BRADFORD VTS TEACHING AIDS

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Growth Charts in Children

How to measure, plot and read the UK–WHO charts — with the red flags that matter and worked examples you can recognise at a glance. A practical guide for GP trainees and IMGs.

▸ Why growth is a vital sign

Growth is one of the clearest windows into a child's health. A well child usually grows in a steady, predictable way. When that pattern changes, it can be the **first clue** that something is wrong — often before any other symptom appears.

◎ One measurement is a photo. Growth is a film.

A single reading tells you where a child is *today*. Several readings over time tell you the **story**: whether the child is following their own path or drifting off it. **The pattern over time matters more than any single point.** This one idea underpins everything that follows.

1 The right chart for the right child

The UK uses a family of charts. Pick the one that matches the child's age and situation. Using the wrong chart gives the wrong answer. RCPCH

Chart	Use it for	Age range
UK–WHO 0–4 years	All infants and toddlers, however they are fed. Also suitable for *moderately* preterm babies (32–36 weeks).	Birth – 4 yrs
UK–WHO 2–18 years (UK 1990 reference)	School-age children and young people. Includes puberty guidance, BMI look-up and an adult-height predictor.	2 – 18 yrs
Neonatal & Infant Close Monitoring (NICM)	*Very* preterm babies (from 23 weeks) and infants with early problems such as weight faltering.	23 wks – 2 yrs corrected
Childhood & Puberty Close Monitoring (CPCM)	Children needing close monitoring of growth or puberty; specialist clinics and special schools. Adds Tanner-stage graphs.	2 – 20 yrs
Condition-specific charts	Use the dedicated chart for **Down syndrome** (RCPCH/DSMIG) and **Turner syndrome**. Correct for prematurity on standard charts.	Term – 18 yrs

▸ Fast rule

Under 4 → the **0–4 chart**. 2–18 → the **2–18 chart**. Very preterm or a sick baby needing close watching → **NICM**. A named condition (Down, Turner) → its **own chart**. RCPCH · NICE NG75

2 How to measure — get this right first

A chart is only as good as the measurement behind it. Poor technique creates false alarms and false reassurance. Only trained staff should measure, plot or interpret. **Plot in pencil.** RCPCH

W Weight

Use **Class III electronic scales** in metric. Weigh **babies naked**; weigh toddlers in **vest and pants, no shoes**. Empty bladder if you can.

L Length — under 2 years

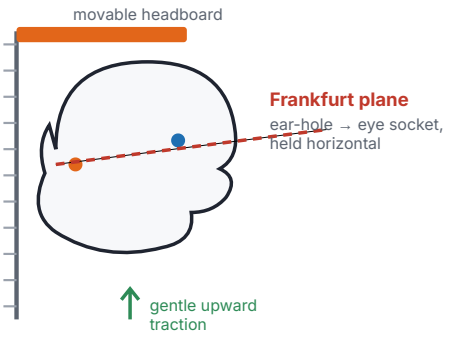
Lying down, on a **length board or mat**. **Two trained people**: one holds the head in the Frankfurt plane, the other straightens the legs and brings the footboard to the heels. Shoes and nappy off.

H Height — from 2 years

Standing, using a **stadiometer** or rigid rule with T-piece. Heels, buttocks and shoulders touch the wall; head in the Frankfurt plane; apply gentle upward traction under the mastoids. Record to the **last millimetre**.

C Head circumference (OFC)

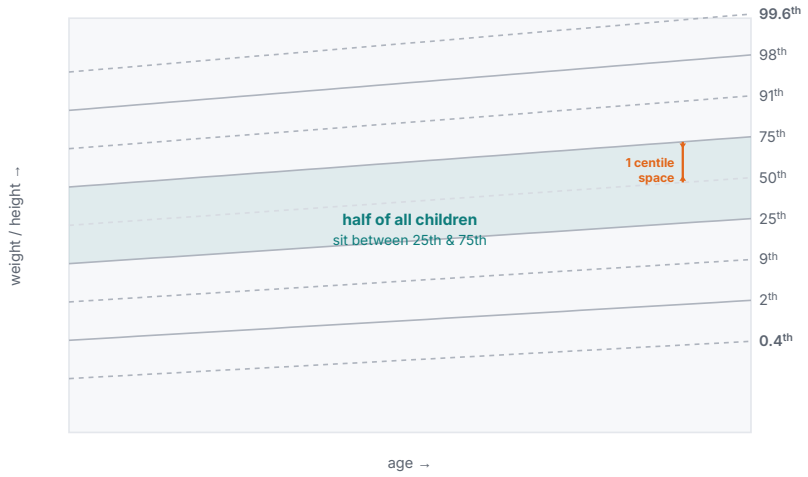
Use a **narrow paper or plastic tape** at the **widest** point of the head. **Do NOT use a cloth or sewing tape** — it stretches and misleads.



The **Frankfurt plane**: an imaginary line from the ear-hole to the lower edge of the eye socket, held horizontal, so the head is neither tipped up nor down. Use it for both length and height.

3 Reading centiles

A centile compares a child with 100 others of the same age and sex. On the **9th centile**, 9 children in 100 are smaller and 91 are bigger. UK charts show **nine lines**: 0.4th, 2nd, 9th, 25th, 50th, 75th, 91st, 98th and 99.6th — each about two-thirds of a standard deviation apart. RCPCH



The nine centile lines. **99 of 100** healthy children sit between the outer lines (0.4th–99.6th); **half** sit between the 25th and 75th. A **centile space** is the gap between two neighbouring lines — the unit we use to judge change.

◆ The 50th centile is NOT a target

Parents often expect every healthy child to be 'on the 50th'. They should not. Being on the 50th simply means half of children are bigger and half are smaller. A child who steadily follows the 9th centile is usually just as healthy as one on the 50th. RCPCH · WHO

4 Plotting — three special rules

1 Preterm babies

Correct for gestation. For a baby born before 37 weeks, plot from the **corrected age**, not the birth date. Keep correcting up to at least **1 year**. Very preterm (<32 wks) → use the **NICM** chart, corrected to 2 years.

2 The first 2 weeks

Charts have **no centile lines from birth to 2 weeks**. Early weight change varies hugely. Do not rely on plotting here — work out the **percentage weight loss** instead.

3 Height step at age 2

Length (lying) becomes height (standing) at 2. The spine settles, so height is slightly less than length and the **lines step down a little**. This is expected — what matters is the child keeps their centile afterwards.

% weight loss = (birth weight − current weight) ÷ birth weight × 100

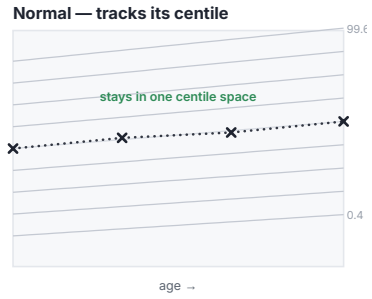
Example: a baby born at 3.500 kg who is 3.150 kg on day 5 has lost 0.350 kg = **10%**.

▲ Newborn weight loss — act on these

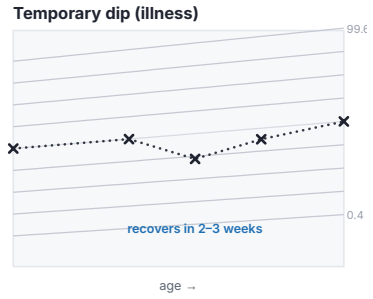
Most babies lose a little weight in the first 3–4 days and regain birth weight by about 3 weeks. **You must assess feeding and examine the baby carefully if weight loss is more than 10%, or if birth weight is regained slowly.** RCPCH

5 Normal pattern vs red flag

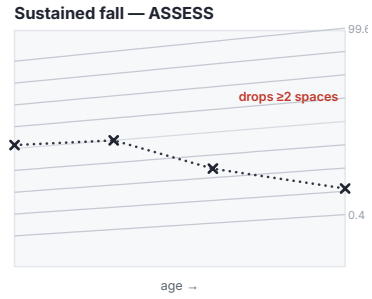
Healthy children usually **track** — they stay within about one centile space of their own line. Babies do not all grow at the same rate, so the line is not always followed exactly, especially in the first year. RCPCH



Follows its own centile. **Reassuring.**



Dips with illness, then recovers within 2–3 weeks. Usually fine.



Falls through **≥2 spaces** and stays down. **Assess.**

▲ The key red flag

A **sustained** drop through **2 or more weight centile spaces** is unusual (fewer than 2 in 100 infants). **It must be assessed by the primary care team, including measuring length or height.** RCPCH

▸ Head circumference

After 6 weeks, an OFC below the **2nd centile** is seen in only about 1 in 250 children and **should be assessed**. An OFC above the 99.6th, or crossing up 2 spaces, only concerns you if it **keeps rising after 6 months** or there are other signs. RCPCH

6 Faltering growth — the thresholds

Faltering growth is the modern term (we no longer say 'failure to thrive', which sounds like blame). It means weight gain that is slower than expected. NICE ties the threshold for concern to the **birth weight**. NICE NG75

If birth weight was...	Be concerned if weight falls across...
Below the 9th centile	**≥1** centile space
Between the 9th and 91st centiles	**≥2** centile spaces
Above the 91st centile	**≥3** centile spaces
Any birth weight	current weight **below the 2nd centile** for age

▸ Two more checks in faltering growth

- If length/height is **more than 2 centile spaces below the mid-parental centile**, think undernutrition or a primary growth disorder.
- In a child **over 2 years** with a growth concern, work out the **BMI centile**.

NICE NG75

7 When to arrange assessment or refer

In school-age children, arrange further assessment or referral if **any** of the following apply. RCPCH

▲ Refer / assess — act on these

- **Weight, height OR BMI below the 0.4th centile** (unless already fully investigated at an earlier age).
- **Height more than 3 centile spaces below the mid-parental centile.**
- **Height centile drops by more than 2 centile spaces** (once measurement error is excluded).
- Smaller falls, or a child–parent height mismatch — especially if combined, or with signs of underlying disease.
- Any other genuine concern about the child's growth.

RCPCH

◆ Also remember

A **single** height above the 99.6th or below the 0.4th centile warrants review and usually referral. Height above the 99.6th is nearly always healthy; height below the 0.4th rarely is. RCPCH · CHILD GROWTH FOUNDATION

8 BMI — from age 2

From age 2, BMI is a better guide to thinness or fatness than weight alone. Read the BMI centile from the chart's look-up, or calculate it. RCPCH · NICE NG75

BMI = weight (kg) ÷ height (m)^2

BMI centile	What it means
Above 91st	Overweight
Above 98th	Very overweight (clinically obese)
Below 2nd	Unusual — may be a small build *or* undernutrition
Below 0.4th (age >2)	Probable undernutrition

The **% median BMI** (the child's BMI as a percentage of the median for age and sex) is used mainly for risk assessment in eating disorders. RCPCH

9 Is the child short or tall for the family?

A child's height should fit their parents. The mid-parental height (MPH) estimates where the child is heading. RCPCH

Boy's MPH = (mother's height + 13 cm + father's height) ÷ 2
Girl's MPH = (father's height − 13 cm + mother's height) ÷ 2

The 13 cm is the average adult height difference between men and women. Worked example (boy): mother 160, father 176 → (160 + 13 + 176) ÷ 2 = **174.5 cm** ≈ the 50th adult centile.

◎ Target centile range & adult height

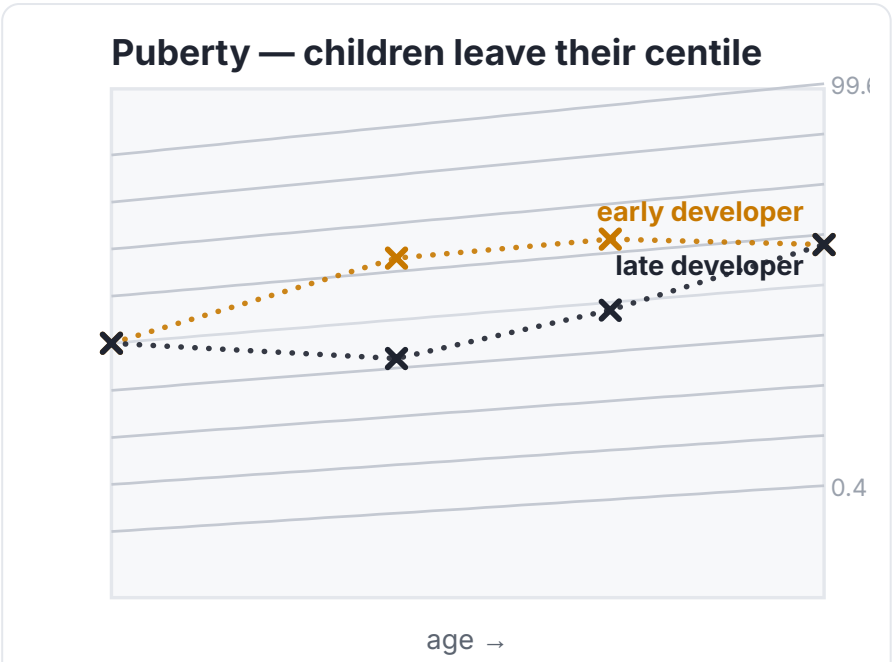
The child is expected to reach the **mid-parental centile**, within a **target centile range** around it (the paper charts mark this; traditionally about ±10 cm). The RCPCH charts have a built-in calculator using the parents' z-scores, which is more accurate when parents differ a lot in height. A healthy child's height centile at **age 2–4** predicts adult height well — 4 in 5 children end up within ±6 cm. RCPCH

◆ Important caveat

This does **not** apply if a parent's own height is not their natural height (for example, due to their own untreated illness). CHILD GROWTH FOUNDATION

10 Puberty and the growth spurt

At puberty, every child has their own, sharper growth spurt. So most children **leave the centile they were following** for a while — this is normal.



An **early** developer shoots up early, then others catch up. A **late** developer sinks a centile or two, then springs back. Both can reach the same adult height. Judge teenagers against their **pubertal stage**, not age alone.

Tanner staging — still the standard

Stage	Boys — genitals	Girls — breast	Both — pubic hair
1	Pre-pubertal.	Elevation of papilla only.	None (vellus only).
2	Scrotum & testes enlarge; scrotal skin reddens.	Breast bud; areola widens.	Sparse, long, lightly pigmented hair.
3	Penis lengthens; testes grow further.	Breast & areola enlarge together, one contour.	Darker, coarser, curlier; spreads over pubis.
4	Penis broadens, glans develops; scrotum darkens.	Areola & papilla form a second mound.	Adult type, smaller area; not yet on thighs.
5	Adult size and shape.	Mature; areola recedes, papilla projects.	Adult amount and spread (onto medial thighs).

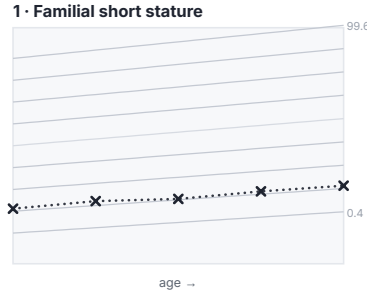
▸ **Bone (skeletal) age**

Plotting height against **bone age** (from a hand X-ray) rather than chronological age helps in specialist assessment. It separates a child who is **small but on track for their maturity** from one with truly abnormal growth. The normal range is narrower against bone age.

11 Worked examples — learn the patterns

Interpretation is **pattern recognition**. These five shapes cover most of what you will see. Learn the shape, not just the numbers.

1 · Familial short stature

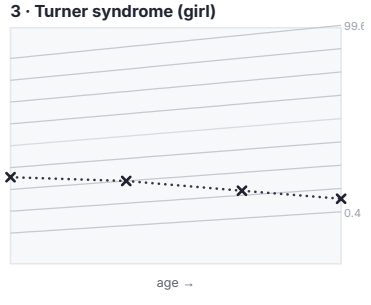


Small but steady: points track **along** a low centile, parallel to the lines, and fit short parents. **Reassuring.**

2 · Undernutrition (wasting)

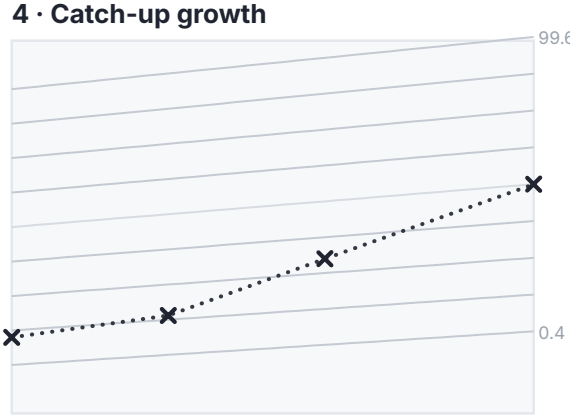
Weight falls **away** from a preserved height. Think feeding or illness — **assess**.

3 · Turner syndrome (girl)



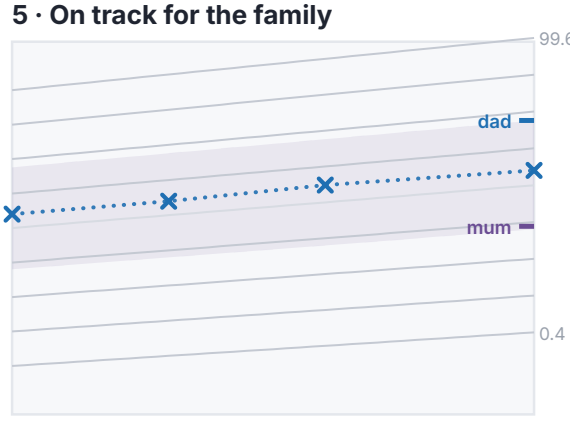
A short girl drifting **below** her range. Short stature that does not fit the family — investigate; use the Turner chart.

4 · Catch-up growth



Points climb **up** through centiles after a setback (e.g. feeding improved, illness treated). Expected recovery.

5 · On track for the family



Height sits within the target range **between** mum and dad. Normal — on track for the family.

12 What's changed from older teaching

Then → now

- **'Failure to thrive' → 'faltering growth'.** Kinder, and it fits a pattern rather than a verdict. NICE
- **Old 3rd–97th (7-line) charts → the 9-centile UK–WHO charts** (0.4th–99.6th). RCPCH
- **Average growth → optimal growth.** The charts are built from healthy, breastfed babies; breastfeeding is the norm. WHO/RCPCH
- **The 50th is no longer emphasised** — it is not a target. RCPCH
- **Vague cut-offs → precise thresholds.** Not 'suspicious below the 10th' but centile-space falls and the 0.4th line. RCPCH/NICE
- **Weighing:** no more subtracting clothing — babies naked, toddlers in vest and pants on Class III scales. RCPCH
- **New:** a separate preterm section with gestational correction, and **% weight loss** instead of plotting in the first 2 weeks. RCPCH
- **Mid-parental height** now via a z-score calculator on the charts — more accurate. RCPCH

Remember six things

1. **Pattern beats point** — the trend over time is the story.
2. **Right chart, right child** — age, prematurity and named conditions each have their chart.
3. **Track = reassuring; a sustained fall through ≥2 spaces = assess.**
4. **Below the 0.4th centile** (weight, height or BMI) → assess/refer.
5. **Fit the family** — check height against mid-parental height.
6. **Measure well** — a bad measurement is worse than none.

Sources & acknowledgements

RCPCH — UK–WHO growth charts (0–4 years, 2–18 years, NICM, CPCM) and Digital Growth Charts guidance for health staff, Royal College of Paediatrics and Child Health, rcpch.ac.uk / growth.rcpch.ac.uk (accessed 2026).
NICE NG75 — Faltering growth: recognition and management of faltering growth in children, National Institute for Health and Care Excellence (2017, updated).
Child Growth Foundation — UK cross-sectional reference (1994/1) growth chart, recording, plotting and referral guidance.
Tanner JM & Whitehouse RH — pubertal staging, *Growth at Adolescence* (Blackwell, 1955); measuring technique notes (1959).
This teaching aid combines and modernises four source documents (the RCPCH 'ten things' summary, the 1959 chart notes, the 1994 boys' chart how-to, and a set of worked chart examples) into current UK guidance. Original chart images were redrawn as clean schematics for clarity; the originals can be supplied on request.