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Obesity Beyond a BMI > 35 Does Not Protect Patients Undergoing Cardiac Bypass Surgery from Red Blood Cell Transfusion

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Purpose
The effect of obesity on allogeneic intraoperative blood product transfusion in patients undergoing coronary artery bypass graft surgery (CABG) is poorly understood. We analyze the influence of obesity on the risk of intraoperative red blood cell (RBC) transfusion among 45,200 consecutive non-reoperative CABG procedures from a multi-institutional perfusion database.

Methods
Patients operated on between April 2013 and May 2015 were grouped into six Body Mass Index (BMI) groups according to World Health Organization (WHO) categories: underweight (BMI < 18.5), normal weight (BMI 18.5 to 25), overweight (BMI 25 to 30), obese I (BMI 30 to 35), obese II (BMI 35 to 40), and obese III (BMI > 40). Binary logistic regression was used to predict risk of transfusion for each BMI category relative to normal weight patients. Our analysis controlled for known confounds including: gender, age, estimated blood volume (Nadler formula), procedure acuity, net extracorporeal circuit prime volume, first hematocrit (Hct) in the operating room, nadir Hct on cardiopulmonary bypass (CPB), use of retrograde autologous priming, volume added on CPB, ultrafiltration volume, urine output on CPB, procedure duration, and quarter of procedure.

Results
Table 1 reports for each BMI category. Among all patients in our study, 43.8% (n=19,792) fell into one of the three WHO categories for obesity. Observed RBC transfusion rates were lowest for the obese III category (15.4%) and gradually increased across successively smaller BMI categories. After adjusting for all confounding variables listed above, overweight status was associated with a 14.3% decrease in risk of transfusion, the largest of any BMI category. A BMI in obese I category was associated with a 9.9% decrease in transfusion risk (p < 0.05). Compared to patients with a normal BMI, obese II and obese III patients do not have any change in the relative risk of RBC transfusion.
Conclusion
Overweight and mild obesity have a protective role in reducing intraoperative blood transfusion during CPB surgery. However, logistic regression analysis showed that much of the observed reduction in transfusion rates for obese patients can be accounted for by other known confounds. The lack of a linear effect of increasing BMI on blood transfusion risk is a novel finding and warrants further investigation.