

## Balanced resuscitation: the role during non-massive hemorrhage

Kent Garber, Lucy Kornblith , Joseph Cuschieri 

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During the past two decades, balanced transfusion strategies for patients with traumatic hemorrhage have been increasingly adopted. Research has predominantly concentrated on the sickest trauma patients—those receiving “massive transfusion,” classically defined as receiving over 10 units of red blood cells (RBCs) within 24 hours after injury. For this group, a higher ratio of plasma to RBCs has been associated with reduced early mortality due to hemorrhagic shock and improved outcomes.<sup>1,2</sup>

However, as highlighted by Jehan *et al*<sup>3</sup> most civilian trauma patients receiving blood transfusion do not receive “massive transfusion.” Data from the American College of Surgeons’ Trauma Quality Improvement Program (TQIP) indicate that less than 3% of trauma patients receive more than 10 units of RBCs within 24 hours.<sup>4</sup> Therefore, decision-making around transfusing plasma and platelets with RBCs in the majority of trauma patients suffers from a lack of comprehensive data to guide us.

To address this gap, Jehan and colleagues analyzed TQIP data from 2016 to 2019 for over 85 000 patients receiving “submassive transfusions” and explored whether there is a mortality benefit when plasma and platelets are administered with RBCs, and what the RBC threshold is where the addition of plasma and platelets becomes beneficial. Using backward stepwise logistic regression and propensity matching, they identified that the addition of plasma or platelets for patients receiving 1–3 units of RBCs was not associated with reduced mortality. However, for patients receiving more than 3 units of RBCs, the combined use of plasma or platelets significantly lowered the odds of death.

Although subject to the usual limitations of retrospective large database study designs, the findings are important. They contribute to the knowledge of beneficial resuscitation strategies for the majority of injured civilians, for which the traumatic hemorrhage transfusion trials have not well addressed potential coagulopathy.<sup>5</sup>

That said, there is much more to the story that needs to be unraveled. The study excluded patients who died within 24 hours, a crucial subgroup. Further, the design used the classical “massive transfusion” definition, which has been substantially challenged in modern resuscitation.<sup>6</sup> This is important as it is possible patients analyzed in the “submassive transfusion” category may have been massively hemorrhaging by more modern definitions. Finally, the study also did not evaluate the

effects of different plasma or platelet volumes or ratios, timing of administration, or coagulation profiles in patients receiving combined resuscitation versus RBCs alone. Future studies should examine these variables, but until then these results support consideration of early initiation of combined resuscitation for patients receiving 3 units of RBCs or more.

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**ORCID iDs**Lucy Kornblith <http://orcid.org/0000-0002-1861-9691>Joseph Cuschieri <http://orcid.org/0000-0003-1456-6841>**REFERENCES**

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Surgery at ZSFG, University of California San Francisco, San Francisco, California, USA

**Correspondence to**

Dr Joseph Cuschieri; joseph.cuschieri@ucsf.edu