Short Stature

Definition / Supporting Information

Short stature is defined as a height that is 2 or more standard deviations below the population mean (below the second centile).

A single point on a growth chart often does not define a worrisome growth pattern; therefore, previous growth data should be plotted whenever available and serial measurements taken. Any evidence of unusually slow growth (eg, serial height measurements crossing centiles) should prompt careful clinical review, as many chronic illnesses may present with short stature.

The most common causes of short stature are familial short stature and constitutional delay in growth and puberty.

Essential History

Ask about:

- Pregnancy history
  - Maternal health
  - Medications
  - Smoking
- Neonatal history
  - Gestation and birth weight
  - Neonatal complications
- Previous height measurements
- Feeding history, diet, and appetite
- Pubertal history
- Medical history of chronic illness
- Medication history
  - Steroids, including corticosteroid inhalers
  - Stimulants (eg, methylphenidate hydrochloride)
- Review of systems
  - Weight loss or gain
  - Fatigue
  - Diarrhoea
  - Constipation
  - Abdominal pain
  - Headache
  - Visual disturbance

- Family history
  - Height of parents and mid-parental height centile
  - Growth and puberty history of parents
  - Birth weight and growth centiles of siblings
  - Medical history and genetic conditions
- Social history (See When to suspect child maltreatment [NICE clinical guideline CG89])
  - Neglect
  - Social deprivation

'Red Flag' Symptoms and Signs

Ask about:

- Weight loss
- Constipation or diarrhoea
- Headache (See Abnormal growth [HeadSmart - Be brain tumour aware])
- Vomiting

Look for:

- Normal or excess fat stores
  - More common in endocrine conditions
- Reduced fat stores
  - Insufficient calories or chronic illness
- Disproportionate short stature (short limbs or trunk)
- Dysmorphic features (see Congenital Malformations)
- Anaemia
- Enlarged thyroid and / or clinical features of hypothyroidism
- Focal neurological deficit
- Hypertension
- Delayed puberty
- Signs of child maltreatment (See When to suspect child maltreatment [NICE clinical guideline CG89])

Differential Diagnosis / Conditions

- Familial short stature
  - The child is growing at a normal rate below the second centile.
  - One or both parents are short.
  - Tend to have puberty at a normal age and to achieve an adult height within 6-8 cm of their adult target height

- Constitutional delay in growth and puberty
  - Birth weight is normal, but between 6 and 24 months linear growth and weight track downward to the second centile or below.
  - After age 3 years, children follow their own curve parallel to the lower end of the growth centiles and beneath their target centile range.
  - Typically have a delayed onset of puberty / growth spurt associated with downward tracking of height and weight in early adolescence
- Small for gestational age
  - Various thresholds for height and weight at birth are used to define 'small for gestational age', the three most commonly used being:
    - A length at birth that is 2 standard deviations or more below the population average
    - A weight at birth that is 2 standard deviations or more below the population average
    - A weight at birth below the 10th centile
  - Children born small for gestational age whose growth has not caught up by 4 years of age are candidates for treatment with growth hormone.
- Endocrine disorders
  - Hypothyroidism
  - Cushing's syndrome
    - Endogenous Cushing's syndrome is extremely rare.
    - Iatrogenic Cushing's syndrome is more common.
  - Growth hormone (GH) deficiency
    - Not a common cause of short stature
    - A suggestive physical finding is an increase in truncal subcutaneous fat.
    - Most cases are congenital, with fall-off in growth starting late in the first or in the second year of life.
    - Acquired GH deficiency is less common and raises the possibility of a pituitary tumour. (See Abnormal growth [HeadSmart - Be brain tumour aware])
- Syndromes
  - Turner's syndrome
  - Russell–Silver syndrome
  - Noonan's syndrome
  - Prader–Willi syndrome
  - Achondroplasia / hypocondroplasia
- Chronic illnesses and nutritional disorders
  - Inadequate caloric intake
    - Anorexia nervosa

        - Neglect (See When to suspect child maltreatment [NICE clinical guideline CG89])
    - Inflammatory bowel disease
        - Growth attenuation may start before gastrointestinal (GI) symptoms are apparent.
    - Coeliac disease
        - May have few, if any, GI symptoms
    - Renal disease
        - Renal tubular disorders
        - Chronic kidney disease
    - Liver disease
- Medications
    - Long-term oral or inhaled glucocorticoid therapy with corticosteroids
    - Stimulant medications

Investigations

To be undertaken by non-specialist practitioners (eg, General Practitioner (GP) Team):

- Urea, creatinine, and electrolytes
- Full blood count
- CRP and ESR or plasma viscosity
- Liver function tests
- Bone biochemistry
- Thyroid function tests
- Coeliac screen

To be undertaken by specialist practitioners (eg, Emergency Department / Paediatric / Paediatric Endocrinology Team(s)):

- Above tests if not already done
- Insulin-like growth factor (IGF-1) and / or insulin-like binding protein 3 (IGFBP-3)
- Karyotype (girls)
- Specific genetic investigations if syndrome associated with short stature suspected (eg, Prader–Willi syndrome)
- Bone age
- Further imaging as indicated (eg, skeletal survey, MRI brain)

When to Refer

Refer to specialist practitioners (eg, Emergency Department / Paediatric / Paediatric Endocrinology Team(s)):

- If any ‘red flag’ signs or symptoms (urgent referral)

- Children crossing two or more centiles or one centile band width
- Children who were born small for gestational age (intrauterine growth restriction) who have not caught up to the normal range by ≥ 2 years
- Children with short stature who have not started puberty by age 14 years (see Delayed Puberty)
- Dysmorphic children with short stature (see Congenital Malformations)
- Children with short stature due to chronic illness
- Children in whom child maltreatment is suspected (refer according to local safeguarding policy)

Escalate care to Paediatric Endocrinology Team or appropriate sub-specialty team if:

- Specialist investigation and treatment (including GH replacement) is required.
  - See Human growth hormone (somatropin) for the treatment of growth failure in children [NICE technology appraisal TA188]
  - GH replacement is indicated in:
    - GH deficiency
    - Turner's syndrome
    - Prader–Willi syndrome
    - Small for gestational age with subsequent growth failure at 4 years or later
    - Chronic renal insufficiency
    - Short stature homeobox-containing gene (SHOX)
- Evidence of chronic illness
  - Refer to appropriate sub-specialist such as a gastroenterologist or nephrologist.

'Safety Netting' Advice

- Any suggestion of unusually slow growth should be reviewed.
- Some children with short stature develop significant psychosocial problems, such as poor self-esteem.
  - Referral to a psychologist may be helpful in such cases.

Patient / Carer Information

Please note: whilst these resources have been developed to a high standard they may not be applicable to children.

- Restricted growth (dwarfism) (Web page), NHS Choices
- Turner syndrome (Web page), NHS Choices,
- Prader-Willi syndrome (Web page), NHS Choices

Resources

National Clinical Guidance

Human growth hormone (somotropin) for the treatment of growth failure in children (Web page), NICE technology appraisal TA188, National Institute for Health and Care Excellence.

When to suspect child maltreatment (Web page), NICE clinical guideline CG89, National Institute for Health and Care Excellence.

UK-WHO growth charts 0-18-years (Webpage), Royal College of Paediatrics and Child Health.

Medical Decision Support

Neglect (Web page), RCPCH Child Protection Companion 2013 (2nd Edition)

Suggested Resources

Please note: these resources include links to external websites. These resources may not have national accreditation and therefore PCO UK cannot guarantee the accuracy of the content.

Abnormal growth (Web page), HeadSmart - Be brain tumour aware.

Turner Syndrome Support Society (Website).

Child Growth Foundation (Website).

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