Editorial

Judicious red blood cell transfusion practices in non-cardiac thoracic surgery: more than just matters of the heart

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A mindful approach to intra-operative utilization of red blood cell (RBC) transfusion has become a topic of renewed interest in the last few years. While maintaining adequate tissue perfusion and oxygen carrying capacity is vital to optimizing surgical outcomes, liberal transfusion parameters are also potentially harmful. Transfusion of blood products is associated with increased rates of infection (cytomegalovirus, Epstein-Barr virus, hepatitis B, hepatitis C, chagas, babesiosis, Lyme, etc.), acute transfusion reactions, transfusion related acute lung injury, and hemolysis, among other complications, suggesting that a judicious approach to their use is appropriate (1-5). Initiatives to improve blood utilization may have the most impact in the surgical arena, given large variations in transfusion practices that have been evidenced in both cardiac and non-cardiac surgical subspecialties (6,7). As such, significant efforts have been made to standardize blood utilization in surgical practices. For example, Mazer and colleagues demonstrated that a restrictive approach to intraoperative red cell transfusion in moderate-high risk cardiac surgery patients was non-inferior to a liberal approach in terms of survival, cardiovascular, and renal outcomes (8). In fact, in 2021 the Society for Thoracic Surgery, American Society of Extracorporeal Technology, Society of Cardiovascular Anesthesiologists, and Society for Advancement of Blood Management published an update to their blood management practice guidelines (9). This document incorporated the framework of patient blood management (PBM) in proposing sweeping recommendations in pre-operative, intra-operative, and post-operative care practices to reduce blood loss and transfusion. The tenets of PBM, which are included in *Figure 1*, provide structure to the protocolized approach that the guidelines espouse. Most of the focus in blood utilization has been on surgical subspecialties with high rates of intra-operative hemorrhage, like orthopedic and cardiovascular surgery (10). Unfortunately, there is little evidence to guide transfusion practice changes in non-cardiac thoracic surgery, although opportunity exists in this realm, too.

In a recent issue of *Journal of Thoracic Disease*, Galata and colleagues provide a much-needed update on erythrocyte transfusion practices in non-cardiac thoracic surgery (11). The authors performed a retrospective analysis of 379 consecutive patients that underwent general thoracic surgery at their tertiary referral center in Mainz, Germany in 2021. In their analysis the authors assessed RBC transfusion needs during the first three days of surgery

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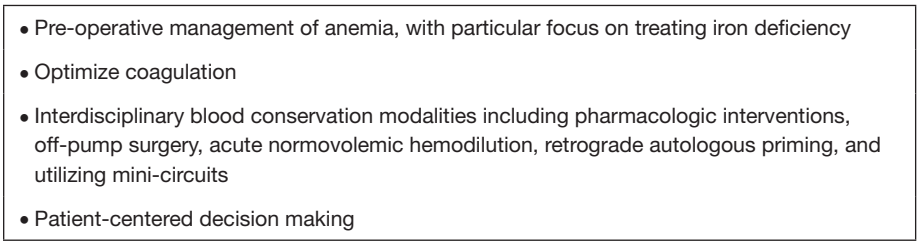

Figure 1 Tenets of patient blood management.

and performed univariate and multivariate analyses to identify risk factors associated with greater transfusion requirements. The Mainz cohort consisted of patients with a median age of 65 (IQR, 53–74) and a body mass index (BMI) of 25.4 kg/m^2 (IQR, 22.0–29.6). Just over half (50.7%) had malignant disease. Fifty-five percent of the cohort were an American Society of Anesthesiologists (ASA) disease severity class 3 (severe systemic disease), while 29% of patients were class 2 (mild systemic disease), and ~15% of patients had class 4 disease (severe disease that is a constant threat to life). All patients were routinely cross matched for two units of blood, more for high-risk cases. The majority of cases performed were minimally invasive with 72.4% being video-assisted thoracic surgery (VATS) or robot-assisted thoracic surgery (RATS). A similar percentage of cases (72.6%) were elective cases. Lung resections accounted for 44.6% of cases, with 18.5% being wedge resections and 15.3% being lobectomies. Of the 55.5% cases that were not resections of lung parenchyma, 16.4% were pleural surgeries, 10% decortications, 7.4% chest wall cases; the rest included surgery to the mediastinum and evacuations of hemothoraces and pneumothoraces. Notably, close to 20% of patients were on anticoagulation prior to surgery, but all therapeutic anticoagulation was held for an appropriate amount of time preoperatively. Aspirin, on the other hand, was continued in patients requiring elective surgery, if previously prescribed. The transfusion rate in this cohort was 7.4% (28 patients), with a median of 2 units per cross-matched patient (IQR, 2–4). The majority of patients transfused (21/28 or 75%) received blood on the day of surgery. The transfusion rate for patients undergoing minimally invasive surgery was 2.7%, while the transfusion rate for open surgeries was 20%. Transfusion rates for specific procedures included 5.2% for lobectomies, 13% for mediastinal surgery, and 44.7% for decortication of empyemas. Risk factors associated with transfusion need were identified by multivariable analysis and included pre-procedure hemoglobin ≤10.4 g/dL (OR =0.52), age >77 years (OR =1.07), the need for open surgery (OR =26.41), and decortication procedures (OR =15.71), all with P value < 0.01. Overall, 916 units of blood were crossmatched and 68 were transfused.

The findings presented by Galata and colleagues are predictable, but important. They demonstrate a real-world snapshot of transfusion needs in an academic thoracic surgery practice. With the wide-spread use of minimally invasive procedures and the establishment of patient blood management programs, transfusion incidence has decreased from a historic 23.6% for anatomic resections to 2.4%. Overall transfusion rates for all types of thoracic procedures have decreased from 16.1% to 7.4% (12). Why are these findings important? For one, they can be used to provide more accurate prognostication regarding bleeding complications to patients, especially those opposed to receiving blood products. In addition, these data can be used to identify patients that may need type and screens, *vs.* crossmatches, *vs.* no pre-procedural testing at all, providing a sensible, patient-centered approach to laboratory testing. This may be valuable for patients with known antibodies where crossmatching may be an arduous process; the blood antibody rate of 7.6% identified in this study is not insignificant. Higher risk elective procedures may be timed to coincide with favorable blood bank staffing to accommodate patient needs.

Strengths of this study include the fact that transfusion rates and risk factors for transfusions are on par with findings from recent cohort studies regarding RBC transfusion practices in thoracic surgery (13-16). Moreover, this study demonstrates what transfusion needs are in a "real-world" contemporary cohort where management practices are aligned with current recommendations for patient blood management. Different from other studies, Galata and colleagues identify that patients undergoing non-elective procedures are at higher risk for RBC transfusions. This study is limited by its single-center, retrospective design, which in this case further highlights

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idiosyncratic institution-specific practices. For example, the crossmatch rate of 86.5% in this center is high compared to other centers, especially when many other centers are limiting type and screens for anatomic lung resections and esophagectomies (13,17,18). It would have been interesting to have seen more granular data regarding pre-operative management in elective procedures, especially related to treating anemia and optimizing anticoagulation.

Overall, the authors provide compelling evidence related to the benefits of patient blood management and embracing minimally invasive surgery in reducing transfusion needs. These common-sense approaches are important for stewardship of scarce resources and have the potential to improve patient outcomes.

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