

Guidelines for Growth Charts and Gestational Age Adjustment for Low Birth Weight and Very Low Birth Weight Infants

Guidelines

- 1.) All low birth weight (LBW) and very low birth weight (VLBW) infants and children (up to 2 years of age) who have reached the equivalent age of 40 weeks gestation, shall be assessed for growth using the 2000 CDC Birth to 36 Months Growth Charts, adjusting for gestational age*.
- 2.) The assignment of nutrition risk criteria #121 (Short Stature) and #152 (Low Head Circumference) for premature infants/children shall be based on adjusted gestational age.
- 3.) Infants born prematurely (less than or equal to 37 weeks gestation) who have not reached the equivalent age of 40 weeks gestation may be assessed for growth using a growth chart for low birth weight (LBW) or very low birth weight (VLBW) infants (e.g., Infant Health and Development Program [IHDP]) consistent with the protocols of the local medical community in which the WIC clinic operates. The Centers for Disease Control and Prevention (CDC) does not recommended the use of the 2000 CDC Growth Charts for preterm infants who have not reached the equivalent age of 40 weeks gestation.

* See Attachment A: Calculating Gestation-Adjusted Age, for instructions on how to adjust for gestational age.

Justification

These growth chart guidelines for preterm, LBW and VLBW infants were developed to ensure the consistency and accuracy of growth assessments of premature infants performed by WIC agencies. The use of weight, length, and head circumference measurements as a component of nutritional assessment is well established. Plotting measurements on growth charts allows comparisons with reference populations. Serial measurements enable determination of improvement or alteration in individual growth patterns. Ideal growth rates and patterns for preterm infants have yet to be established. Specialized reference curves commonly used (e.g., Babson/Benda, Lubchenco, etc.) are not based on current medical and nutritional advances in treatment of these infants (1). Updated reference curves are needed for assessing intrauterine and extrauterine growth for premature LBW and VLBW infants (2).

Growth and a composition of weight gain at a rate similar to that of intrauterine (fetal) growth is considered by some to be the gold standard for premature infants (2). However, controversy exists over the feasibility of replicating intrauterine growth on an extrauterine basis (2,3).

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LBW infants are a heterogeneous group that includes premature infants who have attained weight, length, and proportionality that are appropriate for their gestational age, as well as infants who are small for their gestational age (SGA). Infants who are born small for their gestational age may be preterm or full-term. Premature infants usually fall in the lower percentiles before adjusting for gestational age (4).

For convenience, the following classifications are provided.

Classification Definitions* (1)

Gestation

Preterm	less than 37 weeks gestation
Postterm	greater than 42 weeks gestation

Birth Weight

Extremely low birth weight (ELBW)	less than 1000 g
Very low birth weight (VLBW)	less than 1500 g
Low birth weight (LBW)	less than 2500 g

Size for Gestational Age

Small (SGA)	weight less than 10%ile
Appropriate (AGA)	weight greater than or equal to 10%ile and less than or equal to 90%ile
Large (LGA)	weight greater than 90%ile

* The definitions for WIC nutrition risk criteria: Prematurity; LBW; and VLBW are inclusive of the cut-off number (e.g. less than or equal to 37 weeks for Prematurity) for the purpose of WIC nutrition risk determination.

Gestational Age

Gestational age is estimated during the prenatal period using maternal dates of expected delivery based on last menstrual period, and/or fetal characteristics (uterine fundal height, presence of quickening and fetal heart tones, and ultrasound evaluation). These estimates may be inaccurate, due to an irregular menstrual period, inability of mother to recall dates, early trimester bleeding, or lack of use of early ultrasound (1,5). Postnatally, the New Ballard Score or the Dubowitz score is used to assess gestational age by scoring the infant against physical and neurological signs (1,6,7). Ideally, more than one method is used to determine gestational age.

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The Workshop on Low Birth Weight recommends adjusting for gestational age for premature infants (8). Instructions for adjusting for gestational age are found in Attachment A of this document, or may be obtained from the CDC website (website address is cited in Attachment A). For practical reasons, CDC recommends adjusting for gestational age for at least 2 years. There is no other convenient juncture, and for healthy premature infants, there is minimal catch-up growth after 2 years. In addition, the majority of catch-up growth that will occur among healthy SGA infants takes place during the first 2 years of life (9,10). Although the majority of preterm and SGA infants will attain catch-up growth by two years of age, not all will (11). Premature infants with intrauterine growth retardation demonstrate limited catch-up growth, with growth deficits persisting into early childhood (10,11,12); and some VLBW infants may never catch-up completely in their growth (13).

Furthermore, once these children reach the age of 2 and their growth measurements are plotted on the 2 to 20 years (or 2 to 5 years) growth charts and gestational age is not accounted for, they may drop in percentile ranking. As long as the rate of growth (trajectory of the growth curve) continues upward, staff should be cautious when counseling the parent/caregiver to not raise undue concern over the child's percentile ranking. As with all children who demonstrate growth problems or who are at risk for potential growth problems, WIC staff should routinely complete anthropometric assessments and follow-up (to include coordination with, and referral to other health care providers and services) for children with a history of prematurity and/or SGA who have not yet demonstrated normal growth patterns. More information about the assessment and nutritional care of preterm infants can be found at the following two websites:

- 1) www.eatrightoregon.org/PNPG.resource.htm, and
- 2) www.depts.washington.edu/growing/index.html.

Growth Reference Curves

For premature infants, a variety of growth charts are available and in use by medical care providers. Several have been developed from extrauterine growth data. There are also intrauterine growth charts available, which are useful for determining expected growth (weight, length, and head circumference) at various gestational ages (3,14). It should be noted that, to date, there is no one LBW or VLBW growth reference curve recommended for use by the American Academy of Pediatrics or CDC as currently available references do not reflect current growth patterns resulting from advances in nutrition and medical care for preterm infants (15).

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In a recent study, CDC reviewed the scientific evidence and available growth reference curves for VLBW infants (16). The growth reference curves that were evaluated included:

- Infant Health and Development Program (IHDP), Casey, P, et al
- Brandt
- Gairdner and Pearson (Castlemead)
- Babson and Benda

To examine the references, the researchers developed *a priori* criteria for ideal and technically accurate references, compared each reference to the criteria, sought input from experts, and made recommendations for use. The *a priori* criteria included:

- Data that were collected in the 1990s or later;
- U.S. sample, well-nourished, racially/ethnically representative;
- Adequate sample size;
- Appropriate exclusions;
- Standardized, accurate measurements;
- Frequent measurements to capture patterns of growth;
- Age range from at least 24 weeks to three years;
- Available by gender, anthropometric indices, percentiles, z-scores; and
- Accurate gestational age correction.

It should be noted that the commonly used Lubchenco growth reference curves were excluded from the evaluation because the data were too old (data were collected between 1948-1961) and limited to infants born in a high altitude location.

Of the reference curves evaluated, the IHDP reference was considered to be the best available. The IHDP data were collected in 1985, whereas the others were collected from before 1954 to 1975. The IHDP reference had a relatively large sample size and was most representative of the population groups with VLBW infants, whereas the other available references were based on white infants. Although the researchers found the IHDP reference to be the best available reference for VLBW infants, the reference data did not meet all the criteria and had limitations. The IHDP reference is the most current of the available references, however, it was developed before recent advances in nutrition and medical care for premature infants, and does not reflect current growth patterns of preterm infants. In addition, gestational age was calculated based on a less accurate method (an assessment of physical and neurological characteristics) rather than ultrasound and date of last menstrual period (17).

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The other three growth references evaluated in the study were found to have serious limitations, making them inappropriate for assessing the growth status of VLBW infants. The limitations included: data collected before 1976, small sample size and reference data limited to primarily white children.

Once the determination was made that the IHDP reference curves were the best of those evaluated, the next step of the study was to compare them with those of the 2000 CDC Growth Charts. Population data for the 2000 CDC growth charts includes infants who are LBW but does not include VLBW infants (18).

A comparison of the IHDP and CDC/NCHS 2000 charts revealed the IHDP charts demonstrate catch-up growth *to* the CDC charts in length-for-age and head circumference-for-age, and initial falling off, then, stabilization *to* the CDC charts in weight-for-age. A comparison of external VLBW data to IHDP and CDC charts showed the relative position on the charts is closer to IHDP, the pattern of growth for length-for-age is more similar to IHDP, and weight-for-age early pattern is more similar to CDC.

The CDC recommendations are:

1. For LBW infants, use the 2000 CDC Growth Charts adjusted for gestational age.
2. For VLBW infants, adjust for gestational age and use either the IHDP or the 2000 CDC Growth Charts.

WIC Program Implications

The Risk Identification and Selection Collaborative (RISC) considered the CDC study and met with CDC staff to develop the guideline that all premature infants who have attained a gestational age of at least 40 weeks, be assessed for growth using the 2000 CDC Birth to 36 Months Growth Charts, adjusted for gestational age. In addition to the evidence-based rationale for the use of the 2000 CDC Growth Charts, practical implications were also considered. Due to the fact that the 2000 CDC Growth Charts are used for term infants and older children, the use of these same charts for LBW and VLBW infants who are at least 40 weeks gestation, would not create an additional burden on clinic operations.

The WIC staff (depending on WIC resources and staffing) may also want to consider monitoring the growth of VLBW infants/children using the IHPD charts, in addition to the 2000 CDC Growth Charts, to obtain additional growth reference information to use in providing nutrition services to this population of participants.

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Clarification

There is a cross reference to this document in nutrition risk criteria #121, #134, #141, #142, #151, and #152, as these guidelines may impact, or provide useful information in addressing these nutrition risk conditions.

References

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Calculating Gestation-Adjusted Age¹

INSTRUCTIONS*:

- Document the infant's gestational age in weeks. (Mother/caregiver can self-report, or referral information from the medical provider may be used.)
- Subtract the child's gestational age in weeks from 40 weeks (gestational age of term infant) to determine the adjustment for prematurity in weeks.
- Subtract the adjustment for prematurity in weeks from the child's chronological postnatal age in weeks to determine the child's gestation-adjusted age.

* For WIC nutrition risk determination, adjustment for gestational age should be calculated for all premature infants for the first 2 years of life.

EXAMPLE:

Randy was born prematurely on March 19, 2001. His gestational age at birth was determined to be 30 weeks based on ultrasonographic examination. At the time of the June 11, 2001, clinic visit, his chronological postnatal age is 12 weeks. What is his gestation-adjusted age?

- 30 = gestational age in weeks
- 40 - 30 = 10 weeks adjustment for prematurity
- 12 - 10 = 2 weeks gestation-adjusted age

His measurements would be plotted on a growth chart as a 2-week-old infant.

¹ Adapted from the Centers for Disease Control and Disease Prevention (CDC) internet training module: "Overview of the CDC Growth Charts"; www.cdc.gov/nccdphp/dnpa/growthcharts/trainingmodules/module2/text/page5itext.