Evaluation of Referrals for Short Stature to a Regional Paediatric Centre

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INTRODUCTION & OBJECTIVES

Growth is an important indicator of health and a growth chart (GC) is a fundamental element of evaluation of overall health. Monitoring of growth with serial measurements has been recommended in routine healthcare visits from infancy to adolescence (1).

Referrals to pediatric endocrine clinics for short stature are common. Short stature is defined as either a height that is two standard deviations (SDs) below the mean height for age and sex (< third percentile), or two SDs below the mid-parental height (MPH).

Height velocity (HV) is an essential component of the evaluation of short stature as growth deceleration often reflects an underlying pediatric endocrine diagnosis (PED) (2). Access to previous measurements facilitates prompt calculation of HV and prevents delay in investigation as well as any required treatment. A consensus statement on growth hormone deficiency concluded that "the single most useful parameter in the assessment of the child with growth retardation is the clinical evaluation, with emphasis placed upon accurate serial measurements of height and determination of the height velocity."(3)

The objectives of our study were:
- To determine the availability of previous measurements at time of referral for short stature.
- To characterize pediatric endocrine diagnoses.
- To determine the predictors of a PED.

METHODS

A retrospective chart review was performed on all referrals for short stature to a single pediatric endocrinologist between January 2008 and December 2014. Exclusion criteria are detailed in Figure 1. The study was approved by the Human Research Ethics review board at Western University.
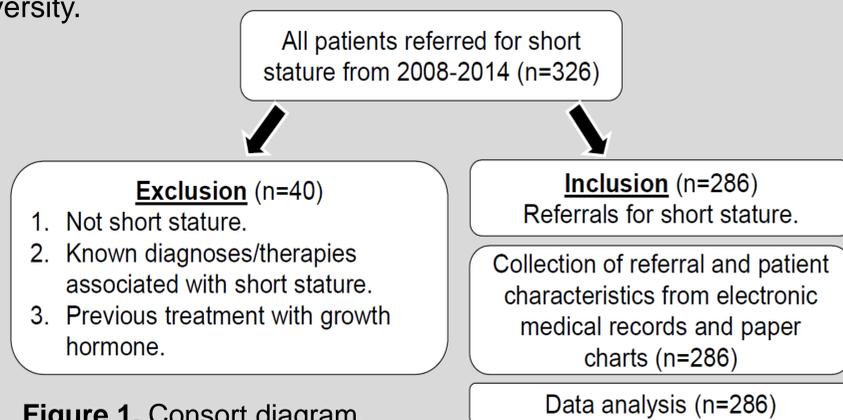

All patients referred for short stature from 2008-2014 (n=326)

Exclusion (n=40)
1. Not short stature.
2. Known diagnoses/therapies associated with short stature.
3. Previous treatment with growth hormone.

Inclusion (n=286)
Referrals for short stature.

Collection of referral and patient characteristics from electronic medical records and paper charts (n=286)

Data analysis (n=286)

Figure 1. Consort diagram.

Data were captured from a combination of the patient's paper chart and electronic chart. All z-scores and percentiles for height and weight were calculated based on WHO growth charts. Data were analyzed using t-tests, chi-squared tests, and logistic regression.

Height Velocity (cm/yr), Mid Parental Height (MPH) (cm) and Height Deficit (HD) were calculated as follows:

1. $$Ht\ Velocity = \frac{(Current\ Ht - Prev\ measured\ Ht)}{Month\ interval} \times 12$$

2. $$Boys\ MPH = \frac{MHt + FHt + 13cm}{2}, \quad Girls\ MPH = \frac{MHt + FHt - 13cm}{2}$$

3. $$Height\ Deficit = MPH\ Zscore - Child's\ Ht\ Zscore$$

RESULTS & CONCLUSIONS

- A total of 326 charts of patients, aged 11 months to 18 years, were reviewed and 286 were eligible for inclusion (Figure 1). Males made up the majority of referrals (67.5%). The mean age at referral was 9.73 years for males and 8.90 years for females.
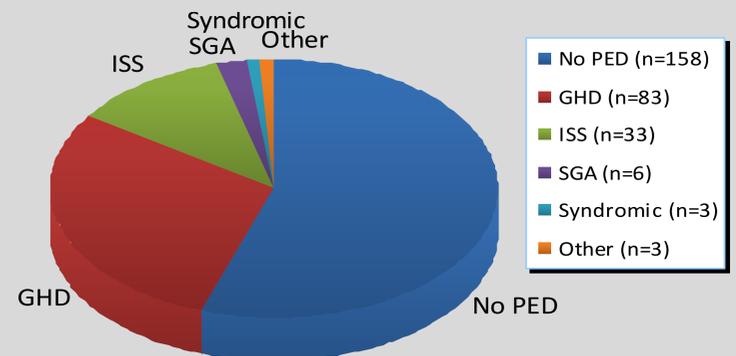

- No PED (n=158)
- GHD (n=83)
- ISS (n=33)
- SGA (n=6)
- Syndromic (n=3)
- Other (n=3)

Figure 2. Distribution of pediatric endocrine diagnoses.

- Previous measurements were available in 72.4%, and 44.8% were found to have a PED. Of those with a PED, growth hormone deficiency (GHD) was the most common pathologic etiology (Figure 2).
- There was a significant relation between HV<25th percentile and a PED (p<0.0001), as well as, between HD and a PED (p<0.0001).
- Logistic regression analysis showed that a HV<25th percentile and a HD>2 SDs, significantly increased the odds of PED (Table 1).

Outcome	Variable	Odds Ratio	95th CI	P-value
Pediatric Endocrine Diagnosis	Height Velocity < 25 percentile	5.148	2.941, 9.012	< 0.0001
	Height Deficit >2 Standard dev.	1.385	1.101, 1.742	< 0.005

Table 1. Summary of logistic regression analyses.

This retrospective chart review showed that there was an increased frequency of GCs at initial assessment of patients referred for short stature to our center, 72.4% vs 41-54% (4,5). This was likely attributable to our standard clinical practice, wherein following receipt of a referral for short stature, repeated requests were made to the referring physician for previous measurements. This has a significant clinical impact as in the absence of serial measurements at referral, calculation of HV would be delayed by a minimum of 6 months. Investigation, diagnosis and management of a PED, which accounted for 44.8% of our population, would also be delayed.

Height velocity and HD were shown to be good predictors of a PED and combining HD>2SDs with HV<25% allowed for more accurate prediction of a PED. This study quantifies the valuable information that can be obtained from GCs.

In conclusion, HV is a significant predictor of a PED. Our higher rate of previous measurement availability is likely due to our effective referral screening protocol. The availability of these measurements, which are essential for HV calculation, reduces delay in diagnosis and management

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