



“Anemia of Prematurity and Transfusion Practices”

by
Arie Alkalay, M.D.

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Many of the babies in the NICU need a transfusion at one time or another. Depending upon a baby's condition, he may require one or many small blood transfusions. Nearly all of the babies less than 1500 grams (3 pounds, 5 ounces) need transfusions, because they become anemic from the many blood tests that are drawn to check the level of oxygen, carbon dioxide, sugar, and minerals in their blood. Also, very premature babies do not produce blood cells as well as they will when they are older.

Babies may need transfusions for a variety of reasons, and may need different components of the blood to help them in their recovery. The most commonly transfused component of blood in the NICU is red cells - referred to as packed red blood cells, or PRBCs, since they are separated from the rest of the whole blood (which includes white cells, plasma, and platelets) collected from donors. In the past few years, Cedars-Sinai's NICU has reviewed and studied the practice of transfusing red cells to newborns (neonates) to see if there is an optimal criterion to use in deciding when to transfuse a neonate. The following article by neonatologist Arie Alkalay, M.D., summarizes the findings and practices associated with these transfusions.

No objective criteria exist for packed red blood cell (PRBC) transfusion in premature infants. It has been estimated that 38,000 premature neonates receive annually more than 300,000 transfusions. Transfusion practices range from waiting for signs and symptoms of anemia to develop to transfusing at a pre-determined hematocrit level. So far, studies that have attempted to establish indications for transfusions on the basis of clinical signs and symptoms have been equivocal. Since the 1980's, a progressive decline in frequency of packed red blood cell (PRBC) transfusions has taken place due in part to the institution of transfusion guidelines, and in part to the acceptance of lower hemocrits. In very low birth weight infants, transfusions per infant (mean \pm SD) declined from 7.0 ± 7.4 in 1982 to 2.3 ± 2.7 in 1993 ($p < 0.001$). This decline was associated with a decrease in pre-transfusion hematocrits from $33.6\% \pm 2.8$ in 1982 to $29.8\% \pm 5.1$ in 1993. In 1995, although the safe lower limit of pre-transfusion hematocrits was not determined, recommendations for pre-transfusion hematocrit levels in asymptomatic infants declined even further to $<20-21\%$.

Attempts have been made to formulate objective criteria at which to transfuse anemic infants. These criteria, while based on "best guess" estimates of hemoglobin needs for optimal tissue oxygenation under various clinical circumstances, have never been shown to improve any measurable outcome variable (e.g. length of stay, growth, etc.). Although neonatal intensive care units may have rigorous practice guidelines, it is felt that commonly the final decision to transfuse is based upon the clinical judgment of the practitioner.

In 1995, Alverson wrote "Clinically useful indicators of physiologically significant anemia requiring intervention have yet to be defined in the newborn". To date, there is still no clinical or laboratory "gold standard" for transfusing premature infants and attempts to define such standards has to date been unsuccessful. Signs and symptoms such as tachycardia, tachypnea, apnea, and poor weight gain may not be due to anemia only, but to other causes as well.

A few years ago, our division conducted a study (Pediatrics 2003; 112:838-845) which suggested that many apparently "stable" preterm infants with hematocrits $\leq 21\%$, and to a lesser extent, infants with hematocrits between 22-26% may be in a high-cardiac output-state. This condition is not desirable for these infants. By doing echocardiography of the heart in these infants, it will be possible to predict more objectively if an infant with a certain hematicrit needs PRBC transfusion or not.

In summary, as current "traditional" criteria for PRBC transfusion are not sensitive, objective, non-invasive echocardiography criteria may guide the clinician to when PRBC transfusion is necessary or when it can be postponed.