Evaluation of a Neonatal Growth Curve Designed for an Electronic Health Record.

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**Introduction:** Developing accurate reference values to evaluate postnatal weight changes in the smallest, most preterm infants remains a challenge for clinical investigators. While survival of extremely preterm infants continues to improve, greater prematurity can increase the severity and variability of clinical disease, leading to the difficulty of identifying norms for this group. Reliable growth curves can provide decision support to assist clinician management of early salt and fluid postnatal adjustments, and to assess nutriture efficacy on growth during the later ‘feeding and growing’ recovery stage.

Rosenbloom [JAMIA 2006;13:302-8] recently developed for electronic health record (EHR) systems a postnatal growth equation that accounted for early postnatal fluid losses, and then ‘realigns’ the infants' growth velocity during the recovery stage based on a combination of the gold standard intrauterine growth rate and clinical data collected from ‘healthy’ preterm infants at Vanderbilt University Medical Center.

**Objective:** to evaluate the postnatal weight and growth curve equation by comparing predicted to measured daily weight.

**Methods:** Data describing ELBW infants treated at Forsyth Medical Center and Brenner Children’s Hospital in Winston Salem, NC during 2002-2003 were collected either from the electronic neonatal nutrition design system [Neohal JAmColNutr 1997; 16:283-7] or medical practitioners records.

ELBW: Extremely-low-birth-weight (BW <1000g)

**Inclusion criteria:**
- Delivered at Forsyth Medical Center
- Birth weight 700-1000 grams
- Survived at least 2 weeks
- No severe/terminal congenital anomalies
- Received at least one week of parenteral nutrition

Nutrition components collected included daily fluids, parenteral dextrose, protein, lipids, and enteral feeding source, volume, and calories. ELBW infant growth curves were generated at Vanderbilt University using patient electronic health record data.

Data analysis included means determination of descriptive variables. The daily predicted weight was computed and \(\Delta PrWt\) (measured – predicted weight) was analyzed using paired t-test (Crunch Software, Oakland, CA), focusing on the first two postnatal weeks individually. Pearson correlation and ANOVA was applied to evaluate \(\Delta PrWt\) to enteral and parenteral nutrition components. All data are reported as mean± either 1StanDev or StanErr when comparing group means.

**Results:** The 85 ELBW infants who met the above criteria had a birth weight of 867±84(1SD)g and a gestational age of 26.5±1.4 wks. Daily measured weight was \(\geq\) predicted weight by 46.2 g (35.0-57.3, 95% CI), \(p < 0.001\). ANOVA revealed infants receiving more parenteral nutrition had increased \(\Delta PrWt\), \(p=0.01\). The strongest nutrient correlation for \(\Delta PrWt\) was parenteral nutrition dextrose concentration, \(r=0.33, p<0.01\).

**Discussion:** This study evaluates a postnatal growth curve equation designed to incorporate postnatal water loss and intrauterine grow velocities. ELBW infants demonstrated daily weight equal to or greater than predicted during their first postnatal month. It is possible better humidification technology, new postnatal nutrition protocols, and standardized fluid management may be factors influencing these results.

Clinicians may use reliable infant growth curves to assess excess fluid or delayed growth for individual infants or to evaluate infant subgroups for impact of infant nutriture or chronic disease on growth and health. For example, preterm infant length and bone mineralization improved with human milk fortification [Greer JPediatr 1988;112:961-9].

Last, high parenteral nutrition [dextrose] usually indicates extended parenteral nutrition need and was linked to greater weight differences. Therefore, infants not tolerant of nutrient-dense enteral feedings probably should not be included when developing optimal reference postnatal growth curves.

**Future work:** These growth equations need to be evaluated in a prospective manner to determine their impact as an information tool for clinicians to manage patients.