

# Comparison of the performance of algorithms proposed to standardize growth monitoring

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## Background

Growth monitoring of apparently healthy children aims at early detecting severe underlying conditions including growth hormone deficiency (GHD). Current growth-monitoring practices are mainly based on inappropriate tools resulting in delayed diagnosis of severe target conditions and inappropriate referrals. Practices could best be optimized by standardization with validated evidence-based tools. Seven algorithms for defining abnormal growth in children have been proposed. Their level of validation is low and no head-to-head comparison of their performance has been performed.

## Objective

To perform an external validation of the seven algorithms proposed for defining abnormal growth and compare their performance to early detect GHD.

## Conclusions

Among algorithms proposed for growth monitoring, the Grote clinical decision rule had the best performance for early detection of GHD, using national French growth charts. Its performance on other target conditions of growth monitoring and using WHO growth charts must be evaluated (see e-poster n°1027).

## Methods

Using a case-referent approach, we applied the seven proposed algorithms on growth data of 33 children with GHD related to pituitary-stalk interruption syndrome born between 1990 and 2006 in France (cases), and 2,200 apparently healthy national French children followed longitudinally from birth (referents).

The sensitivities, specificities and theoretical reductions in time to diagnosis of these algorithms using French growth charts<sup>(1)</sup> were calculated, and the sensitivities of highly specific (>98%) algorithms were compared using McNemar/Wilcoxon tests for matched pairs/series.

## Results

Sensitivities and specificities varied substantially (table). Among the two algorithms with a specificity > 98%, the Grote clinical decision rule had a significantly higher sensitivity and offered a better theoretical improvement in time to diagnosis than the Coventry consensus.

Table: sensitivity for the detection of GHD, theoretical reduction in time to diagnosis, and specificity of proposed algorithms

Algorithms	Auxological parameters used	Specificity (%) (n=2250)	Sensitivity (%) (n=33)	Theoretical reduction in time to diagnosis (year) (n=33)
WHO criterion <sup>(2)</sup>	Single (< -2 SD)	90.9	78.8	2.25 [0.33-3.42]*
Coventry consensus <sup>(3)</sup>	Single (< 0.4 <sup>th</sup> p)	100	15.2	0.00 [0.00-0.00]
Dutch consensus <sup>(4)</sup>	Combined <sup>†</sup>	53.1	90.9	1.84 [0.75-3.30]
GHR criteria <sup>(5)</sup>	Combined <sup>‡</sup>	42.8	100	3.08 [1.75-3.92]
Grote clinical rule <sup>(6)</sup>	Combined <sup>^</sup>	99.2	66.7	0.34 [0.00-1.75]
Saari clinical rule <sup>(7)</sup>	Combined <sup>\$</sup>	71.1	81.8	2.42 [0.58-3.58]
Saari clinical rule <sup>(8)</sup>	Combined <sup>φ</sup>	Insufficient published data to perform external validation		

GHR: Growth Hormone Research Society

\*Median [Q1-Q3]

<sup>†</sup> Standardized height, distance to standardized target height, height deflection per time interval, absolute height deflection, small-for-gestational age with no catch-up, and disproportion and/or dysmorphic features

<sup>‡</sup> Standardized height, distance to standardized target height, height deflection per time interval, and standardized height velocity

<sup>^</sup> Standardized height, distance to standardized target height, absolute height deflection, small-for-gestational age with no catch-up, and disproportion and/or dysmorphic features

<sup>\$</sup> Standardized height, distance to standardized target height, standardized height deflection

<sup>φ</sup> Standardized height, standardized BMI, distance to standardized target height, standardized height deflection, and standardized BMI deflection

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