Growth Monitoring Of VLBW Babies: Text for Webinar.

Slide 1 Neonatal Growth Charts & Growth monitoring

Slide 2 Objectives of this webinar

Slide 3 Introduction

Premature infants have greater nutritional needs to achieve optimal growth in the neonatal period than at any other time in life.

AAP recommends that extra uterine growth of a preterm baby should parallel the intrauterine growth trajectory of a fetus of comparable GA without stressing the developing metabolic or excretory system.

Slide 4 Post Natal Growth Targets for Preterm Babies

The ideal growth targets of preterm babies based on intra uterine growth rates is:

- Weight – 15 to 18 g/kg per day
- Length – 1 cm/week
- Head circumference – 0.7 cm/week

Slide 5.Extra uterine growth restriction

However due to inherent limitations ,large proportion of ELBW & VLBW babies will have cumulative deficits in protein and energy resulting in show slower growth than intrauterine counterparts causing EUGR.

EUGR is defined as weight < 10th centile at 36 weeks PMA or at discharge.

Hence provision of adequate nutrition from birth and growth monitoring essential for all preterm babies.

Slide 6 Need for Growth Monitoring

We must know that extra uterine growth restriction is associated with a host of long term adverse outcomes for such babies. These include:

- Long term adverse neuro-developmental sequelae
- Increased risk of ROP
- Poor bone health

- Lower final weight & height at 18 years of age.
- On the other hand, increased post-natal growth after a period of extra uterine growth retardation, results in increased risk of coronary heart disease, type II diabetes mellitus, hypercholesterolemia, hypertension & stroke in adulthood – the adult metabolic syndrome.

Slide 7 Objectives Of Growth Monitoring

To ensure that post-natal growth is as optimal as is possible and that the baby is growing along the birth trajectory, post-natal growth parameters of these babies should be diligently monitored using growth charts.

This will help in early identification of growth faltering so that nutritional and other interventions (like management of cold stress, sepsis, anemia etc.) may be carried out for improving the growth trajectory and the response to our interventions can be assessed.

Slide 8   Growth parameters to be tracked

For monitoring growth, the three parameters that are routinely tracked are weight, length & head circumference of the baby.

Before, we learn more about the growth charts to be used for monitoring VLBW babies, let us first take a look how these anthropometric measurements are taken.

Weight: (In video format)

The Weight of VLBW babies is preferably monitored on an electronic weighing scale with a minimum accuracy of ± 5 gm. For ELBW babies an accuracy of 1 gm is preferred.

The weighing scale should have a re- zero weight adjustment facility & a clear digital read out. It should be calibrated with standard weights at least on a monthly basis.

The pan / baby tray of the weighing scale should be of non-heat conducting material (Acrylic) and should be cleaned with spirit before use.

 A sterile baby towel should be placed on the pan & the weight read out should be re- zeroed before weighing the baby. If this facility is not available on the weighing scale, the weight of the sheet should be subtracted from the final weight.

Place the baby in the middle of the pan.

Ensure that the baby is quiet & not moving and that the digital readout is steady, before recording the weight of the baby in grams.

Length: (In video format)

Length of the baby is measured using an infantometer.

The infantometer has a firm, flat horizontal surface with a measuring tape in 1 mm (0.1 cm) or 1/8 inch increments.

At one end of the infantometer is an immovable headpiece at a right angle to the horizontal board and tape, and at the other end is a smoothly moveable foot-piece, perpendicular to the tape.

Clean the infantometer with spirit before use.

Place the baby gently on the horizontal flat board ensuring the head is in contact with the head piece. Gently straighten out the baby's legs ensuring that the knees are straight & move the foot board till it is in apposition with the baby's feet. The feet should be perpendicular to the legs and resting on the foot board in this position. Read the length to the nearest 0.1 cm.

Head Circumference (In video format)

Head circumference is measured using a non-stretchable measuring tape. The tape should be 1/4 - 1/2 inch wide. Ideally an 'insertion tape' is used, since it provides a more accurate 'view' of the circumference measure than that obtained by overlapping the edges of a tape measure. The tape should have 0.1 cm increments.

The tape is placed to cover the head at the maximum circumference over the supra orbital ridges anteriorly, behind the ears & at the external occipital protuberance posteriorly. The measurement is done on the lateral surface of the head by the cross tape technique.

How frequently should the anthropometric measurements be taken?

The standard practice is to weigh the VLBW infant daily until discharge from hospital, then twice a week or weekly until term, and then monthly until 12 months of chronological age. Babies who are unwell are weighed more frequently.

Slide 9. Growth Charts Commonly Used
- Two growth charts are commonly used for monitoring preterm babies:
- **Intrauterine growth curves** from that are generated from anthropometric data at birth from preterm babies delivered at various gestations. Examples are the Fenton's charts & the Intergrowth 21st charts
- The other are the **Post Natal Growth curves** based on longitudinal postnatal weights of preterm babies   at various gestations. The Ehrenkranz charts are postnatal growth charts

Slide 10   Gender Specific Fenton charts 2013

Most neonatal units plot early growth the Fenton intrauterine growth reference chart which are based on the recommended growth goal for preterm infants and are called Standard or prescriptive charts. They have separate charts for boys and girls for all the three parameters of weight, length & HC on the same chart. The same charts are used at birth to characterize babies as adequate, large or small for gestational age. As these charts are based on IU growth standards of apparently normal babies of different gestational ages, taken at birth, they do not account for the normal postnatal weight loss that occurs in babies in the early days after birth.

Weights plotted on these charts are equivalent to the WHO growth charts at 50 weeks gestational, so no change in centile when transitioning.

Slide 11 Ehrenkranz Post Natal Growth Charts

Many centers also use the Ehrenkranz postnatal growth charts to assess the adequacy of postnatal growth, weights. These longitudinal curves represent postnatal growth & portray how the baby is growing after birth. These charts allow for the initial postnatal weight loss seen in newborn infants. They are also known as reference / (descriptive) curves.

Slide 12

The intergrowth 21st charts of the INTERGROWTH-21st Consortium have recently been published for babies between 33 weeks to 64 weeks, in 2013 & from gestational age of 23 weeks onwards in 2016, and may also be considered for use.

Slide 13 Plotting Growth of 26 weeks 750 grams, for first 28 days

Irrespective of the charts used the principles of plotting the parameters is the same.

For the intrauterine growth charts (Fenton's, Intergrowth 21st), the **gestational age in weeks** is plotted on the x axis and the weight, length & head circumference on the y axis as seen in these charts below. For the postnatal growth charts the **postnatal age in days** is plotted on the x axis.

Let us take an example of weight:

The weight of the VLBW is taken daily and plotted on the Fenton's chart according to the corrected age in weeks & days or according to the post-natal day of life on the Ehrenkranz. Seen below is the anthropometric parameters of a 26 week GA baby girl with a birth weight of 750 grams, plotted on Fenton & Ehrenkranz charts up to 28 days of postnatal life.

As you can see from the Ehrenkranz charts, this baby regained birth weight by day 20 of life and the growth velocity thereafter picked up with fortified human milk coupled with good KMC. Weight plotted on the Fenton chart reveals that though the growth velocity has improved, the baby is growing along a lower percentile than the birth percentile and is likely to be diagnosed as EUGR by 36 weeks corrected GA.
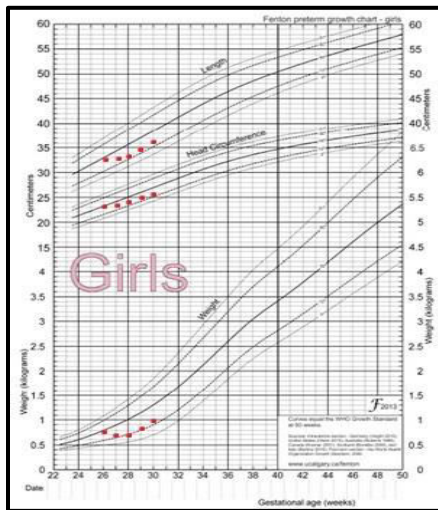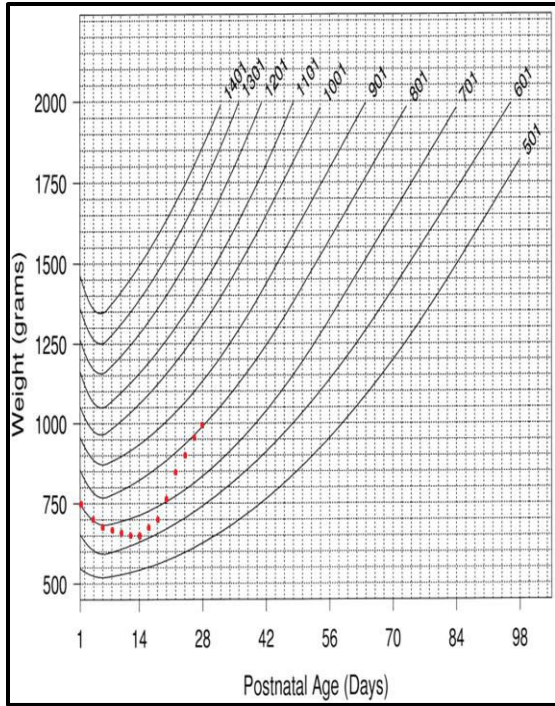
Slide 14 Reasons for Poor Growth & Management

The commonest reason for poor postnatal growth in the convalescent period is inadequate protein & caloric intake, which needs to be addressed by optimizing feeding volumes to 160 to 180 cc/ kg /day of EBM as well as by fortifying milk to provide 120 Kcal / kg / gay & 3.5-4 gm /kg / day of proteins.

Occult cold stress may also impair growth & maximizing KMC duration per day may help better growth. Other problems like anemia of prematurity, hyponatremia and occult infections like urinary infections, fungal sepsis may also cause growth faltering & need to be investigated and treated appropriately.

If poor growth, or growth faltering is identified, the likely cause needs to be identified and addressed appropriately.

Reasons For Poor Growth	Management
Inadequate protein &/ or caloric intake	Fortification of human milk to provide atleast 120 K cal / kg / day & 3.5 -4 gm /kg / day of proteins
Cold stress	KMC
Anemia	Correction of symptomatic anemia
Occult Infection Hyponatremia	Investigate & treat appropriately

Once a baby has reached a corrected age of term, further growth monitoring should be done on the universally used WHO growth charts.

Slide 15 Key Messages
- VLBW & ELBWs prone to EUGR
- Growth Monitoring of weight , length& head circumference essential for all preterm.
- Monitor on Fenton's (prescriptive) for classification of nutritive status at birth & Fenton's /Ehrenkranz (descriptive) charts after birth
- Use growth charts to monitor faltering and to monitor effectiveness of corrective intervention
- Fortification of mothers milk, KMC for improved growth velocity