AACP 2019 Paper Presentation

Thursday, February 7, 2019 (07:45 – 9:30 AM)

THE EFFECT OF VARIOUS BLOOD MANAGEMENT STRATEGIES ON INTRAOPERATIVE RED BLOOD CELL TRANSFUSION IN FIRST TIME CORONARY ARTERY BYPASS GRAFT PATIENTS

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Effective blood management during cardiac surgery requires a concerted, multifactorial cross-discipline effort to limit patient exposure to allogeneic blood products. The present study evaluated the distribution of high-evidence, intraoperative blood management interventions in patients undergoing first time coronary artery bypass graft surgery (CABG) with cardiopulmonary bypass (CPB).

Records from patients undergoing non-reoperative CABG surgery at 120 hospitals occurring between January 2017 and December 2017 were reviewed, and performance quartiles with respect to intraoperative red blood cell (RBC) transfusion established. The 30 hospitals with the lowest transfusion rates fell into each of the 1st quartile (low transfusion group – LT, N=3,566 patients), while the 30 hospitals with the highest transfusion rates fell into 4th quartile (high transfusion group – HT, N=2,620). A survey was sent to the chief perfusionist at each hospital in each group to assess the use of the blood management techniques which included: Acute normovolemic hemodilution (ANH), autologous prime (AP), fluid management, intraoperative autotransfusion, residual CPB volume processing, ultrafiltration and nadir hematocrit (HCT) for RBC transfusion both on-CPB and post-CPB.

Patients in the LT group had a RBC transfusion rate of 6.4%, while in the HT group 23.6% were transfused. While there was no difference in gender or age between quartiles, the LT group had higher body surface areas and larger estimated blood volumes. Time on CPB was significantly longer in the HT group (100.2$\pm$40.7 min v. 95.6$\pm$38.0 min, $p<0.001$). Fluid management was reduced in the LT group with smaller net prime volumes and lower crystalloid use during CPB, but no difference in anesthesia crystalloid volumes was observed. The LT group did not use ANH as often (5.9% v. 14.5%, $p\leq0.001$), and had lower sequestered volumes when used (375.7$\pm$131.5 mL v. 529.9$\pm$190.8 mL, $p\leq0.001$). The use of AP was higher among hospitals in the LT group (89.3 % v. 86.8%, $p\leq0.036$) with greater volumes displaced (920.5$\pm$408.9 mL v. 693.9$\pm$419.8 mL, $p\leq0.001$). Ultrafiltration was used more often within the LT quartile group (39.7 v. 35.1, $p\leq0.001$), with more volume removed as well (1,562.8$\pm$963.7 mL v. 1,340.7$\pm$956.9 mL, $p\leq0.001$). In the LT group Nadir HCT for transfusion on-CPB averaged 1.6% lower, and 3.0% lower for transfusion post-CPB. Intraoperative RBC units transfused averaged 0.13$\pm$0.69 U per patient in LT group compared to 0.50$\pm$1.15U in the HT group. Mixed-effects logistic regression identified first in operating room and first on CPB HCT, estimated blood volume, and nadir HCT for transfusion as the strongest predictors for RBC transfusion.

Significant variation exists in the transfusion of RBC in CABG patients undergoing CPB which may be related to the application of intraoperative blood management techniques and acceptable nadir HCT during cardiac surgery.