Getting the plot: Understanding growth charts and developing supporting educational materials

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# UK-WHO growth charts

- 2006-WHO published new growth standard for children under 5 years of age
  - Sample of breastfed infants of non-smoking non-deprived mothers in 6 countries: USA, Norway, Oman, Brazil, India Ghana.
  - Very similar linear growth patterns in all 6 centres
  - Charts are a description of **optimal** rather than average growth





### **Comparison of WHO and UK90**



# UK-WHO growth charts

- 2006-WHO published new growth standard for children under 5 years of age
- The Scientific Advisory Committee on Nutrition decides to adopt standard
- DH commissioned Royal College of Paediatrics and Child Health to:
  - Design new growth charts
  - Develop new evidence based instructions
  - Develop educational materials
- 2009-UK-WHO growth charts introduced

## **RCPCH Growth Charts Group**



# **Product Goals**

- A4 charts with evidence-based instructions
- A5 (PCHR charts) with information for parents
- Education package
  - Sets of slides for students and staff
  - Fact sheets
  - Quiz
- Parent information sheet
- Low birth weight chart for babies from 23 weeks gestation

# Professional plotting workshops

- Aims
  - To advise on the design of the charts
  - To inform the instructions
  - To inform the educational materials

# Professional plotting workshops

- How
  - Iterative process
  - 2 sets of workshops
  - Permutated exercises comparing UK1990 and several UK-WHO designs
  - Quantitative analysis
  - Qualitative comments in discussions

# Professional groups - Stage 1

- Aim: test understanding of new design and assess impact on plotting and interpretation
- Method: Four scenarios requiring plotting on new prototype and existing UK 1990 charts
  - 5 workshops in three centres (Newcastle, Birmingham and London)
  - 46 participants HVs, nursery nurses, paediatric nurses, other students

# Professional groups – Stage 2

- Aim: test overall accuracy of plotting and reading of new charts, with emphasis on new elements and areas of known difficulty. Draft instructions tested at this stage.
- Method: two plotting exercises organised to allow comparisons between old and new charts and a third to test new height predictor and a BMI lookup
  - 7 workshops in 3 centres (Glasgow, Birmingham and London)
  - 78 participants HVs, dieticians, paediatricians, other nurses

# Results

- Confusion and inconsistency about when to apply gestational adjustment
- John-healthy child born at 34 weeks gestation, weight >50<sup>th</sup> centile with steady weight gain to chronological age 3 months
  - Plotted correctly at birth
  - Thereafter only half plotted at gestationally correct age
- HCPs using different definitions of 'pre-term' with some including all infants born before 38 completed weeks

# Results

- Scenario with baby showing 12.5% weight loss between birth and 2 weeks
  - Only half participants would refer to paediatrician or breastfeeding counsellor
  - Some professional groups (Paeds and Midwives) use of 10% as threshold for concern was standard. HVs rarely calculated percentage weight change
  - "I wouldn't worry about this weight loss because they lose weight the first two weeks anyway and he's breastfeeding."

# Results

- Stage 2
  - Overall only 22/61 (36%) made no major mistakes in any scenario
  - 19 (31%) made a least one mistake in each scenario
  - No trend towards any one professional group being more or less accurate (but numbers small)

## Workshops - outcomes

- Gestational age
  - Clear definitions required of term and preterm
  - Unambiguous guidance about application of gestational adjustment
  - Uniform method for showing gestational correction
- Need for clear recommendations about measurement frequency

## New chart features

- Separate preterm section
- No centiles 0-2 weeks
- Gestational correction
- De-emphasise 50<sup>th</sup> centile, but clear labelling
- Clearer labelling of axes
- Adult height look up
- BMI centile look up

# Plotting pre-term infants Background

- A child born before 37 completed weeks gestation is preterm - This is 259 days/ 36 weeks and 6 days
- The WHO standard does not include data for preterm babies
- The "preterm" section of the UK/WHO chart has been compiled using UK reference data for size at birth







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www.growthcharts.rcpch.ac.uk

# Plotting pre-term infants What is Gestational Correction?

- Gestational correction adjusts the plot of a measurement to account for the number of weeks a baby was born early
- Number of weeks early = 40 weeks minus gestational age
- Should not be used for term infants (37 weeks+)
- Should be continued till ...
  - > 1 year for infants born 32-36 weeks
  - > 2 years for infants born before 32 weeks



# Plotting pre-term infants Plotting with gestational correction

Plot measurement at actual age

Draw a line back the number of weeks the baby was early and mark this with an arrow.

The arrow point shows the gestationally corrected centile



Where measuring frequently, plot all at actual or corrected age and use arrow only for a selection to avoid crowding on page.



# Plotting pre-term infants Transfer preterm to infancy section



Born 6 weeks preterm

Plot on preterm section of chart until 42 weeks (EDD+2)

Then plot on infancy section using gestational correction



### Weight faltering in infant born at 34 weeks?



### Weight faltering in infant born at 34 weeks?

or are the plots in the wrong place ?





### Plotting pre-term infants **Failure to allow for gestation**



- Need to be clear which plots are adjusted for gestation
- Other users may not adjust
- Could place child at risk





# No centile lines in first 2 weeks

- WHO data do not match:
  - UK preterm and
  - birth data
- Individual patterns
- Percentage weight loss more relevant than centiles at this time

### New born infants

### Assessing neonatal weight loss

- Most babies lose some weight after birth
  - < 80% will have regained this by 2 weeks of age >
- Fewer than 5% of babies lose more than 10%

< Only 1 in 50 are 10% lighter at 2 weeks >

- A baby 10% or more below birth weight at or before 2 weeks needs careful assessment for:
  - Feeding problems
  - unrecognised illness



### When to weigh

- Weigh in the first week as part of the assessment of feeding
- After first week and once feeding is established, babies usually need to be weighed only at the time of routine immunisations ...
  - ✓ 8, 12 and 16 weeks and age one year
- Where closer monitoring is required, babies should be weighed <u>no more than</u>:
  - once a month before 6 months
  - ✓ once per two months aged 6-12 months and
  - once per 3 months over age one year



# Training in growth and growth charts

- many had no formal training
- Widely different understanding of gestational correction, centile terminology and what constitutes normality:

 "I just think nobody should be able to start plotting before they have had training – I think this would be a disaster waiting to happen".
 Health Visitor

# Education package

- Drew on learning needs identified in professional (and parent) groups
- Standard package
- National recommendation to train staff
  - New chart features
  - General use of growth charts

http://www.rcpch.ac.uk/Research/UK-WHO-Growth-Charts



Leaflet for health visitors

http://www.rcpch.a c.uk/Research/UK-WHO-Growth-Charts

Click on:

See the advice from <u>Department of</u> <u>Health information</u> for Health Visitors Using the new UK–World Health Organization 0–4 years growth charts

Information for healthcare professionals about the use and interpretation of growth charts



### Measurement Record

Your health visitor or doctor should fill in these boxes when they weigh your child and then plot the measurements on the appropriate centile charts

Gestation

Other

Name or Initials

Date of Birth / / Birth Weight + In



### Plotting and interpreting measurements

The chart is a guide to how your child is growing. It compares your child's length and height with other children of the same age. It also shows how quickly your child is

or the same age. It also shows now quickly your child is growing. Your haby's charts shows weight in kilograms and height in centimetres. If you want to change these measurements into pound/sources and feedfinches you can use the conversion chart in this record or ask your health visitor to convert them

Someone who has been appropriately trained should Someone who has been appropriately trained should complete the growth chart. If your baby was born prematurely (less than 37 weeks), the weight will be plotted on the preferent chart, until your baby reaches the estimated delivery date (EDD) plus 2 weeks (42 weeks). After this, his or her weight will be plotted on the 0-1 year weight chart but with an allowance to take account of prematurity. This should continue until at least 1 year of age.

Normal weight and height The curves on the chart are called centile lines. These show the range of weights and heights (or lengths) of most children. If your child's height is on the 25th centile, for example, this means that if you lined up 100 children of the example, this means that it you meet up too motion to the same age in height order, your child would be number 25; 75 children would be taller than your child. It is quite normal for a child's weight or height to be anywhere within the centile lines on the chart.

### When are children unusually big or small?

There is not an exact point at which it can be said that a child's weight or height is definitely abnormal. However, only four in every thousand healthy children are at or helow the 0.4th centile. A paediatrician usually assesses these children to make sure that there are no problems. Being very small can sometimes indicate a medical or health

problem. Babies on the top weight or length centile are usually healthy. If your child's weight goes above the top centile

after 12 months of age, this may be a sign that they are overweight. Your health visitor may want to assess this further What is a normal rate of weight gain?

Weight gain in the early days varies a lot from baby to baby so there are no lines on the chart for 0-2 weeks. By 2 weeks of age most babies weight will be on a centile close to their birth centile. It is unlikely that your baby's weight will exactly follow a

single centile line, particularly in the first year. It is most likely to track within one centile space (i.e. the gap between two centile lines)

two centile lines). Children may lose weight during an illness but their weight will usually go back to their usual centile within 2-3 weeks. However, if your baby's weight remains down by two or more centile spaces, they should be assessed by your health visitor and their length should also be measured.

Length and height henger and a bed a back included a Length and height Under the age of 2 years, a child's length is measured lying down. When your child reaches 2 years of age their height will be measured instead. When standing up, the spine is squashed a little, which will mean that your child's height is slightly less than their length. However, their height will be on the same centile as their length and your child should Continue to grow approximately along the same centile. Healthy children may be on a different length/height centile. from the weight centile, although the two are usually

To get an idea of how tall your child may be as an adult, plot their height and follow the centile line to the scale at the their neight and toilow the centue line to the scale at the sole of the 2-4 years height chart. Four out of the healthy children have an adult height that is within 6cm above or below this value. So, fi, for example, your childs height is on the 25th centile, the average adult height for a grif for this centile is 161cm and for a boy is 174 cm. A grifs adult height is therefore likely to be between 155cm and 167cm and a boy's adult height between 168 cm and 180 cm.



http://www.rcpch.ac.uk/Research/UK-WHO-Growth-Charts