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Editorial

Interneonatal Intensive Care Unit Variation in Growth Rates and Feeding Practices in Healthy Moderately Premature Infants

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In this month's *Journal of Perinatology*, Blackwell et al. (reference) describe the ''Interneonatal Intensive Care Unit Variation in Growth Rates and Feeding Practices in Healthy Moderately Premature Infants''.

Several large databases of information are available for the short- and long-term outcomes of prematurely born neonates[1–3] and previous investigations have evaluated the perinatal and neonatal factors associated with poor outcomes; however, data on more mature, healthier neonates is lacking. The authors correctly note, ''Care of the healthy but immature infant born between 30 and 35 weeks GA has received little attention in the last decade,'' and remind us that infants with birth weights of 1500 to 2500 g represented 7 to 8% of live births in 2002, and 35 to 50% of NICU admissions and bed days.

Failure to conduct research in any specific group of patients leads to uncertainty of ''standard of a care'' and promotes variation in practice. The degree of variation is readily apparent in outcomes,[3,4] medication use,[5,6] and nutritional support.[7–9] This variation is not helpful or justifiable and screams for better prospective studies to define appropriate standard of care. The best way to improve care is through research that demonstrates both safety and efficacy. We have successfully carried this out in the past[10,11] and we can and should do this in the area of nourishing neonates.

In a recent review, we described the term, ''extrauterine growth restriction,'' which refers to the concept that prematurely born neonates develop a severe nutritional deficit during the first weeks after birth.[12] Despite some catch-up growth during the second month of hospitalization, many neonates go home undergrown. Their nutritional deficit affects not only their weight, but their length and head circumference as well.

Safely nourishing premature neonates is difficult, resulting in accrued nutrient deficits, which are greatest in neonates less than 30 weeks' estimated gestational age. However, as Blackwell et al. (reference) clearly demonstrate, malnutrition is also a problem for more mature (30 to 35 weeks' estimated gestational age) neonates. A recent study suggests that postnatal malnutrition and growth restriction are inevitable, if we follow the current recommended dietary intakes.[13]

Failure to see daily weight gain and failure to thrive are late manifestations of malnutrition, while growth measurements (weight, length, and head circumference) are macroscopic measures of nutritional status. Energy deficiency, as well as micronutrient deficiency, can alter growth at a cellular and a systemic level before macroscopic measures are altered. In the brain, energy is needed for cell division and growth (e.g., neuronal growth), transport via the radial glial cells, and myelination. Malnourished neonates often experience immune deficiencies that reflect poor protein stores, which exacerbate an already immature immune system. In addition, nutrition may be therapeutic (reparative) for premature neonates by allowing more rapid adaptation to the extrauterine environment. To prevent growth failure and extrauterine growth restriction, we need to detect nutrient deficiencies early and act to correct them.

Early nutrition or failure thereof may program neonates for later morbidity.[14–16] Critical periods of nutritional ''exposures'' prenatally and during the postnatal period appear to influence an individual's disease risks throughout life.[17–20] In early life, poor growth may reset the potential for later growth.[20–22] Postnatal growth lag is associated with neurological and sensory handicaps and poor school performance. Hack et al.[23,24] showed that subnormal head size at 8 months of age was predictive of poorer verbal and performance IQ scores at eight years of age; lower scores for receptive language, speech, reading, mathematics, and spelling; and a higher incidence of hyperactivity.[23,24] Population-based studies evaluating the effects of poor fetal growth support these observations.[25–29]

Blackwell and others have established that variation in dietary support accounted for a substantial proportion of variation in the growth of neonates cared for in different neonatal intensive care units.[7,8] We (neonatologists, neonatal nurses, and nutritionists, and every other member of the health care team) can and should improve our nutritional care practices by carefully reviewing the recommendations from Blackwell et al. (reference). The patients studied were at very low risk for bowel complications. We cannot starve 100% of our infants and hide behind the defense that we are doing it to avoid necrotizing enterocolitis (NEC), since less than 3%

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of neonates at $\geq$30 weeks' estimated gestational age will develop NEC that requires treatment.[30] Additionally, centers that nourish their neonates well do not have higher rates of NEC[7] and most studies looking at more rapid advances of feedings have not shown an increased rate of NEC.[31,32] This is particularly true in low-risk neonates.

The literature on our failure to translate new evidence into clinical practice and process change is well established.[33] It plagues all areas of medicine. Yet, the simple truth is that one of the most important aspects of improvement is attending to the problem. This is the point of having growth charts in the offices of every pediatrician who offers care to children. It forces her/him to attend to her/his patients' nutritional needs. It is not sufficient to pay attention to calorie intake without demonstrating that the level of reported caloric support is leading to good growth (symmetric increases in weight, length, and head circumference).

While more and better evidence is needed to help guide best practices, this should not prevent neonatologists from using the clinical observations presented by Blackwell and others to improve their current practice. There is credible evidence that small safe changes in current practice can have a positive influence on growth.[7,8] These include early administration of intravenous amino acids and lipids, minimal enteral nutrition, and supplemented formula and human milk. Simply recognizing the degree of growth failure by monitoring weight and focusing on the accruing deficit should encourage clinicians to increase nutritional support to enhance recovery growth.

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