Storage time does not affect outcome after massive blood transfusion in trauma and non-trauma patients

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Introduction

Red blood cell transfusion and massive blood transfusion are independent risk factors for mortality. Prolonged stored packed red blood cells (PRBC) might increase morbidity and mortality. Therefore, we tested whether prolonged storage increases mortality in patients receiving massive transfusion after trauma needing surgery and surgery related to non-trauma issues. As a secondary hypothesis, we considered the extent to which a differential relationship for trauma and non-trauma patients and mean PRBC storage duration exists.

Patient Characteristics/ Methods

Assessed for eligibility (n=496)

Excluded (n=191)

- Died with 6 hours of starting massive blood transfusion (n=75)
- Gastrointestinal bleeding without surgical intervention (n=19)
- Incomplete data/ inadequate documentation (n=54)
- Did not meet inclusion criteria (n=34)

Analyzed (n=305)

Trauma patients (n=214)

average ISS score: 30.3

- Abdominal trauma 25%
- Polytrauma 19%
- Gunshot wound 18%
- Motor vehicle accident 17%
- Thoracic trauma 8%
- Large bone fracture 5%
- Blunt trauma 5%
- Stab wound 3%

Non-Trauma patients (n=91)

Elective surgery: 41%

- Oncology 10%
- General surgery 10%
- Vascular surgery 7%
- Gynecology 3%
- Orthopedic/ spine surgery 1%

Results

The final analysis was done in 305 patients receiving a total of 8046 PRBCs. Patient mean PRBC storage duration ranged from 8 to 36.6 days with a mean $\pm$ standard deviation of 22.1 ± 5.9 days.

The odds ratio (95% confidence interval (CI)) for in-hospital mortality corresponding to a one-day in mean PRBC storage duration was estimated at 0.99 (0.95, 1.03, $P=0.77$). We did not find a differential relationship between trauma and non-trauma patients ($P=0.75$). Data from 259 patients was included into a multivariable analysis but the result did not differ from the univariable analysis and the odds ratio (95% CI) was 0.99 (0.94, 1.05) after adjusting for age, sex, blood type, initial heart rate, initial systolic blood pressure, initial pH, and number of transfused PRBCs were selected for adjustment in the final models.

Univariable relationship between patient mean PRBC storage duration (mPRBC-StD) and in-hospital mortality.

A: Overall results, presented as estimate and pointwise 95% confidence interval. A histogram of the observed values of patient mean RBC storage duration underlies the plot. The P-value represents a Chi-squared test of association for a univariable logistic regression model which incorporated restricted cubic splines to allow for nonlinearities.

B: Univariable relationship between mPRBC-StD and in-hospital mortality, separately for **trauma (dashed lines)** and **non-trauma (shaded regions)** patients. Results presented as group-specific estimates and pointwise 95% confidence intervals. Histograms of the observed values of patient mean RBC storage duration underlie the plot. The lack of significance indicated by the P-value in the figure indicates that our data did not support the hypothesis that the nature of the relationship differed among the groups (i.e., test for the interaction between group and patients' mPRBC-StD).

Conclusion

In summary, our data suggest that mean PRBC storage duration does not correlate with patients mortality after massive blood transfusion. Trauma and non-trauma patients did not differ in regard to susceptibility toward prolonged stored PRBCs.