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Preoperative Anemia and Neonates

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In this issue, Goobie et al[1] describe an independent association of preoperative anemia, defined as a hematocrit (Hct) level less than 40%, with higher in-hospital mortality in neonates. Preoperative anemia was 1 of several independent risk factors associated with postoperative mortality; the others were American Society of Anesthesiologists class 3 to 5, body weight less than 2 kg, preoperative mechanical ventilation, and preoperative inotropic support. With almost two-thirds of the procedures being classified as emergent, the factors associated with mortality, with the exception of anemia, are largely not modifiable prior to surgery. The question then remains: if the anemia was corrected prior to surgery, would the outcome be improved with respect to the mortality rate?

What is known about anemia and mortality in the neonatal population? Previous trials in very low-birth-weight infants have found no difference in mortality between those infants liberally transfused with red blood cell (RBCs) compared with infants conservatively transfused resulting in more anemia. [2] Currently, there are 2large, ongoing, multicenter, randomized controlled trials in extremely low-birth-weight in fants tp tompa.l'e a liberal vs conservative threshold for RBC cell transfusion with a combined primary outcome of death or disability at 2 years of age. The Effects of Transfusion Thresholds on Neurocognitive Outcome of Extremely Low Birth-Weight Infants Study[3] and the Transfusion ofPrematures (NCT 01702805) will provide data about the efficacy and safety of restrictive vs liberal RBC transfusion on survival and long-term neurodevelopment outcome at 2 years of age. These trials may provide information that can guide transfusion in the neonatal intensive care unit in a very select population of neonates.

For infants with a birth weight more than 1000 g, much less evidence to guide transfusion practices is available. A 2016 review suggests that infants who weigh more than 1000 g at birth are generally not transfused for an Hct level less than 40% unless they have cyanotic

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congenital heart disease or are on extracorporeal membrane oxygenation.[4] This review also reports that RBC transfusion thresholds start at Hct levels of35% and are accordingly adjusted based on the clinical condition of the infant. [4] Furthermore, the review recommends that the Hct level should be greater than 30% for infants with anemia of prematurity undergoing major surgery. All of these sugges tions come primarily from expert opinion and consensus guidance to support RBC transfusion owing to the paucity of data in these relatively larger infants. Similar to the findings in this study, observational data suggest that even mild preoperative anemia may be associated with a higher risk of postoperative mortality in adults undergoing noncardiac surgery. [5]

To our knowledge, there are no prospective ongoing trials to compare levels of Hct, RBC transfusion, and outcomes in infants with a birth weight greater than 1000 g or those specifically undergoing surgery, leaving a significant knowledge gap in the field for these large populations of infants. Therefore, there is need for further investigation in this population.

The work of Goobie et al[1] has shone a spotlight on this understudied population and the lack of data to guide RBC transfusion practices. However, in their study, was it the anemia or the conditions that led to the anemia that were associated with a higher surgical mortality in the neonate? If one looks at the data presented, the factors that were associated with postoperative mortality are markers of severe illness. An ASA classification of3, 4, or 5, preoperative mechanical ventilation, and preoperative inotropic support all had odds ratios for mortality higher than the odds ratio for Hct levels less than 40%. It is not surprising that critical illness is associated with worse outcomes. In addition, neonates with acquired surgical conditions such as necrotizing enterocolitis, which has a high-case fatality rate and is a common indication for neonatal surgery, [6] are likely to present later in the neonatal period when anemia is more common. By contrast, common congenital conditions such as imperforate anus and myelomeningocele have a relatively low mortality rate, [6] and infants with these conditions are more likely to undergo surgery soon after birth, when anemia may be less common. Because the authors did not control fortype of surgery, the association between Hct and martality may be confounded by surgical case-mix between anemic and nonanemic groups. If these critically ill neonates had an increase in their Hct prior to surgery, would their survival improve? The information provided by Goobie et al[1] is cer tainly thought provoking. It is hypothesis-generating observational data that suggest optimizing preoperative Hct may improve post-operative survival, particularly in neonates who weigh less than 2 kg, are on mechanical ventilation prior to surgery, or are receiving inotropic medication prior to surgery.

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