[3]

There is no doubt that the presented models are all very useful in clinical practice as they bring an objective tool for prediction of critical haemorrhage. We would like to know the authors' opinion about choosing MT as the focused outcome variable and if it is the answer to critical haemorrhage after trauma.

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AUTHOR RESPONSE TO LETTER TO THE EDITOR

We would like to thank Dr. Tonglet for his constructive and appropriate letter. We agree on all the aspects of earliest possible diagnosis of haemorrhage after trauma, ideally even before hospital arrival if possible.[1]

The ideal variable for defining critical bleeding remains controversial. We agree that massive transfusion (MT) is not the gold standard identifying patients with critical haemorrhage. Firstly, the traditional definition ($\geq$10 units in the first 24 hours) is not truly representative of critical haemorrhage. A more inclusive definition is $\geq$5 units in the first 4 hours.[2] Several other definitions have indeed been suggested and were included in this review. Secondly, as correctly noted by Dr. Tonglet, MT as a variable may exclude cases of damage control surgery (DCS) and acute traumatic coagulopathy (ATC), where critical bleeding may be present, but a MT not delivered.[3]

A broader inclusion criteria that encompasses all patients requiring MT, DCR and ATC would be ideal as attempted in developing the trauma induced coagulopathy clinical score and we agree that the language shift towards critical haemorrhage, hence the title of our article, not massive transfusion.[4] Unfortunately, unique challenges for retrospective identification of patients with critical haemorrhage exist. Indications and availability of DCS are varied and the diagnosis of ATC ranges anywhere from viscoelastic measures to traditional measures of INR and aPTT. Even the objective measures of MT are prone to bias dependent on variable indications of transfusion in the trauma setting, but likely to be more consistent at this time.[5]

In planning our review, we had concerns about models that included too many outcome variables in the same prediction attempt because of the introduction of heterogeneity. Hence we chose a narrow outcome measure with the presumption that it may be adequate to predict MT alone with perceived benefits that prediction mobilises the blood bank, the angio-embolisation team and trauma surgeons. Critical bleeding is time dependent. Most studies rely on prediction scores from a particular time point - which are unsurprisingly unreliable. This is illustrated in our review. Time base analyses using continuous physiologic variable monitoring such as described by Mackenzie et al.,[6] seem likely and logically to provide better predictive values. Because patients may develop haemorrhagic shock over time, we believe an approach with frequent, standardised, repetitive assessment over time with a simple model, (e.g. the shock index[7]) may prove more accurate and feasible than finding an advanced model applied at a single-point in time.

The Holy Grail is identifying the bleeding patient. Dichotomising between 'critical bleeding' and not 'critical bleeding' is useful for research purposes, but will remain clinically arbitrary and academic. However, for prediction to be of any utility it must function to prepare the relevant teams and services for what the patient may need and be tailored to the needs of an individual service.

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