

Assessment of Neonatal Growth in Prematurely Born Infants



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KEYWORDS

- Growth assessment • Neonatal growth • Premature infants • Body proportionality
- Growth curves • Small for gestational age • Growth status

KEY POINTS

- Growth assessment should start at birth and continue on weekly intervals at a minimum thereafter; birth and weekly assessments should include weight, length, and head circumference.
- Assigning an infant a set of percentiles for weight, length, and head circumference at birth provides an estimate of morbidity risk and target goals for growth.
- Where an infant's growth measurements plot on growth charts and the assignment of specific growth measurement percentiles differs between each set of charts. Assessment of change in size over time, however, is comparable between growth charts.
- Monitoring growth on growth curves allows for intervention when it decreases from birth percentiles; in this setting, precise percentile measurements are less important than the pattern of growth over time.
- Because body composition is not routinely measured in the neonatal intensive care unit, a proxy, such as body mass index, may be a useful clinical tool for preterm infants.

INTRODUCTION

The assessment and surveillance of growth in infants and children is recognized as an important part of health assessment.^{1,2} Many disturbances in health and nutrition, independent of their etiology, alter growth. The goals of monitoring growth are to improve nutritional status, reduce the risk of inadequate nutritional intake, educate caregivers, and produce early detection and evaluation of conditions manifested by growth disorders. Understanding inadequate growth and excess growth are both important. The focus of this review, therefore, is the examination and evaluation of optimal growth in prematurely born infants.

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The evidence that poor intrauterine growth manifests as small for gestational age (SGA), excessive growth manifests as large for gestational age (LGA), and both influence health outcomes is not new³⁻⁵ and remains a valuable consideration today.⁶ Compared with premature infants born with normal weights for gestational age, SGA preterm infants have a higher mortality and are more likely to have postnatal growth failure, prolonged mechanical ventilation, and require treatment with postnatal steroids.⁶ Being born SGA is associated with an increased risk of death or neurodevelopmental impairment. Similarly, infants born LGA are at increased risk for poor outcomes, including hypoglycemia, respiratory distress, obesity, and longer hospital stays.⁷⁻¹⁰

Although intrauterine growth restriction (IUGR) and SGA are commonly considered synonymous terms, the definitions and standards used to identify IUGR are different from those used to define SGA. A fetus with a diagnosis of IUGR may not meet the criteria for a diagnosis of SGA (usually defined as <10th percentile for age); however, both IUGR and SGA are associated with increased risk for poor health.¹¹⁻¹³

How an infant grows after being born prematurely also is important. Numerous articles demonstrate that infants born prematurely are at high risk for poor extrauterine growth (weight, length, and head circumference) when compared with estimates of growth that would have occurred had the infants remained in utero.¹⁴⁻¹⁷ Risk factors associated with poor extrauterine growth in prematurely born infants include immaturity (low gestational age), SGA status, male gender, need for assisted ventilation on the day of birth, a history of necrotizing enterocolitis, need for respiratory support at 28 days of age, and exposure to steroids during the hospital course.¹⁵ Risk factors that influence growth also impact other outcomes and make it difficult to assess the independent impact of early growth on long-term outcomes. Ehrenkranz and colleagues,¹⁸ however, showed that the pattern of growth of prematurely born infants exerts a significant, and possibly independent, effect on neurodevelopmental status and growth outcome at 18 to 22 months' corrected age. Data on how well individual sites promote normal growth show that some neonatal intensive care units (NICUs) perform better than other units.¹⁹⁻²¹ Site performance can be improved, and one method for improving the growth of preterm infants admitted for intensive care is simply to monitor their growth and thereby diagnose and treat growth failure at an early stage.²¹

The concept that adequate nutritional status and normal growth are important is well accepted. How to assess the adequacy of nutrition and how to define appropriate growth remains an area of active debate. Our goal is to review how growth is assessed at birth and during the hospital stay of prematurely born infants, and to offer a standardized approach.

ASSESSMENT OF GROWTH STATUS AT BIRTH

In the NICU and the healthy newborn nursery, assessment of growth begins at birth. The assessments of weight, length, and head circumference are all equally important and must be a part of every admission examination. Meaningful assignment of SGA and LGA classification therefore requires the following: accurate knowledge of gestational age; accurate measurement at birth of weight, length, and head circumference; and cutoff values based on reference data from a relevant population,²² all of which are a challenge to achieve. For example, estimated gestational age is often not precise and most experts would argue that gestational age precision is, at best, plus or minus 2 weeks. Although weights that use an electronic balance are quite accurate, individual head and length measurements may be less reliable in the clinical setting. Furthermore, the assessment tools (eg, growth curves) used to evaluate growth differ based

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