

TRANSFUSIONS AND MORBIDITY AFTER SURGERY OF CONGENITAL HEART DISEASE: PURE STATISTICS OR TIME FOR A PARADIGM SHIFT?

To the Editor:

We read with great interest the article by Redlin and colleagues¹ and appreciate the continuous efforts of this group to establish blood-saving strategies in surgery for congenital heart disease. We think, however, that the relationship between transfusion and clinical outcome might be more complex than that outlined by Redlin and colleagues.¹

Complex patients with a complicated clinical course and critically low arterial and venous oxygen saturations may require more liberal transfusions. The clinical course thus determines transfusion. This view largely reflects clinical practice outside the context of prospective controlled clinical trials and is contradictory to the conclusions of Redlin and colleagues.¹ There are, however, other aspects deserving recognition in the relationship between transfusion and morbidity.

Patients undergoing prolonged mechanical ventilation (MV) will receive analgo-sedation, which causes vasodilation. To maintain hemodynamic stability, larger volumes are infused, and this hemodilution will most likely trigger transfusion. The transfusion is thus a result of prolonged MV, rather than vice versa. Unfortunately, this effect can hardly be quantified.

In contrast, the effect of blood sampling on blood loss in a pediatric intensive care unit (ICU) is easier to define. We assume that blood gas analyses, including measurement of blood glucose and electrolyte concentrations, are performed every 2 hours during MV and every 4 to 6 hours after extubation. The harvested volume can be calculated as 1 mL (although the exact amount needed for the measurement may be smaller). Additionally,

TABLE 1. Effect of blood sampling on blood loss

	Group 1	Group 2	Group 3
Study data			
Mechanical ventilation (h)	11	33	93
Intensive care unit stay (d)	1	3.5	6
Median body weight (kg)	9.7	6.0	4.9
Estimated blood loss by sampling			
Blood gas analysis during mechanical ventilation (mL)	5	16	46
Blood gas analysis after mechanical ventilation (mL)	3	10	10
Blood sampling volume per d (mL)	8	28	48
Total blood sampling volume during intensive care unit stay (mL)	16	54	104
Estimated total blood loss by sampling and calculated total blood volume			
With body weight of 3.5 kg (%)	6%	20%	37%
With the median body weight in the study (%)	2%	11%	27%

we assume that during the ICU stay approximately 4 mL of blood is taken twice a day for cell count, coagulation status, and clinical chemistry. In light of the median values for MV and ICU stay presented in the study,¹ the effect of blood sampling on the calculated blood volume (body weight in kilograms multiplied by 80mL) can be calculated for a 3.5-kg neonate and also for the mean values of body weight of the groups² (Table 1). Viewing these calculations, it is evident that blood sampling alone during prolonged MV and ICU stay is likely to be responsible for transfusions, particularly in group 3. Again, morbidity determines transfusions.

The initial publication with this study cohort² revealed that there were fundamental differences among groups in terms of patient characteristics, the risk score of the operation, and procedural data. We are surprised about the fact that the ages of the patients were not considered in the multivariable analysis. Patients in groups 2 and 3 were significantly younger than patients in group 1. Major deficiencies in the development of neonatal organ systems, such as the lungs, liver, kidneys, and so on, are well known. Inclusion of age into the multivariable analysis thus would have been absolutely necessary.

We must remain open-minded for new data, even, or perhaps

particularly, when they may break up established treatment paradigms. The evidence that transfusions affect clinical outcome is increasing. We consider caution to be indicated before reducing this complex problem to a simple unidirectional relationship, however, particularly, when the analysis is based solely on retrospective, observational data.

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