

The Clinical and Policy Implications of New Measures of Premature Infant Growth

Scott A. Lorch, MD, MSCE

With the rates of premature delivery still exceeding 11% and increased survival rates, there has been growing attention to the processes of care during a child's stay in the NICU that optimize their short- and long-term outcomes. As pointed out in the recent article by Olsen et al,¹ the appropriate growth of a prematurely born infant may have a significant impact on his or her developmental and growth outcomes after discharge from the NICU. In fact, appropriate growth encompasses many aspects of the care of the premature infant besides the monitoring of growth parameters and providing appropriate fortified nutrition.² For example, infants with more severe pulmonology complications of preterm birth are more likely to have growth failure,³⁻⁵ which may follow them after discharge from the NICU.⁶ Thus, assessing an individual NICU's ability to appropriately grow the premature infants in their care may be a comprehensive measure of the clinical care at that NICU. Do we have the data, with the addition of the BMI growth curves developed by Olsen et al, for this to occur?

Several issues remain in the assessment of growth and nutrition in the NICU. First, length is typically an inaccurate measure. For example, a study from Australia found that 59% of the length measures taken on term infants using measuring tape compared with measurement boards differed by >0.5 cm and that 53% of infants had different growth curve percentiles depending on the method of measurement.⁷ Similar differences

were seen in outpatient clinics.⁸ The data used in the development of the BMI growth curves notes that "measuring tape or length board" provided data for this study. Although measurement boards are considered more accurate, they are more invasive to use and could cause increased distress in fragile, sick infants. Until there are more precise but less invasive methods of obtaining lengths, the imprecision in many measurements of length will be a barrier to the use of BMI or any other measure that combines weight and lengths.

Because BMI is a relatively new measure for premature infants, there is limited information about the association between abnormally high or low BMIs and outcomes of preterm infants. This is particularly important because of recent information about the importance of high BMIs in infants and later obesity in adolescence and early adulthood,^{9,10} as well as hypertension.¹¹ Such information still needs to be collected and assessed for BMIs collected during the neonatal intensive care course.

The final issue surrounds what to do with this information. Clinicians already have weights and length data at their disposal. However, without information on the body composition of the infant, and targeted methods to improve linear growth or protein accretion over fat deposition, clinical care typically revolves around modifying the 1 thing that clinicians have control over: caloric density. This article highlights the lack of

Department of Pediatrics, The Children's Hospital of Philadelphia and Perelman School of Medicine at the University of Pennsylvania, Philadelphia, Pennsylvania; Center for Outcomes Research, The Children's Hospital of Philadelphia, Philadelphia, Pennsylvania; and Leonard Davis Institute of Health Economics, University of Pennsylvania, Philadelphia, Pennsylvania

Opinions expressed in these commentaries are those of the author and not necessarily those of the American Academy of Pediatrics or its Committees.

www.pediatrics.org/cgi/doi/10.1542/peds.2014-3774

DOI: 10.1542/peds.2014-3774

Accepted for publication Dec 15, 2014

Address correspondence to Scott A. Lorch, MD, MSCE, 3535 Market St, Suite 1029, Philadelphia, PA 19104. E-mail: lorch@email.chop.edu

PEDIATRICS (ISSN Numbers: Print, 0031-4005; Online, 1098-4275).

Copyright © 2015 by the American Academy of Pediatrics

FINANCIAL DISCLOSURE: The authors have indicated they have no financial relationships relevant to this article to disclose.

FUNDING: No external funding.

POTENTIAL CONFLICT OF INTEREST: The authors have indicated they have no potential conflicts of interest to disclose.

COMPANION PAPER: A companion to this article can be found on page e572, online at www.pediatrics.org/cgi/doi/10.1542/peds.2014-2777.

information about appropriate body composition of preterm, growing infants and methods to optimize their growth and development.

The work of Olsen et al is an innovative step toward giving clinicians more information to adjust their provision of nutrition in the NICU. However, those methods remain elusive, require more research, and likely will require individualization based on the infant's birth weight, gestational age, growth trajectory, and presence of other conditions such as pulmonary health. These data also highlight areas that still need investigation before we develop "ideal" ranges of body composition and/or anthropomorphic measures such as BMI for clinical care, and begin to consider growth as a quality metric of neonatal intensive care.

REFERENCES

1. Olsen IE, Lawson ML, Ferguson AN, et al. BMI curves for preterm infants. *Pediatrics*. 2015;135(3). Available at: www.pediatrics.org/cgi/content/full/135/3/e572
2. Geary CA, Fonseca RA, Caskey MA, Malloy MH. Improved growth and decreased morbidities in <1000 g neonates after early management changes. *J Perinatol*. 2008;28(5):347–353
3. Abrams SA. Chronic pulmonary insufficiency in children and its effects on growth and development. *J Nutr*. 2001;131(3):938S–941S
4. de Meer K, Westerterp KR, Houwen RH, Brouwers HA, Berger R, Okken A. Total energy expenditure in infants with bronchopulmonary dysplasia is associated with respiratory status. *Eur J Pediatr*. 1997;156(4):299–304
5. deRegnier RA, Guilbert TW, Mills MM, Georgieff MK. Growth failure and altered body composition are established by one month of age in infants with bronchopulmonary dysplasia. *J Nutr*. 1996;126(1):168–175
6. Chye JK, Gray PH. Rehospitalization and growth of infants with bronchopulmonary dysplasia: a matched control study. *J Paediatr Child Health*. 1995;31(2):105–111
7. Wood AJ, Raynes-Greenow CH, Carberry AE, Jeffery HE. Neonatal length inaccuracies in clinical practice and related percentile discrepancies detected by a simple length-board. *J Paediatr Child Health*. 2013;49(3):199–203
8. Rifas-Shiman SL, Rich-Edwards JW, Scanlon KS, Kleinman KP, Gillman MW. Misdiagnosis of overweight and underweight children younger than 2 years of age due to length measurement bias. *MedGenMed*. 2005;7(4):56
9. Stocks T, Renders CM, Bulk-Bunschoten AM, Hirasig RA, van Buuren S, Seidell JC. Body size and growth in 0- to 4-year-old children and the relation to body size in primary school age. *Obes Rev*. 2011;12(8):637–652
10. Taveras EM, Rifas-Shiman SL, Sherry B, et al. Crossing growth percentiles in infancy and risk of obesity in childhood. *Arch Pediatr Adolesc Med*. 2011;165(11):993–998
11. Adair LS, Fall CH, Osmond C, et al; COHORTS group. Associations of linear growth and relative weight gain during early life with adult health and human capital in countries of low and middle income: findings from five birth cohort studies. *Lancet*. 2013;382(9891):525–534

The Clinical and Policy Implications of New Measures of Premature Infant Growth

Scott A. Lorch

Pediatrics 2015;135:e703

DOI: 10.1542/peds.2014-3774 originally published online February 16, 2015;

Updated Information & Services	including high resolution figures, can be found at: http://pediatrics.aappublications.org/content/135/3/e703
References	This article cites 10 articles, 2 of which you can access for free at: http://pediatrics.aappublications.org/content/135/3/e703#BIBL
Subspecialty Collections	This article, along with others on similar topics, appears in the following collection(s): Nutrition http://www.aappublications.org/cgi/collection/nutrition_sub
Permissions & Licensing	Information about reproducing this article in parts (figures, tables) or in its entirety can be found online at: http://www.aappublications.org/site/misc/Permissions.xhtml
Reprints	Information about ordering reprints can be found online: http://www.aappublications.org/site/misc/reprints.xhtml

American Academy of Pediatrics

DEDICATED TO THE HEALTH OF ALL CHILDREN™



PEDIATRICS®

OFFICIAL JOURNAL OF THE AMERICAN ACADEMY OF PEDIATRICS

The Clinical and Policy Implications of New Measures of Premature Infant Growth

Scott A. Lorch

Pediatrics 2015;135:e703

DOI: 10.1542/peds.2014-3774 originally published online February 16, 2015;

The online version of this article, along with updated information and services, is located on the World Wide Web at:

<http://pediatrics.aappublications.org/content/135/3/e703>

Pediatrics is the official journal of the American Academy of Pediatrics. A monthly publication, it has been published continuously since 1948. Pediatrics is owned, published, and trademarked by the American Academy of Pediatrics, 141 Northwest Point Boulevard, Elk Grove Village, Illinois, 60007. Copyright © 2015 by the American Academy of Pediatrics. All rights reserved. Print ISSN: 1073-0397.

American Academy of Pediatrics

DEDICATED TO THE HEALTH OF ALL CHILDREN™

