NORMAL VARIANTS OF SHORT STATURE

Definitions

- **Short stature**: height that is below the 3rd percentile
- **Familial short stature**: parents with short stature; normal growth velocity, proportionally normal weight, normal timing of pubertal onset, and normal bone age; predicted final height based on current growth pattern within expected range of mid-parental height
- **Constitutional delay of growth and puberty**: parents without short stature; normal pre-pubertal growth velocity, proportionally normal weight, late pubertal onset, delayed bone age, similar family history in one or both parents; should achieve normal final height without intervention

Measuring Stature

- 0 - 24 months = measure **length** (recumbent)
  - Calibrated length board, no shoes, eyes up, legs extended, toes upwards
- 2+ years = measure **height** (standing)
  - Wall-mounted stadiometer, no shoes, legs straight, looking straight ahead
- Normal growth in stature:
  - 0 - 24 months = rapid growth
  - pre-pubertal = slower consistent growth ~5 cm/year
  - puberty = rapid growth

⚠️ Growth should be plotted on the **WHO Growth Charts for Canada**. For children with genetic syndromes, growth should be plotted on **syndrome-specific growth charts**.
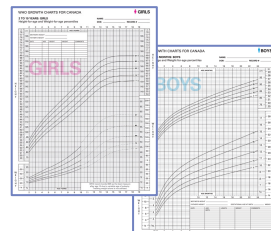
Physical

- Full physical exam including cardiac, respiratory, GI, extraintestinal manifestations of IBD including eyes
- Plot height and growth velocity **every 6 months**
- Upper-to-lower segment ratio and arm span to evaluate for skeletal dysplasia
- Sexual maturity rating (Tanner stages)
- Features associated with genetic syndromes including Down syndrome, Turner syndrome, Noonan syndrome

History

- **Growth history** ➡️ onset of short stature, if child has always been short or recent growth velocity decrease, if weight is not proportional to height
- **Birth history** ➡️ gestation, birth weight and length, IUGR, neonatal hypoglycemia, jaundice, maternal illness, smoking
- **Developmental history** ➡️ developmental milestones, tooth eruption and loss, puberty onset
- **Nutrition** ➡️ calorie intake, feeding history
- **Social history** ➡️ indications of deprivation
- **Medications affecting growth** ➡️ stimulants, corticosteroids
- **Mid-parental height** using child's sex assigned at birth and biological parents' heights

$$\text{male} = \frac{\text{mother} + \text{father} + 13\text{ cm}}{2}$$

$$\text{female} = \frac{\text{mother} + \text{father} - 13\text{ cm}}{2}$$

- **Review of symptoms** ➡️ GI, cardiac, renal, thyroid diseases; neurological symptoms suspicious of tumours including headaches, vision changes

⚠️ Decreased growth velocity is **more concerning** than a short absolute height.

Differential Diagnosis (With Examples)	Potential Investigations
Normal variants • Familial short stature • Constitutional delay of growth and puberty	• Bone age X-ray • No investigations is appropriate, given clinical context
Endocrine • Growth hormone deficiency • Hypothyroidism • Cushing's syndrome	• IGF-1, IGFBP-3, GH • T4, TSH • Cortisol, ACTH • LH, FSH, testosterone, estradiol • Glucose
Malabsorption • Celiac disease • Inflammatory bowel disease	• tTG-IgA • CRP, ESR, fecal calprotectin • Endoscopy, MR enterography
Chromosomal abnormalities • Skeletal dysplasia • Syndromes associated with short stature	• Genetic tests (molecular, chromosomal)