

Child growth evaluation and charting – research update

This newsletter highlights research presented during 2024 showing the value of accurate charting in the diagnosis and management of growth failure. One theme connecting several 2024 publications is the need to ensure that charts are revised in line with secular trends and made relevant to different ethnic populations.



Optimising the transition from paper to digital growth charts

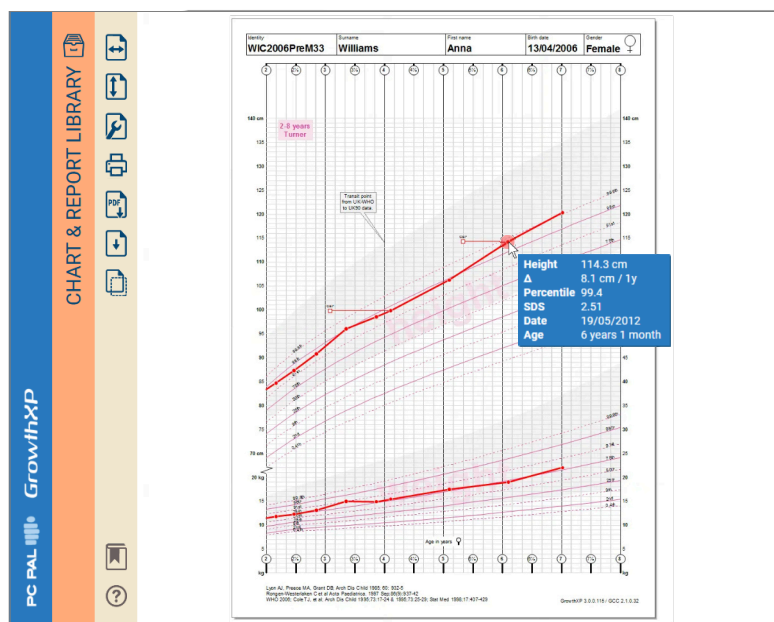
The shift from paper-based to digital growth charts, integrated with electronic health records (EHRs), offers paediatricians substantial benefits, enhancing both clinical efficiency and precision. Digital charts provide a broader range of growth references with automated calculations (e.g. parental target height, height velocity and precise percentile and SD scores), and adjustments for factors like gestational age.

In their recent opinion paper, Wright *et al* (1) outline strategies for successful

implementation, which include embedding charts within EHR systems, developing bespoke local software, or licensing third-party commercial solutions. While resource constraints can limit EHR-based functionality, the authors emphasise the advantages of commercial platforms, which often deliver superior customisation and usability. These tools enable clinicians to provide more accurate and comprehensive growth assessments, ensuring better outcomes for their patients.

Revised guidelines for Turner Syndrome management

A global consensus group has updated guidelines for managing Turner Syndrome (TS), expanding on 2017 recommendations. Published by Gravholt *et al* (2), these guidelines reflect collaboration among the European Society of Endocrinology (ESE), the Pediatric Endocrine Society (PES), and other international organisations.



Turner syndrome chart in GrowthXP, showing height plots, delta, precise percentile and SD calculations, and bone age. The shadow range indicates the national reference population.

The new guidelines not only update the previous one but encompass additional aspects of the syndrome. Specific recommendations on growth management now include the use of TS-specific growth charts. A growth-promoting treatment

response is indicated by either maintaining/improving on the pre-treatment height percentile on the female population reference, or increasing percentile on the TS-specific chart.

Fenton vs. Intergrowth-21: resolving discrepancies in birth size assessment

Two studies have exposed inconsistencies between the Fenton and Intergrowth-21 (IG-21) growth charts in evaluating birth size—a critical marker for predicting health outcomes and guiding an appropriate nutrition plan.

In a multiethnic Asian cohort, Chan *et al* (3) found that Fenton 2013 charts overestimate small-for-gestational-age (SGA) cases and underestimate large-for-gestational-age (LGA) cases compared to IG-21. These misclassifications have significant implications, as both SGA and LGA status correlate with childhood obesity, metabolic syndrome, and adult cardiometabolic risk.

Fenton charts are based on data largely derived from European populations, and possibly not appropriate for use in Asian countries. Based

on this study, the authors conclude that IG-21 charts should be integrated into local practice in preference to the Fenton charts.

Similarly, Cheikh Ismail *et al* (4) observed that Fenton charts misclassified growth outcomes in a preterm cohort, with notable discrepancies in weight, length, and head circumference. At discharge, for every five cases classified as SGA on the Fenton chart, three were classified SGA on IG-21. These findings highlight the necessity of using IG-21 charts, particularly in non-European populations, to improve the accuracy of neonatal assessments and reduce the risks of overfeeding and related complications.

GrowthXP Neo contains both the Fenton and IG-21 growth references.

The case for growth charting revision

Accurate, up-to-date growth charts and formulae are essential tools for monitoring child development in clinical practice. Findings presented in 2024 highlight the importance of revising growth references to account for generational shifts driven by improved nutrition, lifestyle, and other environmental factors.

The trajectory of growth of Latvian children has been comprehensively documented in the 20th and 21st centuries. A new, longitudinal study of child growth in Latvia has highlighted the need to ensure that growth charts in clinical use reflect current populations.

Umbraško *et al* (5) report a study which followed the growth of 70 children (equal number of boys and girls) from birth to age 17 years and demonstrated increased average heights and

earlier pubertal onset compared to 20th-century data. Boys and girls are now, on average, 10.8 cm and 6.0 cm taller at age 17, respectively.

In a very different population, Abdulrazzaq *et al* (6) performed a cross-sectional analysis of height and weight data in United Arab Emirates: compared to the 1992 standards there was a significant height and weight increase at all ages.

The Tanner formula has been relied upon across the world for calculating a child's target height (TH). Kim *et al* (7) found that in the Korean population this formula underestimated TH to the extent of nearly 5cm in males and females. This finding resulted from comparing actual final height with Tanner TH in 2586 individuals, and has implications for clinical practice in Korea.

Waist-to-height ratio – an obesity measure superior to BMI?

Body mass index (BMI) has long been the standard for assessing obesity and related disease risks, but new data from the UK's Avon Longitudinal Study of Parents and Children suggests that waist-to-height ratio (WHtR) may be a better alternative.

Agbaje's (8) analysis shows that WHtR correlates more strongly with direct measures of fat mass and trunk fat mass obtained via dual-energy X-ray

absorptiometry (DEXA). WHtR also demonstrated superior sensitivity and specificity in predicting excess fat mass, outperforming BMI in both males and females. This groundbreaking longitudinal study demonstrates that WHtR accurately discriminates between fat and lean body mass. Agbaje recommends WHtR as a replacement for BMI as a measure in obesity in children.

A minimum dataset to monitoring growth promotion

The GloBE-Reg project has established a minimum dataset (MDS) for tracking the safety and efficacy of recombinant human growth hormone (GH) therapy. Based on a consensus process (Chen *et al*) (9) the MDS includes 63 critical data points that are both clinically relevant and feasible to collect.

Key outcomes include anthropometry (height, weight), pubertal status, biochemical markers (e.g., IGF-1, TSH), and imaging (bone age). Based on this project for GH deficiency, the GloBE-Reg team has a process for GH therapy used in other indications, including small for gestational age, Prader-Willi syndrome, Turner syndrome, Noonan syndrome and skeletal dysplasia.

Modernising growth velocity charts with big data

The data increasingly held in EHRs can also provide a source for updating existing charts and so optimise growth monitoring. Scherdel *et al* (10) report a French study which made use of such 'big data' to develop new height velocity charts. Approximately 200,000 values derived from over 80,000 children in the primary care setting were derived from electronic medical records spanning

the years 1990 to 2018. Height values for each child were used for which a previous measurement 12 months ago were recorded. Interpolation was not made. Compared to the 1979 French height velocity curves, the new charts capture earlier pubertal growth spurts and recalibrate standard deviation curves.

References

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GrowthXP Modules for EHR integration

GrowthXP enables the visualisation of data across the entire continuous care process, from the fetus to the adult. It contributes to continuity and recognition between different care teams, care networks and of course the patient and parents.

GrowthXP is used by 30% of the top 100 hospitals in Europe.

Mother's EHR data

Child's EHR data

Prenatal Monitoring	Delivery Documentation	Maternity Postnatal	Growth Monitoring
GrowthXP Prenatal	GrowthXP Partogram	GrowthXP Neo	GrowthXP Paediatrics
<p>GrowthXP Prenatal</p> <p>Integrates with the patient record: leverage ultrasound data to expand fetal and maternal monitoring</p> 	<p>GrowthXP Partogram</p> <p>Birth Process Visualisation A Comprehensive Labour Care Tool</p> 	<p>GrowthXP Neo</p> <p>Enhanced visualisation of neonatal parameters</p> 	<p>GrowthXP</p> <p>Enhanced Growth Charting Full Electronic Health Record Integration</p> <p><i>"The extensive catalogue of growth curves leaves nothing to be desired."</i></p> 
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