Patient Blood Management in Pediatric Complex Cranial Vault Reconstruction: Time for Some Action

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In this issue of Anesthesia & Analgesia, the Pediatric Craniofacial Collaborative Group (PCCG) presents the results of a retrospective study that assessed a potential association between surgical case volume and perioperative outcome in pediatric patients undergoing complex cranial vault reconstruction. Data were obtained from the Pediatric Craniofacial Surgery Perioperative Registry, a prospective observational registry created by the PCCG in 2011 under the auspices of the Society for Pediatric Anesthesia to describe the anesthetic and surgical management of pediatric patients undergoing craniofacial surgery. The PCCG now includes 33 North-American institutions. The primary objective of the study was to examine the relationship between surgical case volume and perioperative blood product transfusion. The secondary objective was to evaluate a potential association between the primary end point (eg, surgical case volume and transfusion) and the incidence of major perioperative complications, including intensive care and hospital length of stay. The authors observed a progressive decrease in blood product transfusion from low- (median of 0.64 case/mo) to medium- (median of 1.34 cases/mo) to high-volume (median of 2.65 cases/mo) centers. The total perioperative blood donor exposure decreases significantly in the middle- (odds ratio: 0.77, 95% CI, 0.67–0.88; P < .001) and high-volume (odds ratio: 0.69, 95% CI, 0.61–0.79; P < .001) centers when compared to low-volume centers. A statistically significant, but clinically marginal, difference in volume of perioperative blood product transfused was also reported between middle- (median: 28.6 mL/kg, interquartile range: 16.6–47.5; P < .021) and high-volume (median: 28.8 mL/kg, 95% CI, 15.9–53.4; P < .011) centers when compared to low-volume (median: 30.0 mL/kg, interquartile range: 13.3–65.5) centers. Despite the difference in transfusion, the incidence of perioperative major complications and length of stay did not seem to be influenced by surgical case volume. Most importantly, the authors observed some important and significant differences in term of perioperative management, including a significant variability in the utilization of antifibrinolytic drugs between high-volume (80.5% used antifibrinolytics), middle-volume (52.0% used antifibrinolytics), and low-volume (47.3% used antifibrinolytics) centers. The results reported in the present study are in agreement with those observed in a recent analysis of the Healthcare Cost and Utilization Project Kids’ Inpatient Database, in which Chattha et al found higher rates of blood product transfusions in infants and children undergoing craniofacial surgery in low-volume centers, while no difference in overall inpatient complication rates was observed after stratification for surgical case volume. Despite the apparent difference between surgical programs with different caseload, the association between surgical case volume and blood product utilization can either be explained by a true impact of surgical experience and technique or it simply reflects the better quality of the multidisciplinary perioperative blood management program in place in the larger compared to smaller centers.

Patient blood management (PBM) is defined as the timely application of evidence-based medical and surgical concepts designed to maintain hemoglobin concentration, optimize hemostasis, and minimize blood loss in an effort to improve patient outcomes. PBM must be executed by a multidisciplinary team and is organized around the following 3 pillars: optimization of red blood cell mass, prevention/reduction of bleeding, and optimization of the patient’s physiological tolerance to anemia. PBM is now recommended by the World Health Organization (WHOA63.12) as well as a large number of national and international institutions. Successful implementation of PBM in adults has been shown to reduce perioperative blood loss and blood product transfusion, perioperative morbidity and mortality, length of hospital stay, and costs. The development of PBM in adults has followed a stepwise approach starting with the identification of an association between blood product utilization and poor outcome, followed by benchmark studies of current institutional practices, and finally by the development of multidisciplinary local, national, or international guidelines. Benchmarking is a powerful tool to assess and compare the performance of health care providers at various levels with the ultimate goal of standardizing and improving practice. Given the documented extensive
variations in transfusion practices and the consequences of inappropriate transfusions, benchmarking can be particularly useful and effective in modulating transfusion practices, as long as it is performed repeatedly or continuously to monitor performance and use the information obtained to improve the quality of care. In 2007, Gombotz et al published the results of the first Austrian benchmark study that examined transfusion practices in 4 elective surgical procedures (eg, total hip replacement, total knee replacement, hemicolectomy, and cardiac surgery) performed at 18 randomly selected Austrian hospitals. Not surprisingly, significant variations in number of allogeneic transfusions, perioperative blood loss, and in the use of blood conservation methods among the hospitals were observed. After its completion, the investigators communicated to each site the overall findings and their individual performance compared with other sites. It was up to the individual centers to take appropriate actions to improve their performance. In addition, the findings were presented at various professional and public meetings to raise the public awareness. The findings that anemia prevalence, blood loss, and nadir hemoglobin are the main predictors of transfusion also contributed to the development of the concept of PBM in cooperation with several professional societies. Five years later, Gombotz et al published the results of the second Austrian benchmark study conducted in the same sites and investigated the effects of the first study in the implementation of PBM. In 2016, Van der Linden and Hardy published the results of the Network for the advancement of PBM, hemostasis and thrombosis (NATA) benchmark project that aimed at providing the basis for educational strategies to implement optimal PBM across European and Canadian centers. Similarly, the authors found that implementation of PBM remained extremely variable across centers and that further efforts are needed to improve PBM implementation. Despite the demonstrated benefits of PBM, many barriers and challenges limit translation of PBM guidelines into clinical practice, in particular due to lack of knowledge, lack of interdisciplinary commitment, and lack of resources. Those barriers are even more important in children’s hospitals due to the small number of well-designed pediatric studies, the large heterogeneity in surgical case volume and practice between centers, and the limited resource allocated to pediatric research or quality initiatives. To date, no benchmark study has established to state PBM implementation among pediatric centers of different sizes.

The present analysis of the PCCG highlights the urgent need for well-designed benchmark studies and multidisciplinary initiatives promoting the development of PBM in pediatric surgical populations. The variability between centers with different surgical case volume reflects the heterogeneity in perioperative blood conservation strategy between the participating centers. Because this important variability in perioperative blood management was already highlighted in a previous study performed using the database, it is time for the PCCG to start implementing PBM protocols among the different centers. As an example, the study published by Stricker et al highlighted important variability in the use of antifibrinolytic drugs, still the same variability is reported in the present manuscript. Considering the strong evidence regarding the effectiveness of prophylactic administration of antifibrinolytic drugs and their safety, it is now time to urgently develop initiatives to standardize and promote the prophylactic administration of antifibrinolytics in infants and children undergoing complex cranial vault reconstruction. Similarly, because preoperative anemia has recently been shown to increase the risk 30-day mortality in neonates and children undergoing noncardiac surgery, preoperative anemia programs should also be implemented to optimize red blood cell mass before the surgery. The use of restrictive transfusion algorithms should also be promoted. The PCCG leadership should work with the participating centers to create multidisciplinary protocols that will aim at minimizing blood loss, optimizing perioperative hemostasis, and rationalizing transfusion practices in an effort to improve patient outcomes.

In summary, the study published by the PCCG is interesting as it confirms the important variability between centers involved in complex cranial vault reconstruction. Whether the difference reflects a true relationship between surgical case volume or a difference in the quality of blood conservation strategies between larger and smaller centers, it is time for the PCCG to take action and start developing multidisciplinary multicenter PBM strategies that would aim at improving blood utilization in infants and children undergoing complex cranial vault reconstruction.

DISCLOSURES
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REFERENCES
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