Can Non-Invasive Hemoglobin Predict Use of Universal Blood or Urgent Transfusion During Trauma Patient Resuscitation?

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Introduction

We examined whether pulse-oximetry-derived continuous hemoglobin [SpHb] or laboratory hemoglobin [Hb] can predict universal donor (UnX) or additional urgent blood transfusion in first 4 hours of trauma patient resuscitation. *Hypothesis*: SpHb obtained immediately, can identify use of UnX or urgent transfusion better than clinician judgment or Hb.

Methods

SpHb and Hb, and clinical judgment to predict UnX or any blood transfusion up to 4 hours after admission of trauma patients with Shock Index (SI =heart rate/ systolic blood pressure) > 0.6, were compared via multiple linear regression and differences correlated as mean +/- standard deviation (SD,) Bland-Altman bias between paired measurements.

Results

Simultaneous SpHb and Hb were measured on 346 trauma admission to the Shock Trauma Center (STC). Thirteen patients received UnX, and nine received additional blood within 4 hours. Of 83 patients with SI > 0.9, 8 received UnX and 6 further blood < 4 hours, of 188 patients with SI 0.7-0.9, 3 received UnX and 3 patients further blood < 4 hours. Among 70 patients with SI 0.6-0.69, two received UnX transfusion. Predictions of UnX by SI > 0.9 Area Under Curve (AUC) was 0.69 and SI > 0.9 prediction of blood in 4 hours AUC 0.72. Hb predicted UnX use with AUC 0.77. SpHb predicted both UnX and any blood in < 4 hours with AUC 0.54. Differences in Hb v SpHb predictions of UnX and any blood < 4 hours were significant ($p<0.01$). Bland Altman bias between SpHb and Hb was 0.6 +- SD 1.96 g/dl with correlation coefficient 0.49. Absolute Hb was 11.8 +-SD 2.26g/dl before UnX.

Conclusions

Routine laboratory Hb had better prediction of UnX and any urgent blood transfusion compared to SpHb, but was not better than pre-hospital SI. Clinical judgment for UnX. was probably anticipatory and based on visible injury and blood loss, as the UnX pre- transfusion mean Hb was high and SD value largeFunding: FA8650-11-02-6D01(ONPOINT) + ONPOINT Investigators include clinicians at STC and from USAF C-STARS, epidemiologists, electrical engineers, computer scientists, statisticians and technologists.