

Abstract of Research Presented at the  
Society of Thoracic Surgeons (STS) Annual Meeting

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## The Unintended Consequences of Over Reducing Cardiopulmonary Bypass Circuit Prime Volume

### CLINICAL OUTCOMES AND ECONOMIC IMPACT

Contrary to the current trend of reducing prime volume in the heart lung machine to avoid blood transfusions during cardiac surgery, reducing the volume too much (<500 mL) can actually increase transfusions. When used efficiently, red blood cell transfusions may save lives, but these same transfusions are also associated with significant patient complications.

This research is based on SpecialtyCare's Multi-Institutional Operative Registry. In the field of cardiovascular perfusion, this patient registry is the largest of its kind in North America.

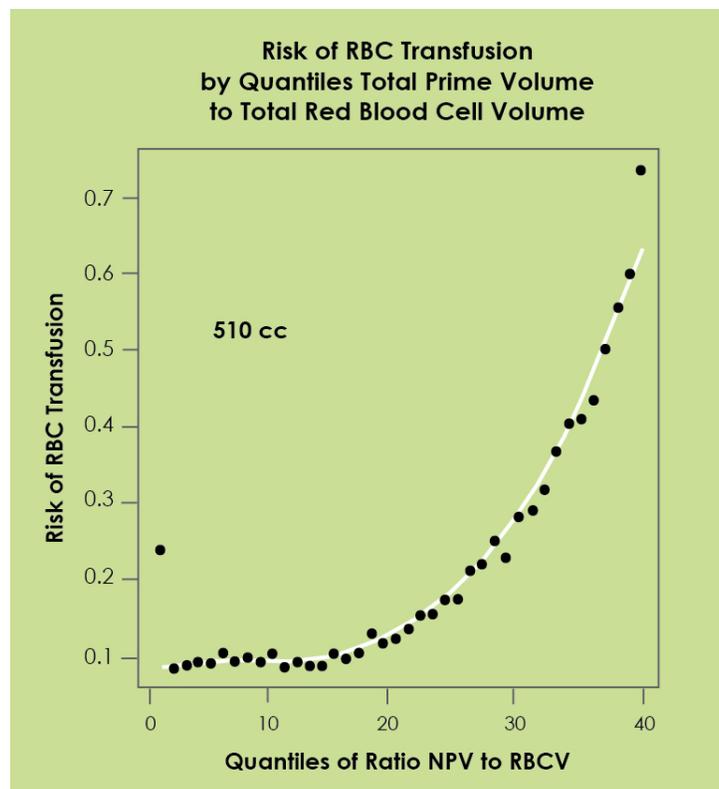
#### Impact on Patient Care

- Reduce patient exposure to complications associated with blood transfusions, such as acute kidney injury and pneumonia
- Alarms previously removed to reduce volume can be replaced, improving patient safety and outcomes

#### Economic impact

- Cost of blood preparation and administration reduced
- Cost related to complications from blood use and the resulting increase in length of stay reduced

Across SpecialtyCare customers, the financial savings was \$3.4 million in actual blood acquisition costs. The related costs associated with patient morbidities are estimated to be between \$8-12 million.



## RESEARCH ABSTRACT

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**Commercial Relationships**

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**Purpose**

The Society of Thoracic Surgeons blood conservation guidelines recommend minimizing cardiopulmonary bypass (CPB) circuit prime volume (PV) as an integral, evidence-based (Class I, Level A) blood conservation strategy. We used a large, multi-institutional database to evaluate the effectiveness of restricting CPB prime volume on intraoperative red blood cell (RBC) transfusion.

**Methods**

We reviewed 51,100 isolated coronary artery bypass grafting (CABG) procedures performed among 190 institutions between April 2012 and May 2015. We categorized net prime volume (NPV) as total prime volume minus autologous priming and evaluated three groups: <500 mL, 500-999 mL, and  $\geq 1$  L. The primary outcome was transfusion of at least one unit of intraoperative RBCs. Logistic regression was used to model the odds of transfusion. We report odds ratios for transfusion after adjusting for age, gender, acuity, re-operation, estimated blood volume (EBV), first hematocrit in the operating room, nadir hematocrit on CPB, and year. We tested for an interaction by gender.

**Results**

Nearly one-quarter of patients ( $n=11,351$ , 22.2%) received an intraoperative RBC transfusion. Relative to an NPV between 500-999 mL, patients exposed to NPV <500 mL had a 1.26-fold increased adjusted odds of transfusion, while those exposed to a net prime  $\geq 1$  L had a 1.61-fold increased odds of transfusion. Women had similar average CPB NPV to men (864 mL vs 858 mL,  $P = .12$ ), although a higher odds of transfusion (OR 5.26,  $P < .001$ ). There was a statistical interaction by gender,  $P = .037$ . Relative to patients with NPV between 500-999 mL, men exposed to an NPV  $\geq 1$  L had a 1.52-fold increased adjusted odds of transfusion and a 1.36-fold increase when exposed to net prime of <500 mL (both  $P < .001$ ). Women had a 1.72-fold increased adjusted odds of transfusion when exposed to net prime of  $\geq 1$  L ( $P < .001$ ), but a non-significant 1.11-fold increase when exposed to net prime <500 mL ( $P = .12$ ).

**Conclusions**

Efforts to minimize CPB NPV below 500 mL do not protect patients from intraoperative RBC transfusion and may actually increase exposure. Perfusion net prime volume can impact both patient morbidity and the economic impact associated with blood utilization. Further studies on the influence of gender on blood transfusion are warranted.